

Towards holistic knowledge creation and interchange: Examples, theory and strategy

Dino Karabeg¹ and Roy Lachica²

¹ Institute for Informatics, University of Oslo,
Pb 1080 Blindern, 0316 Oslo.

² Bouvet AS, Pb 4430 Nydalen, 0403 Oslo, Norway
roy.lachica@bouvet.no

Abstract. Meta-information development, and more generally the creation and organization of knowledge and insights within and across communities and disciplines, will not be the result of simple automation of current practices, but of systematic re-design involving technology, theory and practice. WiKeyPoDia.org here serves both as prototype example and as symbol of this approach, showing how familiar Web 2.0 techniques can be applied to grow information in a new, ‘vertical’ direction, namely towards structure and insight rather than volume. A theoretical basis that supports this approach is outlined, as well as examples of application in several areas including education, academic communication and democratic decision making. Our results allow us to make progress towards our projected Holoscopia platform for holistic knowledge creation and interchange.

Keywords: Topic Maps, socio-semantic web, meta-information, collaborative knowledge creation, e-learning.

1 Introduction

“Data integration will be the web’s next leap forward”, predicts Tim Berners Lee [1] and adds: “The most exciting discoveries will come from the serendipitous combination and integration of data drawn from diverse sources.” We contend that even *more* exciting benefits will result from *carefully orchestrated* combination and integration of *knowledge* drawn from diverse sources, and propose a strategy by which such development may be practically realized.

It is not difficult to predict that organization and integration of knowledge will be the next big theme. Credit must be given to Douglas Engelbart for life-long visionary work along this line. Recent technological developments, notably the Internet and the Topic Maps, bring us a significant step forward towards making his dream come true. Sustainability-related issues on one side and information overload on the other give a sense of urgency to this theme.

In the evolution of the Topic Maps initiative these considerations point at a need for a phase shift, from focus on creation of standards and software, to development of

meta-information and large-scale Topic Map applications. The question remains—How might this new orientation practically develop? And what can we do in order to facilitate such development?

Since knowledge creation requires creativity and knowledge, the possibility of relying on some clever algorithm must be excluded. Our experience with *fuzzy.com* has shown that we may also exclude the straight-forward Web 2.0 approach represented by *del.icio.us*, because meta-information creation requires a more dedicated user community than folksonomy development [2]. In this article we build further on this conclusion and show how dedicated user communities, and the associated practice and software, may be practically developed.

Our approach combines prototype deployment and theoretical arguments. When in 1990 Neil Postman exclaimed “We are glutted with information, drowning in information, have no control over it, don’t know what to do with it.” [3] his intention was to admonish the technology developers not to limit their interest to efficient information technology, but to carefully rethink to what ends and in what ways the technology will be used. We pursue this approach, and argue that a technological solution which caters to the existing market and facilitates an existing practice will not be sufficient, that coordinated re-design of tools, practice and theory is required.

The rest of the article is organized as follows. In Section 2 we outline an approach to community-based knowledge creation and interchange, by describing a preliminary prototype platform called *WiKeyPoDia.org* where this approach is offered as solution to a sustainability-related communication issue. In Section 3 we briefly outline *polyscopy*, a theory where the deficiency of current practice is pointed at and where a theoretical foundation for a remedial approach is laid. In Section 4 we sketch a projected platform called *Holoscopia*, which will implement this approach by combining elements from *WiKeyPoDia.org* and *Fuzzy.com*. In Section 5 we mention several other emerging applications of our approach, in key areas including (countering the negative effects of) globalization, sustainable development, flexible and life-long education and scientific communication. In the Conclusion we summarize our arguments by pointing out that a radical change of practice is now required for both practical and theoretical reasons, and we propose a strategy for information technology and meta-information development which follows from this observation.

2 Key Point Dialog and WiKeyPoDia.org

Our Key Point Dialog project, and the associated key point dialog communication method, are implemented by a prototype platform for knowledge creation called *WiKeyPoDia.org*. Like *Wikipedia.org*, our platform implements community-based, Web 2.0-style development of knowledge. But unlike the *Wikipedia*, *WiKeyPoDia* does not grow information ‘horizontally’, namely in volume, but ‘vertically’, towards a crucial new insight or ‘key point’.

