

Applying Knowledge Cartography Techniques and Tools to Facilitate the Process of Realist Synthesis

Leonel Tractenberg

Faculty of Management and Finance, Rio de Janeiro State University (UERJ), Brazil

leoneltractenberg@gmail.com

Abstract: The astonishing growth of academic publications worldwide and the increasing access to online bibliographic databases of recent decades represent a challenge to researchers and professionals concerning the integration of findings on their area of expertise. As management studies multiply the importance of using new methods of qualitative research synthesis increases. New methods of qualitative synthesis have been recently developed, such as qualitative meta-synthesis and realist synthesis (or realist review). Yet, these qualitative syntheses methods remain relatively unknown by management researchers. Objectives - The purpose of this paper is to briefly present the realist synthesis method, and to show how knowledge cartography techniques and tools can be used in realist synthesis in order facilitate the process of theory building. Design/methodology - Underpinnings and method of realist synthesis are described, followed by a discussion on knowledge cartography and its applications to qualitative research. A realist synthesis on collaborative teaching serves as an illustration of how knowledge mapping tools can facilitate the realist review process. Findings – Cartographic techniques and tools can facilitate organizing and analysing studies, arranging and re-arranging concepts and, thus, can help designing theoretical frameworks in realist reviews. Originality/value – This paper can contribute to the instrumentalization of the realist review method, and to disseminate this method of research synthesis in Management Research.

Keywords: qualitative research synthesis, realist synthesis, knowledge cartography, knowledge maps

1. Introduction

Science is a cooperative and cumulative endeavour. Knowledge building in any field requires trustworthy accounts of past research. But making sense of a growing mass of research evidence is getting progressively harder with the astonishing growth of scientific publications worldwide and with the increasing access to online bibliographic databases of recent decades, available through the Internet. This represents a challenge to researchers and professionals concerned with the integration of findings in their area of expertise (Cooper 1998).

In this scenario, research syntheses have been playing an important role. A research synthesis can be defined as the systematic effort of finding, selecting, organizing, evaluating and integrating research findings on a given topic. According to the Handbook of Research Synthesis (Cooper et al. 2009), until the 1960s, most syntheses were written on an essayistic or narrative fashion. Those traditional literature reviews frequently suffered from researcher bias and lack of rigour, and, in many cases, were not considered as genuine pieces of scientific investigation. On the 1970s, standardized protocols of literature review were developed in order to provide increased reliability and consistency in synthesising research findings. Such systematic and meta-analytic reviews became popular during the 1980s and 1990s, especially in medicine and in social sciences, fostered by institutional initiatives such as the one from EPPI Centre, (<http://eppi.ioe.ac.uk/>), and by cooperative networks such as Cochrane Collaboration (www.cochrane.org) and Campbell Collaboration (www.campbellcollaboration.org) (Crag 1996, Littel et al. 2008).

Despite these developments, most research syntheses tended to focus on quantitative studies. According to Sandelowski et al. (1997:365) the increasing dissemination and refinement of quantitative methods of research synthesis contrasts enormously with the little attention given to qualitative research synthesis. As a

result, findings of qualitative studies end up getting scattered or lost, and end up having little impact on professional practices and policies (Matheus 2009).

In the past decade, new methods of qualitative synthesis have been disseminated, such as qualitative meta-synthesis (Sandelowski et al. 1997) and realist synthesis (or realist review) (Pawson et al. 2004). These methods are still very young and relatively unknown to the wider public of social science researchers.

With the increasing number of qualitative studies in management, it is important to apply these new methods to synthesise findings that, otherwise, would remain dispersed, and, therefore, be able to provide researchers and practitioners with useful information to guide future research or foster evidence-based policies and practices in the field.

The present work aims to be a contribution, not only to the dissemination of the realist synthesis method within the field of management research, but also to its development, by showing how knowledge cartography techniques and tools can be applied in order facilitate the process of theory building within this method. First, we present the main ideas underlying realist synthesis, and briefly describe its process. Then we describe what knowledge cartography is and how it can be useful for research and, particularly, for literature reviews and research synthesis. Finally, using a realist synthesis on collaborative teaching as an illustration, we show how knowledge maps can be used to facilitate some tasks of the realist synthesis method.

2. Background

2.1 Realist synthesis

Realist synthesis (or realist review) is a kind of qualitative research synthesis with the interpretive and explanatory purpose of understanding the processes or mechanisms underlying complex social interventions. In short, it aims to provide explanations of how and why such interventions work (or not) in a given context by creating a theoretical framework or model to be “populated” with empirical evidences drawn out from selected studies. This approach was developed by Ray Pawson (University of Leeds), Trisha Greenhalgh (University College London), Gill Harvey and Kieran Walshe (both from Manchester Centre for Healthcare Management) at the ESRC UK Centre for Evidence Policy and Practice. The present section summarizes the main ideas that support this approach as discussed by Pawson et al. (2004) and Pawson (2006).

