Journal on Efficiency and Responsibility in Education and Science
ISSN: 1803-1617, doi: 10.7160/eriesj.2013.060409

RESEARCH PROBLEM DESCRIPTION AND DEFINITION: FROM MENTAL MAP TO CONNECTION CIRCLE

Stanislava Mildeová

University of Economics, Prague
mildeova@vse.cz

ARTICLE INFO

Article type
Short Communication

doi: 10.7160/eriesj.2013.060309

Article history
Received: September 12, 2013
Received in revised form: December 3, 2013
Accepted: December 27, 2013
Available on-line: December 31, 2013

Abstract

The paper examines the research problem (question) as one of the first methodological steps that has to be accurately and clearly defined. The necessity of modern scientific work is to understand and analyse problems holistically, to see it as a network of interconnected parts. In this sense we show that combination of mental mapping and connection circle may be a way that will be beneficial defining the research problem.

There is some evidence from interviews held with PhD students, who took part in the course Research Methods for Managers at the University of Economics in Prague from 2012-2013.

Key Words

Science, Research Problem, Mental (Cognitive) Map, Causal Analysis, Connection Circle, Software Piracy

Introduction

The world around us is becoming increasingly complex and confusing, which is reflected in the demands for adequate methodological and methodical support of scientific work. When solving scientific problems we come across situations where conventional approaches do not produce the desired results. In this context, the paper examines selected aspects of the initial stages of research.

In the introduction to research, the scientist formulates the purpose of research, than explains why he decided to solve the problem and why it is important to solve the problem. He determines why and who should be interested in his research and what new knowledge is the research bringing. And of course, he/she formulates research questions and their relevant working hypothesis.

The research problem (question) is one of the first methodological steps. The research problem has to be accurately and clearly defined.

To avoid getting into difficulties right at the start, we should apply the appropriate methods and procedures that help us clearly define the problem, identify its boundaries and at the same allowing enough time to get to the root of it.

So far, the paper has the objective to focus on selected methods that may be helpful in grasping research problems.

The result of an interview from 2012-2013 is used in the paper. The interview included PhD students, who took part in the course Research Methods for Managers at the University of Economics in Prague.

Research Problem description: from mental map to connection circle

Research problem

What is and isn't a research problem is quoted in numerous publications. Below there are some of the quotes stating that:

"A research problem is a statement about an area of concern, a condition to be improved, a difficulty to be eliminated, or a troubling question that exists in scholarly literature, in theory, or in practice that points to the need for meaningful understanding and deliberate investigation" (USC Libraries, 2013).

In both the natural and social sciences the research problem is typically posed in the form of a question. The research will answer the question posed.

The research problem reveals what the researcher is trying to answer. Thus the answer to a research question will help address a research problem that Booth et al (1995) define as problem "readers think is worth solving".

Now let's answer the question what is NOT a research problem? A research problem does not state how to do something, offer a vague or broad proposition, or present a value question.

Choosing and defining n a research question is the central element the investigator has to bear in mind when undertaking a research, and that should be the case for both quantitative and qualitative research. This first methodological step makes the theoretical assumptions in the framework more explicit.

Mental (cognitive) map

By using mental maps, we are trying to summarize all the areas that have something to do with the main idea. Collins English Dictionary represents minds map as a "diagrammatic method of representing ideas, with related concepts arranged around a core concept", by other definitions it is "a diagram used to represent ideas or information branching from a central key word or idea and used as an aid in study, organization, problem solving, decision making, and writing". Buzan (1972, 1974) describes mental mapping as graphical technique for visualizing connections between several ideas or pieces of information, where each idea or fact is written down and then linked by lines or curves to its major or minor (or following or previous) idea or fact, thus creating a web of relationships.

In many cases appears mental maps drawn „by hand", however for the creation of mental maps, there are many software products, such as NovaMind, FreeMind or MindMaps. These products allow you to create high-quality graphics diagrams.

Mental maps in research problems description

Mind maps have a wide range of applications, including applications associated with science. Cunningham (2005) and other studies (for example D'Antoni and Zipp, 2006 or Holland et al, 2004) confirm that mind mapping helps understanding concepts and ideas in science. The mental map is also the modern way to describe and develop the research problem.

The author of the paper is convinced that despite the additional options of visualizations using for example concept maps or modelling graphs. Mind maps just have a great potential for research problem description. Spiderors "idea sun bursting" character of mind maps help scientists clarify the topic, define keywords; see the hierarchy of themes and relationships between them.