2.1 Information must grow ‘up’

The motivation for WiKeyPoDia is explained in an article called “How to Begin the Next Renaissance” [3] in which it is argued that

- To be able to resolve sustainability-related and other characteristic contemporary ‘global issues’ which the Club of Rome named ‘the world problematique’ [4], or in other words to be able to resolve the current difficulties our civilization is facing and to help us progress into a new phase of development, we must be able to combine insights from now dislocated areas and compose more general or more fundamental insights, which can guide us to a new way of thinking and a new way of being, as it developed during the Renaissance.
- The obvious obstacle to such development is that it is impossible to be a ‘Renaissance man’ under the conditions of information overload.
- It is, however, possible to overcome this obstacle by using the familiar Web 2.0 approach. A community of people can accomplish together what none of us can do alone. In effect, the members of the community combine their knowledge and *together* emulate a Renaissance man.

We use the direction ‘up’ metaphorically to talk about abstraction or about the synthesis of particular knowledge and insights into more general, direction-giving ones. The procedure used in the Key Point Dialog resembles a collective climb to a mountain top, where by rising above the information jungle the participants can clearly see the new way that needs to be followed.

2.2 Wikipedia and WiKeyPoDia

The WiKeyPoDia uses a similar approach as the Wikipedia, with a single distinguishing characteristic—the goal of WiKeyPodia is a single key insight, the Key Point, not encyclopedic information.

The participants of the online Key Point Dialog co-create the Key Point by contributing evidence and insights, from their own experience or expertise, and by ‘lifting them up’ as it were and making them visible to the rest of the community. The dialog proceeds by combining individual insights into broader or ‘higher’ ones, until the Key Point is reached, and then even further, by expressing the Key Point through the use of artistic and media-rich techniques.

WiKeyPoDia instantiates a general approach to information and information technology development which we call *information design*, where what we do with information is tailored or *designed* according to contemporary needs of people and society and available insights and technology [5]. We call the alternative approach, where we simply implement our traditional ways, *traditional informing*. While Wikipedia *designs* the procedure by which information is produced, the intended result of this procedure is still *traditional*, namely an encyclopedia.

In our conventional *traditional informing* information making is conceived of as reality mapping, where by providing ‘new pieces of information’ we aim to complete the whole reality map as a gigantic jigsaw puzzle (this orientation is indicated by Wikipedia’s familiar logo). The problem with this *traditional* approach is that it tends

to obscure key points and insights (what we now *must* be aware of and take care of) by drowning them, as it were, in an overload of data.

2.3 How WiKeyPoDia functions

Current WiKeyPoDia.org is a simplified prototype implemented by using the Mediawiki software.

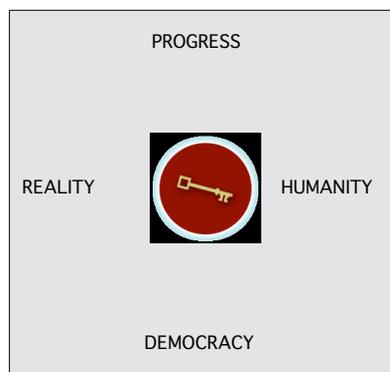


Fig. 1. The navigation gadget on the front page of WiKeyPoDia gives access to the Key Point and its four main *aspects*.

Information is organized based on an elementary structure called *holon*, which consists of a point or insight supported by a collection of *aspects*. The over-all Key Point is supported by *aspects* which show evidence challenging our traditional ideas of progress, reality, democracy and ourselves. Each of the mentioned four *aspects* is a category which is further implemented by using the corresponding *lower-level holon*. The resulting hierarchy of *holons* implements a frame of reference called *polynomy*, and the metaphorical mountain.

The Key Point Dialog progresses by identifying or creating relevant pieces of information, placing them within the *polynomy*, by creating a dialog about each of them using the corresponding discussion page, by re-editing them and by moving them *up* (and giving them more visibility) or *down*, and by periodically reconstructing the division into *aspects* and the underlying *polynomy*.