The notion of complex social intervention is key to realist synthesis. A social intervention is considered to be of increasing complexity as it involves a growing number of processes or mechanisms which are interdependent and intertwined with contextual variables (environmental, historical, political, social, economic, institutional, etc.). The effectiveness of simpler interventions or treatments – such as the testing of a new drug in a given population – can be evaluated by synthesizing the results of a group of studies, selected based on their similarity and methodological rigour. This is usually done by following systematic reviews and/or meta-analytic protocols, often leading to quantitative comparisons and/or sum up of ‘effect sizes’. In contrast, when trying to appraise the effectiveness of a complex social intervention – such as a mentoring programme for developing leadership skills of employees from a company –, these methods tend to be much limited and even problematic. According to Pawson et al. (2004:iv), attempts to measure whether such interventions work using such protocols will always end up with the homogenised answer ‘to some extent’ and ‘sometimes’, but this is little of use to policy makers or practitioners because it provides no clue as to why interventions sometimes work and sometimes don’t or in what circumstances or conditions they are more or less likely to work or what can be done to maximise their chances of success and minimise the risk of failure.

This happens because, on the one hand, complex social interventions involve actions made by people according to their personal intentions, motivations, theories (knowledge and interpretations), values and beliefs of what has to be done in order to succeed. This actions are interdependent, embedded in multiple social systems (groups, institutions, cultures etc.), and form open non linear “living” chains of steps or

processes, i.e., prone to change as they are implemented due to internal and external influences from multiple stakeholders who impose pressures, limits, negotiations, and even redirect the course of action¹. Thinking on the example of a leadership skills mentoring programme, we must find that it may succeed in organization A, fail in organization B, and bring unexpected results in organization C. A close comparison of these three versions of the programme could reveal the richness and complexity of these interactions.

On the other hand, to allow rigorous quantitative comparisons among a set of replica studies, meta-analytic procedures lead to simplification and obfuscation (Pawson 2006:42). Studies are discarded, programme complexities are reduced to simple treatments, details and contextual information is ignored or circumscribed by a given set of categories. Pawson's critique of meta-analytic approach applied to synthesize evidences from studies dealing with complex social interventions can be summarized as follows:

The effort to ensure that evidence is assessed and compared to a common yardstick renders dynamic open systems as closed systems. Because it works at high levels of aggregation, because there is so little inspection of what goes on beneath the surface, and because programmes always contain way-ward, contradictory, self-transforming processes, meta-analytic usually ends with the detection of rather minor intervention effects. The typical product is in fact meta-equivocation (Pawson 2006:43).

Therefore, a realist synthesis takes a different approach. Instead of seeking for universal principles or a final verdict about the intervention (effective vs. ineffective), realist synthesis recognizes the fact that the success of an intervention depends on complex interactions, negotiations and conflicts between individuals, relationships, institutions and infrastructures through whom and for whom the intervention is directed. So it seeks to answer *what works, for whom, in what circumstances, in what respects, and how* (Pawson et al. 2004:v).

This is done by searching for pieces of concepts, models, explicit or implicit theories allegedly responsible for the operation of a particular intervention; building a theoretical model or framework out from these pieces (or based on them), and look for pieces of evidence in a systematic way to test and refine the understanding of the relations among these elements. The ultimate goal is to provide input for the design of new interventions, programmes or policies. The review seeks to synthesize findings in terms of a *theory of intervention* built from a "mosaic" of evidence-based principles and concepts extracted from selected studies. Final conclusions should be capable of expressing the complexity and dynamicity of the intervention, program or policy under study, and recommendations should be given with care and being transparent about the review limitations: *"remember A', 'beware of B', 'take care of C', 'D can result in both E and F', 'Gs and Hs are likely to interpret I quite differently', 'if you try J make sure that K, L and M have also been considered ... 'little is known about V, W, X, Y and Z'"* (Pawson et al. 2004:27).

The review method follows a sequence of steps, but instead of a fixed linear sequence, it is an iterative/recursive process, i.e., allowing revisions and refinements of previous steps, even when the review is well further. A generic template for realist reviews proposed by Pawson et al. (2004:29) is shown in table 1. This template should not be interpreted as a rigid scheme. What matters is to keep the logic and transparency in the process of discovery and theory building and refinement (2006:102).

¹ For a much detailed portrait of the complex nature of social interventions see Pawson 2006:26-37.