Of course, mind map should be based on a deep analysis of solved problems. For this reason, it may be quite extensive and complex. When solving research problems, it is the necessary to take into account all the information that the map contains. So it will be possible to define the untapered framework of the research study.

An example of a mind map principles is illustrated (see Fig.1).

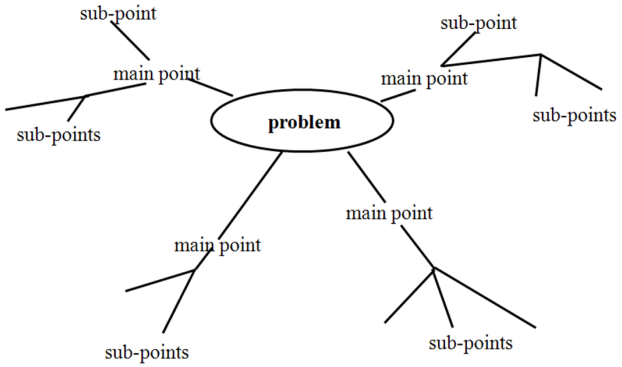

Figure 1: The mind map principles

Causal analysis

The search for the cause or causes of research problem (particular events and objects) is different from mental map. Most research is directed to understanding causal relationships (Richardson, 1991). As shown in Peña mental maps also show the causal-effect relationships among the concepts, and outline complex structures. But it is not typical for them.

While seeking the answer to the question: "What causes the research problem?" Will be probably often - by logic of mental modelling – generated a similar list like this below (see Fig.2):

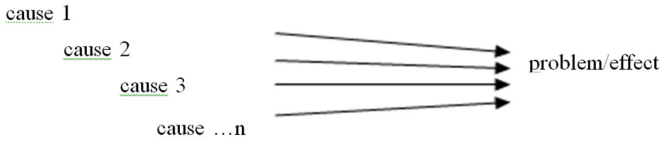

Figure 2: The linear cause-effect thinking

Alternatively, will be used, now classic tool for visualization of cause and effect, the cause and effect diagram, or herringbone spine, fishbone diagram, sometimes also referred to as an Ishikawa diagram (Ishikawa, 1976). Or we will meet with other methods such as Pareto analysis.

The search for the cause or causes of research problem (particular events and objects) is different from mental map. Most research is directed to understanding causal relationships.

But are such Approaches sufficient? For solving research question you need to build on the principle that each of the causes is associated with both its effect and with each other cause in the loop with feedback. In order that researcher understood and define the problem correctly, can be very helpful connection circles, which the paper wants to draw attention to.

Connection Circle

Connection circles are thinking tools designed to help us understand complexity that characterizes something with many parts in intricate arrangement. In science, there are at this time a number of approaches to characterizing complexity and a number of approaches, which are trying to find instruments for its understanding (see Zayed, 2010). Above all, it is a tool of the discipline, which follow the general systems theory by Bertalanffy (1968) or count directly as part of the complex systems theory (Tait and Richardson, 2010). A study of complex linkages is the main goal of complex systems theory.

Connection circles are a way to show interconnections between cause and effect as shown in Figure 3.

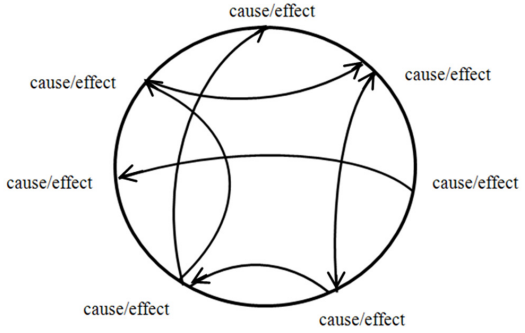

Figure 3: The connection circle

Compared to other instruments, for example with system dynamics (Mildeová, 2010), connection circles are simple. Using connection circles as graphic organizers, one focus their attention on a problem and generate ideas about its causes and possible solutions. We could trace cause and effect relationships to uncover feedback loops that underlie the problem (Quaden et al, 2004-2006).

One example: software piracy

One example is the problem of software piracy. The term "piracy" is used to refer to the unauthorized copying, distribution and selling of works in copyright (Panethiere, 2005). Software piracy is the unauthorized copying of software (Webopedia, 2013). Due

to software piracy affects all of us and has serious implications for the software industry and the economy, it is an actual subject matter for a research study.

Mental map could be used to express the hierarchy of topics and keywords about the problem of software piracy (see Fig.4). (The red marked part would be below described using the connection circle).