We chose this simple, semi-static and hierarchical *polyscopy* implementation with obvious limitations because that was what we were able to do without a reliable platform which combines the wikis, Topic Maps and community-based knowledge creation. In our projected Holoscopia platform the static hierarchy of *holons* will be replaced by a dynamic structure implemented by Topic Maps.

3 *Polyscopy* – theoretical considerations

WiKeyPoDia.org, as we have just seen, is a practical example showing that re-creating our *traditional* information formats in new technology, even when this is done in ingeniously innovative ways as in the case of Wikipedia, will not be sufficient, and that we must *design* or consciously choose what we aim to produce as information. We now turn to theoretical considerations which will help us create guidelines for this new practice.

In an earlier article we described *polyscopy* as the creation and presentation of information based on multiple ways of looking or *scopes*, and we argued that Topic Maps and information in general need to be organized in a holistic or *polyscopic* way [6] [7]. The word ‘holistic’ here may roughly be understood as an antonym to ‘reductionistic’.

3.1 Epistemological underpinnings

During the past century, experimental results in physics [8] and in cognitive science [9] amounted to a disproof of usually tacit fundamental assumptions which underlie our reductionistic information-making traditions, in which ‘true’ information is considered as an objective and exact reality picture, and in which the creation of such ‘true’ information is considered to be the purpose of information making.

An approach to information which on one side aims to fulfill those vitally important social and cultural needs which information now needs to fulfill, and which on the other side explicitly specifies the principles, the criteria and the methods upon which it is founded, is now a more sound alternative, for both fundamental-academic and practical reasons [7].

3.2 *Gestalt* as goal

Aiming towards such approach, we inquire ‘What do we most need from information?’ or ‘What does it mean to be *informed*?’ We propose the *gestalt* (a *designed* notion) as a suitable indicator.

“Grandfather is having a heart attack” is an example of a *gestalt*. Correct *gestalt* leads both to correct understanding of a situation and correct action. We are therefore justified in using the *gestalt* which suits the circumstances as model of ‘being informed’. The *gestalt* corresponds also with the age-old orientation towards knowledge and wisdom, where factual knowledge is refined until it culminates in correct understanding and action.

Unlike the reductionistic view that every piece of information is equally valuable, because it is a piece in the ‘reality puzzle’, the *gestalt* as goal naturally guides our creation and use of information in the direction ‘up’ towards the big picture and the main point.

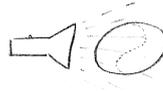
3.2 *Perspective* as criterion

The now common *factual truth* as criterion reflects the old epistemology, where correspondence with reality is identified as the main or even only criterion by which information should be judged. In *polyscopy* four *designed* criteria are offered as more suitable guidance [10]. The most characteristic of them, the *perspective*, is defined with the help of the following ideogram.

Perspective definition



Every whole has a visible and a hidden side.



Information must help us correct the *perspective* by illuminating what is obscure or hidden.

Fig. 2. The ideographic definition of the *perspective* criterion. The intention behind formulating this criterion is to re-orient the creation and use of information from reductionistic to holistic.

Further explanation of the *perspective* criterion is that *factual truth* is to *perspective* as a point is to a shape. To know the *perspective*, individual pieces of information are not sufficient. We must also know how those pieces are combined together to compose the whole. To know the *perspective*, no essential areas of knowledge can be left in the dark. No parts can be blown out of proportion.

It is not difficult to see that the *perspective* criterion re-orientes information creation and use. *Factual truth* guides us to focus on a detail. *Perspective* guides us to create a good, balanced representation of the whole. *Factual truth* guides us to create more information in areas where facts are easily established, even when we may already have too many of them. The *perspective* guides us to create more information there where information is lacking. *Factual truth* supports specialization. The *perspective* requires the integration of knowledge and big picture creation. *Factual truth* is served by looking at things in an established and sanctioned way. *Perspective* is corrected by finding new ways of looking at things and discovering their hidden essential *aspects*.

3.3 Polyscopy as approach

The question is, what should information be like in order to provide the *gestalt* and the *perspective*? And how should such information be created? Here we very briefly outline an answer which is more thoroughly explained in [7].