STEPS		TASKS / GUIDING QUESTIONS
Define the scope of the review	1. Identify the question	<ul style="list-style-type: none"> • What is the nature and content of the intervention? • What are the circumstances or context for its use? • What are the policy intentions or objectives? • What are the nature and form of its outcomes or impacts? • Undertake exploratory searches to inform discussion with review commissioners/decision makers.
	2. Clarify the purpose(s) of the review	<ul style="list-style-type: none"> • Theory integrity – does the intervention work as predicted? • Theory adjudication – which theories about the intervention seem to fit best? • Comparison – how does the intervention work in different settings, for different groups? • Reality testing – how does the policy intent of the intervention translate into practice?
	3. Find and articulate the programme theories	<ul style="list-style-type: none"> • Search for relevant theories in the literature • Draw up 'long list' of programme theories • Group, categorise or synthesise theories • Design a theoretically based evaluative framework to be 'populated' with evidence
Search for and appraise the evidence	4. Search for the evidence	<ul style="list-style-type: none"> • Decide and define purposive sampling strategy • Define search sources, terms and methods to be used(including cited reference searching) • Set the thresholds for stopping searching at saturation
	5. Appraise the evidence	<ul style="list-style-type: none"> • Test relevance – does the research address the theory under test? • Test rigour – does the research support the conclusions drawn from it by the researchers or the reviewers?
Extract and synthesise findings	6. Extract the results	<ul style="list-style-type: none"> • Develop data extraction forms or templates • Extract data to populate the evaluative framework with evidence
	7. Synthesise findings	<ul style="list-style-type: none"> • Compare and contrast findings from different studies • Use findings from studies to address purpose(s) of review • Seek both confirmatory and contradictory findings • Refine programme theories in the light of evidence
Draw conclusions and make recommendations		<ul style="list-style-type: none"> • Involve commissioners/decision makers in review of findings • Draft and test out recommendations and conclusions based on findings with key stakeholders • Disseminate review with findings, conclusions and recommendations

Table 1: The process of a realist review (adapted from: Pawson et al. 2004:29)

The review begins by setting goals and questions that will guide the process. If the goal is to evaluate the integrity of a theory of intervention, the reviewer will seek to identify weaknesses and barriers in the chain of processes of the intervention in a story of successive similar interventions. If the aim is to evaluate rival theories of intervention, the reviewer will try to synthesize the evidence in favour of one or another theory and explanation of the mechanisms, benefits and shortcomings of each. If the objective is to analyze how the same theory of intervention is implemented in different contexts, the reviewer will try to identify factors that best explain this or that situation. If the target is to compare official expectations and current practices, the review will look for elements of reality that are being neglected or contradict official expectations, knowledge and beliefs. The goal and question setting should remain open to revision and refinement along the way.

Searching for references is similar to what happens in systematic reviews: it is necessary to define sources, search expressions, inclusion/exclusion criteria, and quality standards for selecting studies. However, there are some points of differentiation: searching the literature can be done at different moments and for different purposes: a first exploratory search can help the reviewer to get familiarized with the topic, a second search may focus in identifying and extracting relevant programme theories, a third “purposive sampling” search can focus on finding empirical evidences to “fill up” or “test” the model, further searches can be done in order to refine the model; while systematic reviews progressively narrow down the number of references, by applying selection criteria, search strategies in realistic revisions may involve several cycles of narrowing down the scope, followed by scope expansions in another direction towards retrieving “convenience samples” of studies (purposive sampling). This is done in order to investigate specific aspects of the intervention in focus. Thus, the universe of selected references may suffer expansions and contractions along the route. Distinct niches literature can be scrutinized. These strategies are applied recursively until the reviewer identifies a saturation point, where new studies no longer add significant information to the synthesis.

Experimental studies, case studies, ethnographic research, theoretical discussions and other types of research can be included. It is important to mention that quantitative studies also may be used. But in this case, the reviewer will not be looking for pieces of quantitative data (correlations, effect sizes, p-values, significance levels, coefficients, etc.) to summarize. Instead, he will be searching for pieces of “programme theories” in order to build the theoretical framework. Both quantitative and qualitative data can be “extracted” from certain studies to “fill up” this framework.

Different from systematic reviews and meta-analyses, the criteria of selection and quality evaluation are not necessarily the same to all studies. They are established *ad hoc*. Instead of establishing an absolute filter to separate all usable studies, different filters are used to check the partial contributions of each study to the review questions. In later stages, partial assessments can be made on the relevant information to be extracted. On the other hand, some studies selected for in-depth analysis can be assessed more comprehensively. This “just-in-time assessment” makes the process considerably more complex and time-consuming. Pawson (2006) warns about the limitations of this strategy in terms of the amount of studies that the reviewer is able to encompass. Given the inherent complexity of interventions and their variability, it is necessary that the reviewer prioritize certain contexts and certain sources of information in order to limit the amount of data to a manageable volume. All these decisions should be explicit and justified in the final report.

