

THE ROLE OF IMAGINATION IN THE PROCESS OF DATA INTERPRETATION

Radim Čermák
VŠE Praha, Czech Republic
radim.cermak@vse.cz

Abstract:

We are surrounded by complex systems and also we need to interact with these systems. With increasing number of available information involved in these complex systems is sometimes hard to make good decisions. On the other hand, right decisions are today almost necessity (there is no space for errors), mainly for managers and executives. Right decision demands on correct understanding of elements and relations in systems which are involved in our decision making. This article proposes imagination as main factor of correct data interpretation. Imagination is crucial in process of making right relations within our endocepts (mental models of real world) and thus appropriate understanding of surrounding complex systems. Importance of imagination is illustrated on simple example of definition of pulley (which also indicates importance of visualization). Article also points out relationship of data, information and knowledge accompanied by imagination. To conclude, imagination is with sufficient knowledge base another cornerstone for right decision making.

Keywords: imagination, information, knowledge, data, endocept, visualization.

1. INTRODUCTION

We encounter with a large number of different objects every day. Man lives in a world that surrounds him and thus is forced to interact constantly with the outside world. If we want to interact with outside world as successfully as possible, (i.e. primarily, to survive, then to work efficiently with the minimum vain effort, and generally to live as efficiently as possible - at least from the perspective of maximizing of physical and mental needs and thus minimizing of negative feelings and emotions) one must understand the surroundings, understand things, plants, animals, other people, etc. It means that we must understand the behaviour of each object from the outside world and principles and relationships which causes given behaviour. To be able to understand the complex surrounding world, man always tries to take things apart into smaller parts, then analyze and understand the principles governing the behaviour. That means apply reductionist view of the system (i.e. that we're looking at the object as a system = entity composed of parts and relations between these parts (See Rosický, 1997, pp. 41 - 45), when we separate the object from its surroundings, i.e. we determine its boundary - the boundary of the system and then we examine it in a way that we split it into parts and from revealed behaviour of individual parts we conclude about the behaviour of the whole.

Reductionism is undoubtedly a very important way of examination of any system and definitely has good results. Unfortunately, there is quite often a cost of inaccuracy, necessity of limits of initial system conditions, constraints and various approximations of the system. Real-world systems are seldom simple enough to be completely explained by this reduction. In the real world, most of systems have behaviour which is a result of very complex relationships and linkages between the system and its surroundings as well as within the system itself. Such systems are called complex systems.

2. COMPLEX SYSTEMS AND INTERPRETATION

Complex system is a system consisting of relatively many interconnected parts. Complex systems are mostly complicate, subtle and difficult to understand. Relationships in complex systems can be divided into structural and functional ones. Structural relationships define which parts are interconnected and functional relationships define the dynamic behavior of the system, i.e. how behavior change in one part affects other related parts / whole system. (See Burian) Complex system is simply a system composed of a large number of elements, which are inter-linked and interacting through mutual interconnections.

The outside world is complex. Complexity is one of the most basic characteristics of living and also non-living systems. With increasing knowledge and increasing volume of information available in the world today, this fact is more and more evident. One part of the system affects the other and together form a complex system which is often characterized by emergent behaviour.

To select the correct decisions in all areas of human activity, in management, in business, in politics or in our personal life is important to properly understand the complex systems that surround us and with whom we interact. Correct decisions of course need the relevant data and the ability to correctly interpret them into (demanded) information using current knowledge.

But what is crucial for the correct interpretation of the data and therefore understanding the (more or less) of the investigated system? It's imagination. Think of the system as a puzzle, where we know certain parts of the system and their behaviour, but still do not have a complete picture of the system as a whole. Any additional information corresponds to the appointment of a new piece of the puzzle into the whole and thus reduction of our ignorance, increasing or modification of our knowledge and ability to better understand the system and therefore even better decisions. Imagination plays a key role in this process.

Our mind works by constantly making zig-zag movement between perceived and our edocepts. In other words our mind compares perception with our endocepts. Endocept is our internal world model created on the basis of generalization and abstraction of a perceived reality. We can explain this concept on a word dog. Remember that when pronouncing the word dog, most of us imagine a dog. Quite often it is a general dog, it's not a particular race, not a particular "face", etc... It's simply abstraction of dog. It has head, ears, body, four legs and a tail. When thinking about the term dog longer, we can begin recalling details, for example we can imagine a particular dog, we can "hear" barking or "feel" soft coat etc. For most people, the first idea of a word is vague visual idea of abstract

dog. The degree of detail depends on how much we dive into the content of this endocept. (See Pstružina, 1994, pp. 40 - 44 and Čermák, 2010, pp. 17 - 20).