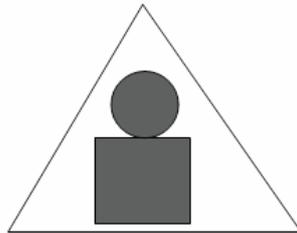


Fig. 3. The Polyscopic Information ideogram depicts polyscopic information (represented by the ‘i’) as a circle on top of a square. It is suggested that polyscopic information consists of a concise and synthetic *high-level information* (represented by the circle), which is founded upon detailed and analytic *low-level information* (represented by the square).

Polyscopy, which is represented by the ideogram in Figure 3, identifies three kinds of abstraction, represented by the three geometrical figures. The *vertical abstraction*, represented by the circle, means metaphorically rounding off the sharp corners and straight edges in order to arrive at the big picture, the over-all main point. The *horizontal abstraction*, represented by the square, aims at identifying and developing a collection of *aspects* where each *aspect*, like a projection in projective geometry, gives a simple and characteristic side view of the whole, and where all the *aspects* together allow us to see the whole from all sides. The *structural abstraction*, represented by the triangle, aims at organizing the *views* resulting from the other two abstractions and making them accessible.

Structural abstraction closely corresponds to creation of Topic Maps. *Polyscopy* helps us understand that the *structural abstraction* alone is necessary but not sufficient, that *gestalt* and *perspective* creation requires a suitable combination of all three kinds of abstraction.

The purpose of *polyscopy* is holistic knowledge creation, as pointed at by *gestalt* as goal and by *perspective* criterion.

The main conclusion that interests us here is that **information creation is not only the creation of facts, but also, and indeed primarily, the practice of the three kinds of abstraction.** It is now becoming common knowledge that the ‘world problematique’ including the characteristic risks that our civilization is now facing are the results of relying on a single way of looking which gives us a stable frame of reference for creating facts and a conventional reality picture. *Polyscopy* invites us to find other ways of looking, until we can be reasonably sure that nothing important has been missed, and then to synthesize and abstract the resulting insights towards an

over-all large picture or *gestalt*. Once we have this main view and the side views ready, we can use *structural abstraction* to organize them and link them together.

The resulting information (represented by the ‘i’ in Figure 3), which consists of a holistic *high-level view* or *gestalt*, founded upon a carefully chosen collection of *aspects* or side views which give it credibility, is what we need for correct understanding and action [11].

4 Functionality of the Holoscopia platform

We now combine the main insights resulting through Fuzzy.com, WiKeyPoDia.org and *polyscopy* in order to arrive at the functionality for our projected Holoscopia platform. Our intention is to sketch a concrete proposal and make it open for discussion, based on which the final platform will be designed.

The approach we take and advocate resembles the methodological approach that was developed in the early days of computer programming. We too provide certain basic constructs (analogous to structuring primitives such as objects and control instructions such as if-then-else) which support good practice (abstraction and structuring). Ideally, our goal is to structure our tools in such a way that good practice results as a side effect of using them.

4.1 A multi-community platform

Holoscopia is envisioned as a platform similar to Fuzzy.com, where instead of a single ontology shared by all users we allow for the creation of one knowledge base for each user community. Provisions are made for sharing elements of respective knowledge bases across the user communities.

The reason is that ontology and knowledge are core elements of a community. It is within a dedicated user community, aiming to create its language, vision, credos and agendas, that the meta-information and the holistic knowledge can naturally be created. Suitable provisions for both autonomy and interchange will be made.

4.2 Polynomy as frame of reference

Provisions exist for *vertical*, *horizontal* and *structural abstraction* and for creating and updating the *polynomy* (a *polyscopic* structure of concepts, or a *polyscopic* ontology) which can serve as frame of reference, similar to parallels and meridians in geography, for placing individual pieces of information.

The motivation is to provide a relatively static frame of reference for representing the underlying whole, which is more stable and more fundamental than the associations joining individual pieces of information together. The *polynomy* secures that information is created and organized in the way which provides a clear and correct *perspective*.

4.3 Information holon as basic information object

An *information holon* may be understood as the ‘i’ consisting of a circle (representing the main point or insight) and a square (its detailed and analytic foundation reflecting its main *aspects*). We envision the *information holon* as similar to an object in Object Orientation, with certain properties such as visibility (indicating what is made available to other *holons*) and certain functions such as association creation.