One of the major challenges of the review process is to “find and articulate programme theories” (step 3 in table 1). A “programme theory” is not necessarily a formal scientific theory, model or set of principles. It can be a conjecture, hypothesis, explanation or rationalization about what works (or not) in a certain part of the intervention chain, and how and why it works (or not). Programme theories are not always explicit, and can be found in different parts of a study (background, methodology, discussion etc.), and not only in the results and conclusions, as it is done in other types of research synthesis. Theories can also differ in terms of: scope, ranging from *macro* (whole society), to *meso* (organizations or groups) or to *micro* level (individuals); level of generalization, from universal concepts, principles and models, to local theories, valid within a specific context. The challenge is not only to identify those theories, but also to prioritise which ones are to be selected, investigated and articulated to each other (Pawson et al. 2004).

2.2 Knowledge cartography

Knowledge cartography is the art, craft and science of mapping cognitive domains. Knowledge maps – sometimes called cognitive maps – are graphical representations of knowledge structures (concepts and relations between them). According Jonassen et al. (1993), cognitive maps serve both to access and analyze the cognitive structure of its author, and to present information in a schematic way, assist in the organization of content, facilitate its representation, visualization, communication and understanding.

There are different types of knowledge maps, each one better suit for specific applications: mind maps are useful for brainstorming ideas, problem-solving and creative writing (Buzan 1991); concept maps are suitable to represent knowledge domains or cognitive structures, by making concept relations and hierarchies explicit (Novak and Cañas 2006); argument maps are meant to visually represent the components of an argument, such as main contention, principles, premises, co-premises, objections and rebuttals, that can be applied to decision-making, legal and political analysis (Okada 2008); hypermedia maps and web maps are graphical and hypertextual representations of knowledge domains which incorporate different digital media files (texts, images, audios, videos etc.), software and/or web links (Okada 2007, 2008, Tractenberg et al. 2009).

While mind maps usually have a radial-branching structure, concept maps have a more strict representation in terms of hierarchy, putting higher-order concepts on the top, over subordinated concepts, and links between concepts must identify the nature of their relation. Argument maps should clearly identify issues, arguments or questions, pros and cons, premises, counterarguments, and conclusions. Hypermedia and web maps have a free hypertextual structure that can hold different kinds of knowledge maps and digital media. These kinds of maps can be very useful for indexing and retrieving hypermedia information (Gaines and Shaw, 1995).

Okada (2008) described seven types of knowledge maps that can be used useful in a research process: a *research project map* can help with defining research problems, questions and objectives, and, thus, building a research project; a *map of references* can support the indexing and organization of a literature review, and also easily retrieving research documents; a *map of reading* can help the researcher with the process of describing, analysing, synthesizing and/or interpreting studies; a *map of concepts* can be useful for building a conceptual framework of each study or a set of studies; a *map of field research* can help with organizing and analyzing fieldwork data (notes, documents, observations etc.); a *map of writing* can help the researcher in the process of systematizing and writing his research report; and, finally, a *map of research process* can be used to keep track and manage the investigation as a whole.

Maps of references, maps of readings and maps of concepts can be of special interest to researchers conducting literature reviews and research synthesis. As put by Vasconcellos,

Mapping ideas, arguments and concepts of a body of literature are important techniques for literature reviews. Mapping allows the researcher to find his way into a set of the existing literature, identify key studies and key concepts, and, at the same time, build up a framework of relationships between each study. (2008:170)

The next section will discuss how knowledge cartography techniques and tools can be embedded in the method of realist synthesis to help with the process of mapping programme theories.

3. Discussion: applying knowledge cartography techniques to facilitate the process of realist synthesis

The tasks of searching for relevant theories in the literature, selecting, listing, grouping, categorising, synthesising programme theories in order to build a theoretical framework form step 3 of the template of a realist review (see table 1: 'Find and articulate the programme theories'). As mentioned previously, this step is one of the major challenges of the entire process of a realist synthesis. Pawson et al. point out that "reviews may spend half of their time in the conceptual quagmire" (2004:18). The authors advise reviewers to temporarily

adopt a 'primary research' rather than 'synthesis' role, and scavenge ideas from a number of studies to produce a long list of key intervention theories from which the final short list will be drawn up.(2004:16)

Considering that the final 'product' from step 3 is a model or theoretical framework, i.e., a set of interrelated concepts, principles and/or variables, representing the rationale of how and why an intervention works; and considering the benefits of knowledge cartography in representing knowledge structures, we wondered if building *maps of references*, *maps of readings* and *maps of concepts* of the relevant studies could be a valuable strategy to help the reviewers succeed on this step.

So we decided to test this idea on a realist synthesis on collaborative teaching in higher education we started in 2013. Before showing how we used the maps, it is necessary to give a few words on the nature and context of the intervention, and on the purpose of our realist review.