Interpretation, in that context, can we imagine as a composition of abstract parts into abstract puzzle that is based on imagination. This means embedding our perception into our endocepts and thus creating a new endocepts or linking and expanding existing ones.

If we are not able to imagine this embedding of puzzle pieces, we are then not able to create appropriate links between endocepts and we are not able to correctly interpret the data. Then it is very probably that our decision will be wrong or at least ineffective.

Populism is a beautiful example of the use or rather misuse of poor imagination associated with the insufficient connection of individually presented data. In an economic context, it results for example in a choice of today's benefit. This choice is represented by rise of various supporting and social doses and increase of debt instead of solving problems even with a necessity of current cut down of our expenses, but with the promise of future development. A concrete example is the growing debt of the Czech Republic (MfČR, 2013) or already escalated problem in the form of crisis that erupted last year in Greece and the subsequent wave of indignation at attempts to tackle it.

This example has of course a much broader causes and consequences. It is a highly complex system that is influenced by a number of criteria. These are the criteria that we would normally not count with, nevertheless they influence the outcome in a quite high extent. An example might be the extent how the language we speak affects the rate at which we are willing to save our money. Chen K. (Chen, 2013) states that people who speak the language in which it is not strictly distinguished past, present and future are about 25-30% more willing to save than people speaking a language that distinguish the time in this way. Moreover this corresponds to the Hall's cultural dimensions of long-term and short-term orientation. From the above information it is very easy to see that we are surrounded by complex systems and that their significant components are often criteria that are not very likely at a first sight.

3. THE ROLE OF IMAGINATION IN THE PROCESS OF INTERPRETATION

To correctly assemble the pieces of a complex system into a meaningful whole, it is important to know how these pieces interconnect. It is important to put perception correctly into the existing endocepts and consequently to make a correct interpretation. You can certainly argue that each person has his own idea of the world, has specially formed endocepts and thus will also interpret its surroundings subjectively. That is certainly true. But here, we are concerned in the general principle of interpretation, where it is necessary to interconnect a large number of our endocepts for correct integration of information and therefore the correct interpretation of the data. The case of insufficient imagination leads to poor connected endocepts, i.e. connection errors, missing endocepts etc...

We try to illustrate the importance of imagination on example. Take, for example, one of the simple machines - pulley. To understand the principle of pulleys, we need a few basic assumptions. The first is actual knowledge of the concepts: the wheel, the groove, the rope, the weight, the power etc. These are terms with various degrees of abstraction and to all of these concepts we need to have appropriate endocepts, because through them we "work" with reality.

Let's look at the definition of pulleys (according to Wikipedia): "A pulley is a wheel on an axle that is designed to support movement of a cable or belt along its circumference. Pulleys are used in a variety of ways to lift loads, apply forces, and to transmit power. A pulley is also called a sheave or drum and may have a groove between two flanges around its circumference. The drive element of a pulley system can be a rope, cable, belt, or chain that runs over the pulley inside the groove."

By definition it is clear that apart from the necessity to know the terms used, we should also be able to imagine the described context. Without imagination, we can learn the definition, but we will never be able to understand what the pulley is and what it can be used for. An obvious advantage for easier understanding of this definition is visualization of the system. Visualization is understood as one of the best ways to enable people to better understand complex systems and give it a better orientation in the surrounding world.