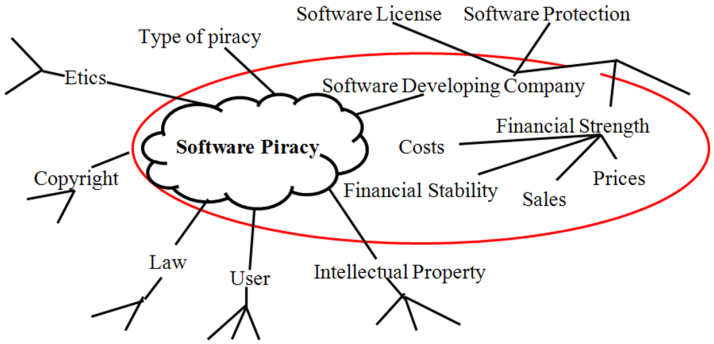

Figure 4: Mind map for software piracy (a cut)

Connection circles are used to represent relationships between the major entities. At first software piracy effect sales and prices, and that effects the financial strength of software developing company, but entities and the relationships between them is much more as it is shown in Fig. 5.

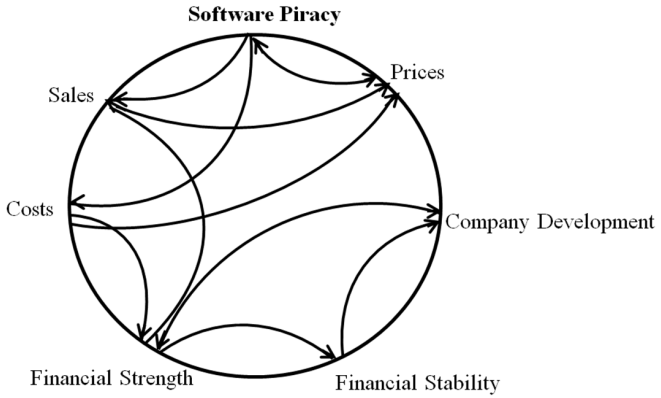

Figure 5: Connection circle for software piracy

Mental shift

Often, especially due to the empirical evidence, we look at the links in reality only through simple causal dependencies. On the question of "What makes something?" under the present dominant paradigm thinking, we will probably think up as an answer a long list of factors causing the problem. The assumption behind this thinking process is that each factor contributes to the effect as the cause, causality runs only one way, each factor acts independently of the others. This paradigm of thinking unfortunately affects even the scientific work as shown by Vitek (2013), based on studies publications in scientific journals and anthologies. This statement can be confirmed by communication with PhD students, at a controlled interview. Interview took place at the time of 2012-2013 and was attended by dozens of students of the course Research Methods for Managers at

the University of Economics in Prague (VSE). The aim of the course is to make students acquainted with the procedures and instruments of scientific work.

A good researcher should think in context. Everyone can look in the dictionary for a particular word, the date in the encyclopedia or a formula in the textbook (Molnár et al, 2012). Scientists should be able to a holistic worldview, which examined details; whether they are chemical compounds, artificial artefacts, groups of people, firms or market. One of the major barriers to the realization of holistic thinking is probably our limited ability to change their paradigm of thinking. If we overcome this barrier and change your thinking, we will be better able to define and solve research problems.

When we came out of the strengths of mind maps, which are ability to show topic's hierarchy and the strengths of the mind map, which is ability to show interconnections, we see an interesting contribution in combination both methods. Ability to show interconnections and ability to show topic's hierarchy are scaled on a range of 0 to 9 in a two-dimensional graph in Fig.6.