Teamwork and collaboration are substantive ideas in post-fordist organizations. Virtues of collaboration are constantly extolled in management articles and business magazines. Yet, forging an authentic and sustainable collaboration culture within the organization is not an easy process. This is particularly true in educational institutions that commonly reinforce isolation, individualism and balkanized forms off collaboration among teachers (Fullan and Hargreaves 2000). Collaborative teaching, our intervention in focus, is a form of teacher collaboration in which two or more teachers work together in planning, development, evaluation, and especially in the implementation of instructional activities directed to the same group of students. Different forms of collaborative teaching, such as team teaching, co-teaching and shared teaching have been studied and practiced since the 50s. Most literature reviews on the topic point to a growing cumulative evidence suggesting that collaborative teaching can contribute to interdisciplinary education, to initial and continuing professional development of teachers, and to reinforce teacher collegiality.

In our own systematic review on collaborative teaching in higher education settings (Tractenberg 2012), we found relatively few studies dedicated to discuss processes and mechanisms underlying such kind of intervention, but no one presented a more encompassing theoretical model or framework. So we decided to do a realist synthesis in order to try to build such framework out from the literature.

In order to build the maps we used a software tool designed for hypermedia mapping called *Compendium*, developed by the Open University (UK)².

We initially created a *map of references* with the articles found in our systematic review (see figure 1). This was a simple list of full-text articles in PDF format organized alphabetically and in columns.

² See: <http://compendium.open.ac.uk/institute/>

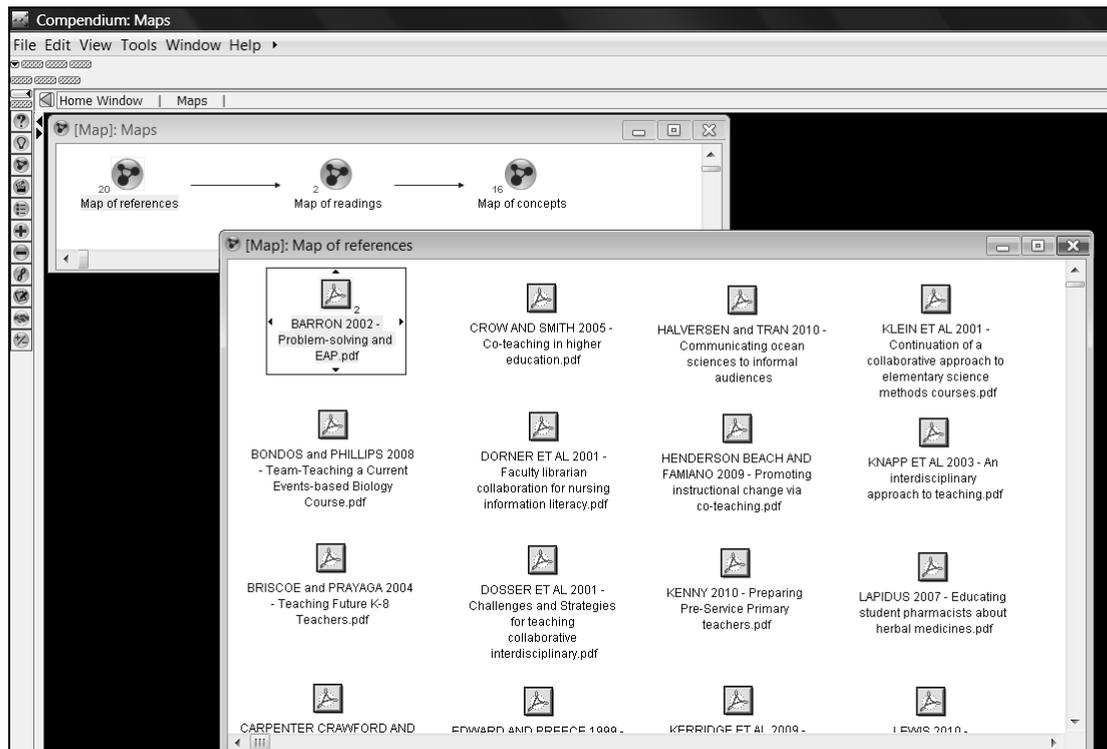


Figure 1: Map of references on collaborative teaching in higher education

Then we created the *maps of readings*, taking each relevant reference and analysing it in terms of research problems, hypothesis and objectives, background ideas, research methods and instruments, results and conclusions, and other elements relevant to the review. Figure 2 shows an example of the analysis of an article – BARRON 2002 “Problem-solving and EAP” (English for Academic Purposes). The structure of these maps took the form of a simple *mind map* where each node contained annotations – figure 2 shows our comments concerning the node “background to research”. As most hypermedia mapping software, *Compendium* allows multiple windows to be open, so this makes easy to examine two or more maps and its nodes simultaneously.