The intention here is to create a structured basic information unit, alternative to conventional article which is flat and unstructured. Each *holon* is both an information unit by itself, and a building block for other, *higher-level holons*.

4.4 Choice of scope

A user interacts with Holoscopia through a *scope*, which is a combination of user-model parameters and parameters chosen by the user.

The reason is that while the underlying frame of reference and the key points are created by consensus of the community, the user must be given the option to view and prioritize the provided information based on personal needs and interests.

4.5 Dynamic visibility

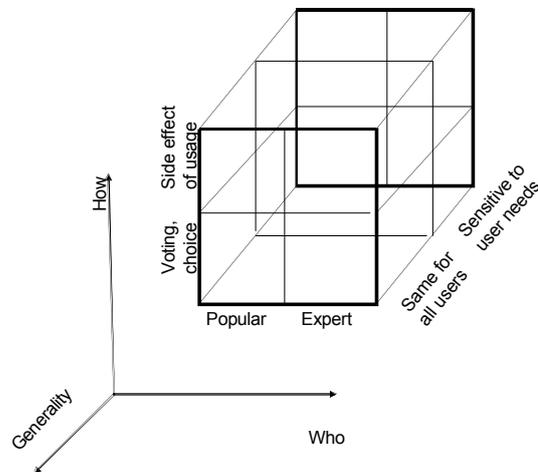


Fig. 4. An ideographic presentation of eight different ways in which visibility of information can be determined.

One of the central issues, which we only mention here, is How do pieces of information or *holons* acquire visibility? We envision eight ways, which can be combined and tuned to specific user and community needs.

Along the ‘generality’ line we distinguish solutions where the visibility is sensitive to the stated needs or the profile of the user from those which don’t. On the ‘who’ axis we distinguish visibility which results from popular votes or usage from the ones which are made by trusted experts. Along the ‘how’ axis we distinguish the visibility which results from deliberate choice from the one which is a side effect of usage.

5 Other applications of the Holoscopia platform

We now turn to further examples of application of the key point dialog technique and our projected Holoscopia platform. The examples shown here are real-life projects in varying stages of development. They illustrate the breadth of the space of possible applications, and the depth of impact such applications may have in key areas.

5.1 Flexplearn

As it is now well known, learning directed by interest is more effective than learning a fixed curriculum. Furthermore, circumstances require life-long learning, which in turn requires that education should be responsive to the learner’s needs and background. Hence education now needs to be made flexible for both pedagogic and circumstantial reasons.

Flexplearn is a flexible and exploratory course model [12]. The idea is to offer the ‘mountain top view’ of a field of knowledge as a point of reference, from which the student can make an informed choice of topics to be studied in depth. A *polyscopic* Topic Map is used as ‘map’ both for orientation, for organizing the learning resources and for reporting the ‘trajectory’ of student explorations for the purpose of exam.

Flexplearn is currently implemented within our University of Oslo Information Design course by using a combination of Fuzzzy.com Topic Map folksonomy and a Mediawiki similar to WiKeyPoDia. An integration is presently being attempted by Morten Wang in his MS thesis, in cooperation with the authors.

5.2 Après Bourdieu project

Paradoxically, as an academic discipline grows larger, it tends to split into subdisciplines which easily lose contact with one another, and even with the social function that motivated the development of the discipline. Since this problem was diagnosed within sociology by Pierre Bourdieu, we gave the name ‘Après Bourdieu’ (After Bourdieu) to our remedial project [13]. The goal of this project is to use a

variant of Holoscopia platform to organize academic information creation and interchange in a way which can remedy this anomaly.

Presently this direction is explored by Andrea Gasparini at the University of Oslo in his work on internet infrastructure development for the University Library and in his MS thesis.

5.3 KommuneWiki.org

The Municipality Wiki or KommuneWiki project [14] is an adaptation of the key point dialog for grass-roots democratic choice of guiding vision and values in Norwegian municipalities, and also (in Phase II of the dialog) for finding concrete measures by which this vision can be implemented. The motivating observation is that since in the era when globalized business can control even elected governments [15], an instrument of this kind is fundamental for democracy.

The KommuneWiki project has been initiated by Tor Næss and Øyvind Sørbrøden. This project is now pending approval in Bø, Telemark, and negotiated with two other municipalities in Norway.