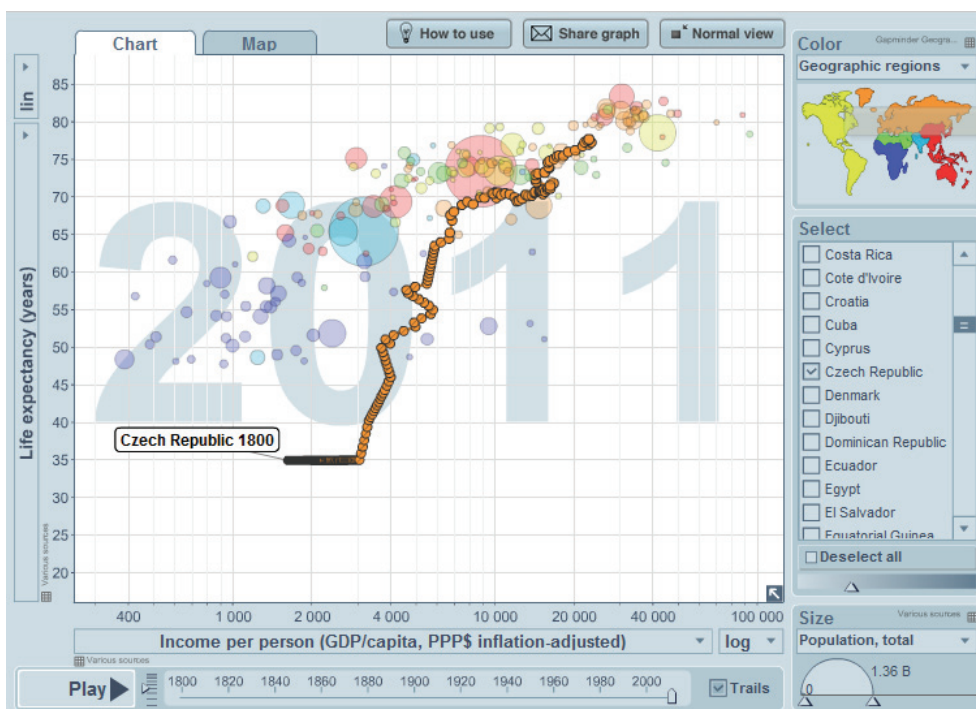
3.1. Imagination and visualization

Example of pulley showed us the importance of imagination, even in very simple system. With the system's complexity this importance grows. In highly complex system is then their complexity so high that there is often a need for help, i.e. facilitate the process of imagination and interpretation. For the imagination is this helping "crutch" formed by visualization.

Visualization has the ability to contain (view) the system or at least a selected portion of the system as a whole and therefore enables a holistic view of the researched thing, making it easier to capture links, hidden patterns and moreover it allows very clear display of large amounts of data. Visualization makes easier communication of required information and facilitates cognitive process and thus leads to a better understanding and interpretation of the presented data.

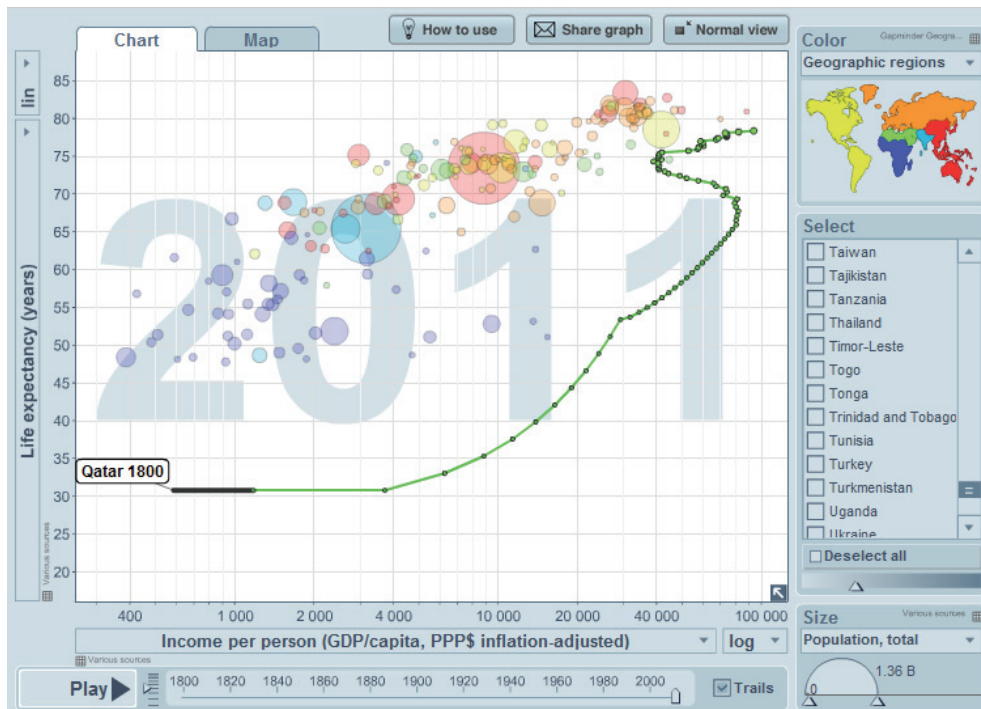
A great example of how you can use visualization of large amounts of complex data is a tool made by Swede Hans Rosling: Gapminder. The following figures illustrate the power of this tool for the communication of otherwise complicatedly imaginable and interpretable data.