It is worth to mention that creating maps of readings can take a huge amount of time, so it should be done only with the studies previously scrutinized and found relevant for the review. Despite of the amount of work, this in depth analysis can be very useful to the reviewer. The exercise of identifying and reflecting on the many elements of each study can enhance his awareness of the differences among studies, in terms of rationale, research designs, subject characteristics, contextual differences and unfolding of each intervention. This can be especially useful when the purpose of the review is to understand how does the intervention work on different settings or which mechanisms work similarly in different versions of the programme. Further on, it can facilitate the process of identifying and extracting empirical evidence, and appraising quality of the study (steps 5 and 6 of the review template in table 1).

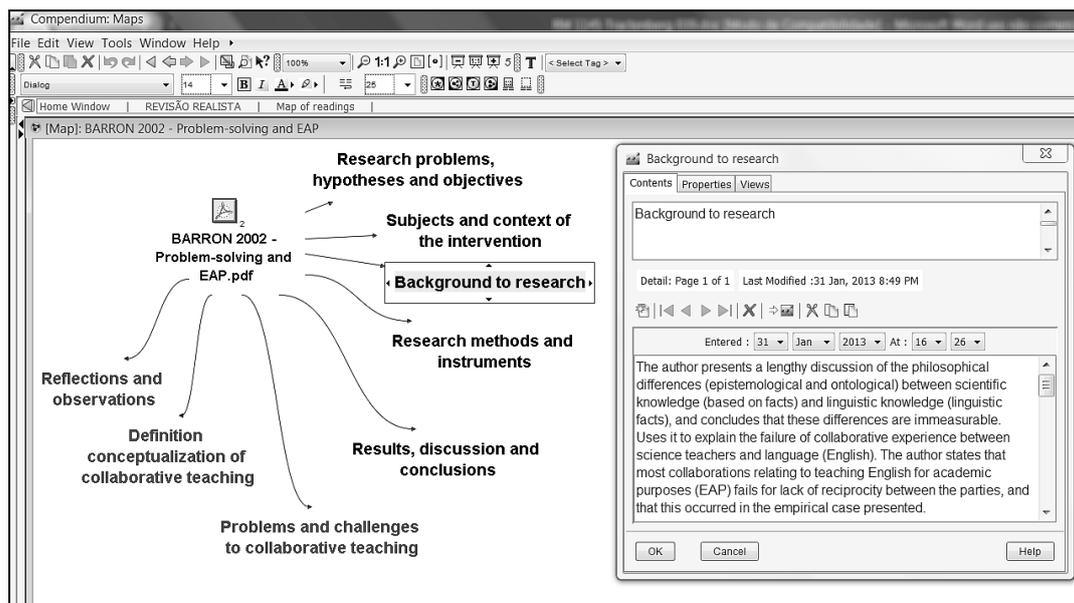


Figure 2: Map of readings of the article: BARRON 2002 - “Problem-solving and EAP” (English for Academic Purposes)

Finally, instead of drawing up a “long list” of theories, as Pawson et al. 2004 prescribe, we began building a *map of concepts* of each study we find theoretically relevant.

Figure 3 shows a map of some concepts from that study from Barron’s article already mentioned. Beforehand, we invite the reader to “read” this map and understand the author’s argumentation. This map took shape of a mix between a concept and an argument map in order to highlight concept relations and hierarchies, arguments, premises, counterarguments and conclusions extracted from the text.