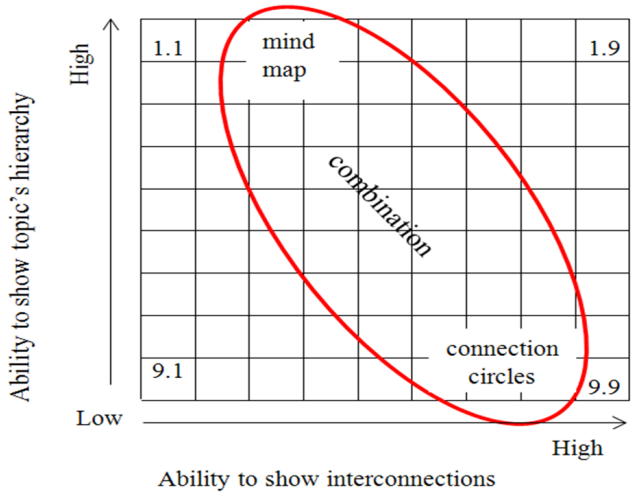

Figure 6: Combination of methods

Conclusion

According to the standard methodological principles of scientific work is the primary research phase determination of the investigation. The ability of a correct definition of the research problem is very closely related to the ability of the system point of view and scientific thinking. The necessity of modern scientific work is to understand and analyse problems systematically, to change their perception of the problems examined. The scientist must shift from examining individual causes and their consequences, and to see the world as a network of interconnected parts. In this sense the paper showed that linking mental mapping, methods of causes and consequences and especially construction circle may be a way

that will be beneficial defining the research problem. This will provide a tool that may enable scientists to develop not only the ability of the system analysis of the problem, but also the ability of creative thinking.

Recommendations thus seeks to combine methods described that their applications are not separate, but rather combined and interconnected. So that way might be in defining the research problem used synergistic effect of the strengths of these approaches.

References

Bertalanffy, L. von. (1968) *General System theory: Foundations, Development, Applications*, New York: George Braziller.

Booth, W. C., Colomb, G.G. and Williams, J. M. (1995). *The Craft of Research*. Chicago, IL: The University of Chicago Press.

Buzan, T. (1972) *Spore One: Structure in Hyperspace, and Other Poems*. Boydell & Brewer.

Buzan, T. (1974) *Use your head*. London: BBC Books.

Cunningham, G.E. (2005) *Mindmapping: Its Effects on Student Achievement in High School Biology.* Ph.D. thesis. The University of Texas at Austin.

D'Antoni, A.V., Zipp, G.P. (2006) 'Applications of the Mind Map Learning Technique in Chiropractic Education: A Pilot Study and Literature Review'. *Journal of Chiropractic Humanities*. 13, pp. 2-11.

Holland, B., Holland, L. and Davies, J. (2004). *An investigation into the concept of mind mapping and the use of mind mapping software to support and improve student academic performance*.Available: http://www.academia.edu/218359/An_investigation_into_the_concept_of_mind_mapping_and_the_use_of_mind_mapping_software_to_support_and_and_improve_student_academic_performance [10 September 2013].

Integrated Study Information System. Available: https://isis.vse.cz/auth/katalog/syllabus.pl?odkud=;zobrazit_sklad=0;zobrazit_obdobi=0;obdobi=;predmet=97966;typ=1;jazyk=3;vystup=1[10 September 2013].

Ishikawa, K. (1976) *Guide to Quality Control*. Asian Productivity Organization.

Mildeová, S. (2010) 'System Dynamics Supporting Complexity Management: Case Studies from a Small Economy within an Economic Integration Environment', in: Tait, A., Richardson, K. A. (2010) *Complexity and Knowledge Management – Understanding the Role of Knowledge in the Management of Social Networks*. pp. 261–277, Charlotte : Information Age Publishing.

Molnár, Z., Mildeová, S., Řezanková, H., Brixí, R., Kalina,J. (2012) *Pokročilé metody vědecké práce.* Praha : Profess Consulting

Peña, A., Sossa, H. and Gutiérrez, A. (2013) 'Cognitive maps: towards a holistic conceptual model'. *Expert Systems with Applications*. pp.1-37. Available:

http://www.wolnm.org/apa/articulos/ESWA_2008.pdf?target= [10 September 2013].

Quaden, R., Ticotsky, A. and Lyneis, D. (2008) *The Shape of Change and The Shape of Change: Stocks and Flows*. Acton, Massachusetts.

Richardson, G. P. (1991) *Feedback Though in Social Science and Systems Theory*. Pegasus Communications, Waltham, Massachusetts.

Tait, A., Richardson, K. A. (2010) *Complexity and Knowledge Management – Understanding the Role of Knowledge in the Management of Social Networks*. Charlotte : Information Age Publishing.

USC Libraries. Available: http://libguides.usc.edu/content.php?pid=83009&sid=618412 [15 September 2013].

Vítek, M. (2013) '*(In)Formation Of Social Systems'*, thesis to SYSIN 2014 conference.

Webopedia. http://www.webopedia.com/TERM/S/software_piracy.html [28 December 2013].

Zayed, J. M., Nouvel, N., Rauwald, U. and Scherman, O. A. (2010) 'Chemical Complexity – supramolecular self-assembly of synthetic and biological building blocks in water'. *Chemical Society Reviews*, 39, pp. 2806–2816.