Picture 1: Visualization of a progress of life expectancy depending on income per capita for the Czech Republic (1800 - 2011).



Source: <http://www.gapminder.org>

Picture 2: Visualization of a progress of life expectancy depending on income per capita for Qatar (1800 – 2011).



Source: <http://www.gapminder.org>

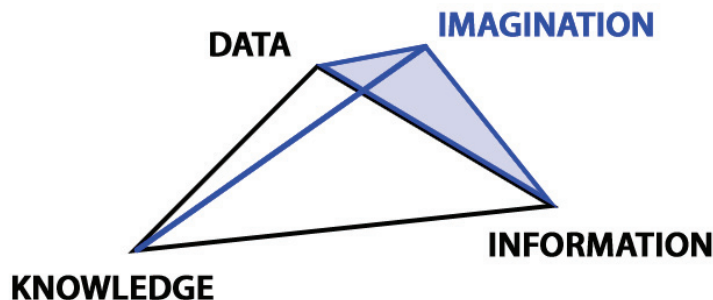
The first picture shows the progress of life expectancy depending on income per capita in each year since 1800 to 2011 for the Czech Republic, the second image for Qatar. We can appreciate the beauty of visualization mainly from the second picture. Apart from the already mentioned dependence can we beautifully observe also huge jump in income per person in year 1939. Income increased in this year almost four times. This fact is obviously related to finding of oil on a territory of Qatar in this year.

We can imagine complex data better due to image and also do so much more complete picture about the studied object. In other words, visualization allows us to take into account a much broader range of data, to give these data in a more comprehensive and easily accessible form, which leads to better connection between endocepts and perception and to wider involvement and linking with existing endocepts and thus to better interpretation of the data.

Linking visualization, information technology and the growing amount of available data provides a way to better and more objective interpretation of data in today's information overloaded world and thereby contribute to a better and more effective decision-making of economic agents. But this issue goes beyond the scope of this article.

Thus we understood the imagination as a newly added, essential element in the process of data interpretation and creation of knowledge. Relationship of data, information and knowledge, accompanied by the imagination is shown in the following figure.

Picture 3: Relationship of data, information, knowledge and imagination (newly added element to the process of data interpretation and creation of knowledge).



Source: Author

4. CONCLUSION

The need to make the right decisions is crucial not only for top managers and executives, but virtually for all occupations and sectors of human activity. With the increasing amount of information is very often saturation of information. This leads on the contrary in oversimplifying of things. Another consequence is a naive belief that easy availability of information means an opportunity to gain all information whenever you need or want. This leads naturally to the limited knowledge in terms of volume and connectivity.

At the beginning we talked about complex systems whose main feature is a large number of elements and their interconnection and interactivity. Because the outside world is made up mostly of complex systems, there is crucial need of realization of relations and connections, which forms these systems. Reflection and understanding of these connections are built up on the imagination.

Sufficient spectrum of knowledge is the cornerstone for good decision making. This article extends cornerstones of the imagination. Imagination is understood as a key element in the process of data interpretation. Imagination allows properly grasp our inner world models (endocepts) and put them into the perceived information (data), respective vice versa. Developing imagination would be one of the basic building blocks of our education.

Note

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REFERENCE LIST

1. Burian, J. Complex Systems Tutorial. *Eldar.cz* [online]. [Cit. 2012-6-10]. Retrieved from: <http://eldar.cz/cognition/complex/>.
2. Čermák, R. (2010). *Vnímání a tvorba grafického designu v různých kulturách*. VŠE, Praha.
3. Chen, K. (2013) Keith Chen: Could your language affect your ability to save money? In: *TED* [online]. 2013-02. [Cit. 2013-04-04]. Retrieved from: [http://www.ted.com/talks/keith_chen_could_your_language_affect_your_ability_to_save_mon ey.html](http://www.ted.com/talks/keith_chen_could_your_language_affect_your_ability_to_save_money.html).
4. MfČR. (2013). Struktura a vývoj státního dluhu. *Mfcr.cz* [online]. 2013-03-29. [Cit. 2013-04-04]. Retrieved from: http://mfcr.cz/cps/rde/xchg/mfcr/xsl/str_vyvoj_sd.html.
5. Pstružina, K. (1994). *Etudy o mozku a myšlení*. VŠE, Praha. ISBN 80-7079-280-9.
6. Rosický, A, Vodáček, L. (1997) *Informační management: Pojetí, posílání a aplikace*. Management press, (p. 149), ISBN 80-85943-35-2.