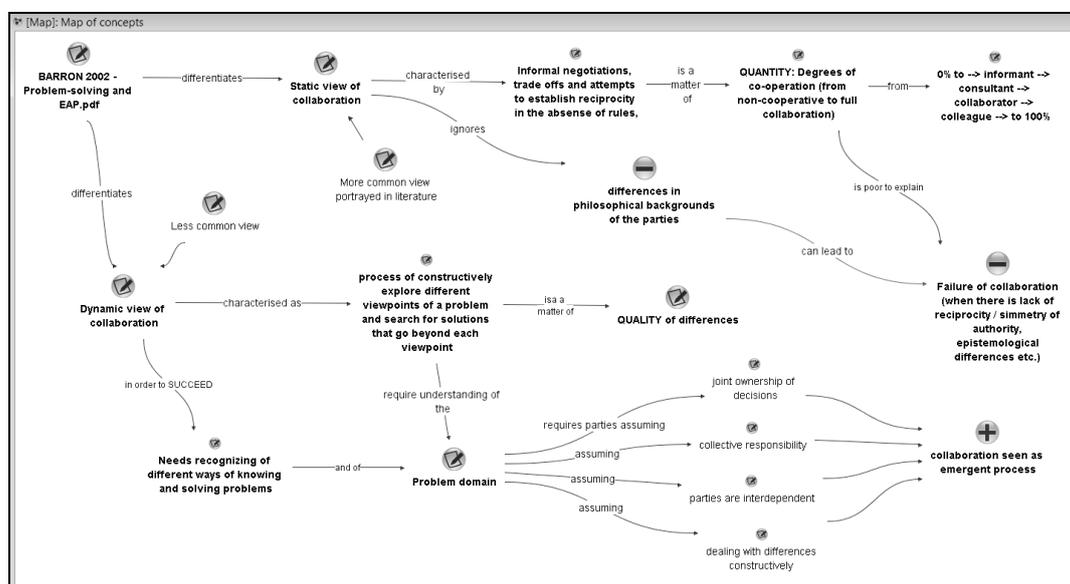


Figure 3: Map of concepts of the article: BARRON 2002 - “Problem-solving and EAP” (English for Academic Purposes)

First, we note the author differentiates a ‘static view’ of teacher collaboration from a ‘dynamic view’. According to Barron, the ‘static view’ is most frequently present in the literature. It sees collaboration (or cooperation) as a matter of quantity (or intensity, or degree), a behaviour characterised by informal trade-offs, negotiations, attempts to establish reciprocity, and so on. The degree of involvement can range from 0% to

100% (from none, to informant, to consultant, to collaborator, and finally to colleague). This 'static view' does not focus on subjective differences, such as differences in teachers' philosophical backgrounds, and under-represents the developmental nature of collaboration (Barron 2002:303). According to the author, this vision is poor to explain failures in collaboration when there are philosophical differences among teachers and refusal to address them in a symmetrical way. He argues and that, if we just understand the collaborative process just in terms of degree of negotiations and trade-offs, we might fail to understand collaborative teaching in depth. On the other hand, he points to a 'dynamic view' of teacher collaboration, which considers it an ongoing (or emergent) process of recognizing and exploring different viewpoints, and trying to go beyond them. In order to succeed, each teacher needs to recognize these differences in knowing and perceiving the problem domain, and in ways of solving problems. They need to embrace interdependency, collective responsibility and ownership of decisions, and try to deal with their differences in a constructive way. These issues were raised by the author when analysing why a collaboration experience between English teachers and science teachers did not succeed as intended (they had to work together on the planning and delivery of a course to develop students' English communication skills, problem-solving and information technology skills).

Note that there is more information on the above explanation than there is on the map. It is information we 'unpack' when reading it, together with information withdrawn from the respective *map of readings*. At this point, it is important to keep in mind that a map of concepts is not 'primary data' extracted from the article. Although it should be anchored on the ideas presented by the author, and present a reliable description of them, it is always a snip of interpretations made by the reviewer when creating the map, and when reading it afterwards. In this sense, a realist synthesis is not an objective and neutral abridgement process, but rather an interpretative and creative one, as is normally the case of most qualitative research). It is also important to note that the map shows just some of the ideas discussed by the author in his empirical case study. It is worth to remember that, different from what happens in quantitative research synthesis, we are *not* looking for summing up results related to the effectiveness of interventions, but for theoretical pieces of collaborative teaching mechanisms.

It is during the creation process of each *map of concepts* when the use of a hypermedia mapping software proves more useful. Compared to textual summaries or descriptions such as the one made above, hypermedia maps offer more flexibility to the reviewer: searching, rewriting, adding, deleting, coping, pasting, moving and mixing different elements and relationships is much easier. It also can facilitate the tasks of grouping, categorising and combining ideas, towards the creation of 'higher order' or 'integrative' maps that ultimately will help building the theoretical framework, the final product of step 3 of the realist synthesis template (see table 1).

Undoubtedly, the task of combining maps and building the framework is the most creative challenge of the whole synthesis. There is no recipe or easy way of doing that. And it is practically impossible not to lose information in this process. But the reviewer must be especially careful with trying to preserve differences (of concepts, subjects, contexts, situations, etc.), otherwise the synthesis can fall the same problem of oversimplification and obfuscation found in the meta-analytic approach (Pawson 2006). For example, Barron's study does not stress differences between the notions of collaboration and cooperation. Other authors do. It would be a mistake to simply mix different notions, without any reservation. It would also be a mistake to mix up different types of collaborative teaching (such as team teaching, parallel teaching, mentoring and so on) without any remark. The same reasoning applies to difference in subjects, situations, relations, etc.

Finally, our example of *map of concepts* (figure 3) only shows statements, principles and arguments, but the reviewer can start extracting fragments of empirical evidence to illustrate specific relations. This will prove to be most useful further on, during steps 4, 5 and 6 of the review.