5.2 European Key Point Dialog

The European Key Point Dialog is an adaptation of the key point dialog approach, proposed for vision and direction quest within the European Union and broader within the European Movement International. The observation which motivates this project is that while under present conditions Europe too will need to revise its vision in order to re-vitalize the interest of its electorate [16], the conventional ways of communicating (the public debate and the opinion poll) will tend to hinder rather than facilitate the emergence of still-minority voices and new directions.

This project has been initiated by Renata Bacic who is one of the leaders of the European Movement in Croatia.

6 Conclusion

Coming back to our main question, about the suitable strategy for meta-information creation and for large-scale Topic Map deployment, based on our discussion we may identify two distinctly different approaches in which this task may be handled. One approach is to create information technology that facilitates the traditional ways of doing things, or more generally, to cater to the exiting market. The problem with this approach is that since the habits, the routines and the values that would support routine creation of meta-information are lacking, it will not serve our purpose. Indeed, anomalies such as information overload have largely resulted by that approach to technology deployment. The other approach, which we advocate in this article, is to design both the information technology and the way in which the technology is used.

By discussing our related work, we have pointed at two related ways in which this latter approach may be put into practice. The first is the development of

methodology, which is the necessary foundation for departing from habitual practice. The second is the *design* and deployment of community-based projects and platforms, which show how suitably orchestrated meta-information development, made possible by the new technology, may make a difference in key areas including sustainability, democracy, education and academic communication. As they are being used, those projects and platforms will naturally bring the new patterns of usage and new values into practice.

Large-scale creation and deployment of meta-information is a radical change of practice, which is conditioned upon a radical change of ideas and values. It is towards such change that our efforts now need to be directed. Our arguments and examples suggest that if we follow this strategy, it will not take long before it is widely recognized that **meta-information creation is the core task of every community**. By developing theoretical ideas within *polyscopy*, and applied projects and platforms such as Fuzzzy, WiKeyPoDia and Holoscopia, we hope to contribute to this strategic orientation.

References

1. Berners-Lee, T.: Welcome to the Semantic Web. Article in World in the Year 2007. The Economist, Special Issue, 2006.
2. Lachica, R., Karabeg, D.: Metadata creation in socio-semantic tagging systems: Towards holistic knowledge creation and interchange. To appear in L.M. Garshol and L. Maicher (Ed.): Sealing Topic Maps. Topic Maps Research and Applications 2007. Springer Verlag LNCS.
3. Postman, N.: Informing Ourselves to Death. Keynote speech to German Informatics Society, 1990.
4. Peccei, A.: One Hundred Pages for the Future. Pergamon Press, 1981.
5. Karabeg, D.: Designing Information Design. Information Design Journal, Vol. 11, 2003.
6. Guescini, R., Karabeg, D., Nordeng, T.: A Case for *Polyscopic* Structuring of Information. In Maicher, L., Park, J. (Ed.): Topic Maps Research and Application 2005. Springer Verlag, 2005.
7. Information must be *designed*. Book manuscript.
8. Heisenberg, W.: Physics and Philosophy. Harper, 1958.
9. Damasio, A.: Descartes' Error. Avon, 1994.
10. Karabeg, D.: Polyscopic Modeling Definition. In Griffin, R. et al. (Ed.): Changing Tides. Selected Readings of IVLA, 2004.
11. Karabeg, D.: Information for Conscious Choice. Information Design Journal, Vol 11, 2003.
12. Karabeg, D., Guescini, R., Nordeng, T.: Flexible and Exploratory Learning by Polyscopic Topic Maps. ICALT 2005. <http://heim.ifi.uio.no/~dino/ID/Articles/ICALT-Flexplearn.pdf>
13. <http://heim.ifi.uio.no/~dino/ID/Misc/ApresBourdieu.pdf>
14. www.KommuneWiki.org
15. Hertz, N.: The Silent Takeover. Global capitalism and the death of democracy. Arrow Books, 2001.
16. European Movement International Newsletter 8, October 2006. <http://heim.ifi.uio.no/~dino/ID/Projects/KeyPointDialog/EMI-newsletter.pdf>