4. Conclusion

In the last decade, there has been a growing interest, especially in the United Kingdom and European Union countries, of evidence-based policies and practices (Young et al. 2002). Traditional systematic reviews and meta-analysis have been of great help in summarizing and disseminating research evidences. But, as we pointed out, these methods are not meant to unveil the complexities of underlying mechanisms of social interventions. Management researchers may find realist synthesis a promising method for integrating research in a non-reductionist way. But it is also a very challenging one, especially for “newcomers”. Here we tried to contribute to the instrumentalization of the method by embedding knowledge cartography techniques and tools. Since research synthesis is relatively young, other contributions to the instrumentalization of this method will be very welcome.

References

- Barron, C. (2002) Problem-solving and EAP: themes and issues in a collaborative teaching venture. *English for Specific Purposes*, vol. 22, pp.297-314.
- Buzan, T. (1991) *The Mind Map Book*. New York: Penguin.
- Cooper, H. (1998) *Synthesizing research: a guide for literature reviews*. 3.ed. Sage, London.
- Cooper, H.M., Hedges, L.V. and Valentine, J. (eds.). (2009) *Handbook of research synthesis*. 2.ed. New York: Russell Sage Foundation.
- Critical Reviews Advisory Group – CRAG (1996) *Introduction to systematic reviews*. School for Health And Related Research (SchARR), The University of Sheffield, Sheffield, UK.
- Fullan, M. and Hargreaves, A. (2000) *A escola como organização aprendente*. 2.ed. Porto Alegre: Artmed.
- Gaines, B. R. and Shaw, M. L. (1995) Concept maps as hypermedia components. *International Journal of Human-Computer Studies*, vo. 43, no. 3, pp.323-361.
- Jonassen, D.H., Beissner, K. and Yacci, M. (1993) *Structural knowledge: techniques for representing, conveying, and acquiring structural knowledge*. Hillsdale: Lawrence Erlbaum.
- Littel, J.H., Corcoran, J. and Pillai, V. (2008) *Systematic reviews and meta-analysis*. Oxford: Oxford Univ. Press.
- Matheus, M.C.C. (2009) Metassíntese qualitativa: desenvolvimento e contribuições para a prática baseada em evidências. *Acta Paulista de Enfermagem*, vol. 22, pp. 543-545.
- Novak, J. D. and A. J. Cañas (2006) *The Theory Underlying Concept Maps and How to Construct Them*. Technical Report IHMC CmapTools 2006-1, Florida: Florida Institute for Human and Machine Cognition.
- Okada, A. (2007) *Using knowledge maps applied to open learning to foster thinking skills*. Paper presented at the 12th Cambridge International Conference on Open and Distance Learning, 25-28 Sept 2007, New Hall, Cambridge, UK.
- Okada, A. (2008) O que é cartografia cognitiva. In Okada, A. (org.) *Cartografia cognitiva: mapas do conhecimento para pesquisa, aprendizagem e formação docente*. Cuiabá: KCM, pp.37-65
- Pawson, R. (2006) *Evidence-based policy: a realist perspective*. London: Sage.
- Pawson, R., Greenhalgh, T., Harvey, G. and Walshe, K. (2004) *Realist synthesis: an introduction*. ESRC Research Methods Programme. University of Manchester, RMP Methods Paper, no. 2.
- Sandelowski, M., Docherty, S. and Emden, C. (1997) Qualitative metasynthesis: issues and techniques. *Research in Nursing and Health*, vol. 20, pp.365–371.
- Tractenberg, L. (2012) Ensino colaborativo e ensino colaborativo online na educação superior: uma revisão sistemática de artigos internacionais publicados - 1988 a 2010. In: Leite, C.and Zabalza, M. *Ensino Superior: Inovação e qualidade na docência*. Porto: CIEE - Centro de Investigação e Intervenção Educativas, pp. 8623-8643.
- Tractenberg, L., Struchiner, M. and Okada, A. (2009) A case of web-based collaborative inquiry learning using OpenLearn technologies. Paper presented at the V *International Conference on Multimedia and Information and Communication Technologies in Education*, 22-24th April, Lisbon, Portugal.
- Tranfield, D., Denyer, D. and Smart, P. (2003) Towards a Methodology for Developing Evidence-Informed Management Knowledge by Means of Systematic Review. *British Journal of Management*, no. 14, pp.207–222.
- Vasconcellos, M. (2008) Mapeamento cognitivo para revisão bibliográfica e análise conceitual. In: Okada, A. (org.). *Cartografia cognitiva: mapas do conhecimento para pesquisa, aprendizagem e formação docente*. Cuiabá: KCM, pp.155-173
- Young, K., Ashby, D., Boaz, A. and Grayson, L. (2002) Social science and the evidence-based policy movement. *Social Policy and Society*, vol. 1, pp.215-224.