Conclusive thought on communication flow, knowledge flow and informal learning

Draft of:

Trentin G. (2011). Conclusive thought on communication flow, knowledge flow and informal learning. In G. Trentin (Ed), *Technology and Knowledge Flow: the power of networks*, ch. 7 (pp. 157-165). Chandos Publishing Limited, Cambridge, UK.

Guglielmo TRENTIN

Institute for Educational Technology, National Research Council, Italy

Abstract

In the previous chapters the spiral model worked out by Nonaka (1994) has often been used as a starting-point for reflection on the theme of knowledge flow.

It is undoubtedly a very suitable model for the purpose. In concluding this book however, it seems to us useful to propose a further perspective on KF processes, that of mediated communication theories. To this end, some considerations on the relationship between communication flow and knowledge flow will be made.

Finally, to conclude both the chapter and the book, we will attempt a summary of the different connotations of KF in formal and informal learning processes.

1. Communication technology and information flow

In this book, reference has frequently been made to the knowledge spiral as a model which effectively represents some aspects of KF, particularly tacit (or in any case non-explicit) KF between two individuals within a professional community. This flow is particularly important in the informal learning context.

Another way of observing KF is from the point of view of technology-mediated processes and in the light of communication theories. Figure 7.1 shows the diagram of a communication system as conceived by Shannon e Weaver (1949): an information source, an information codification and transmission unit; a transmission channel with

noise interference[1], an information receiver and decodification unit, the destination of the information.

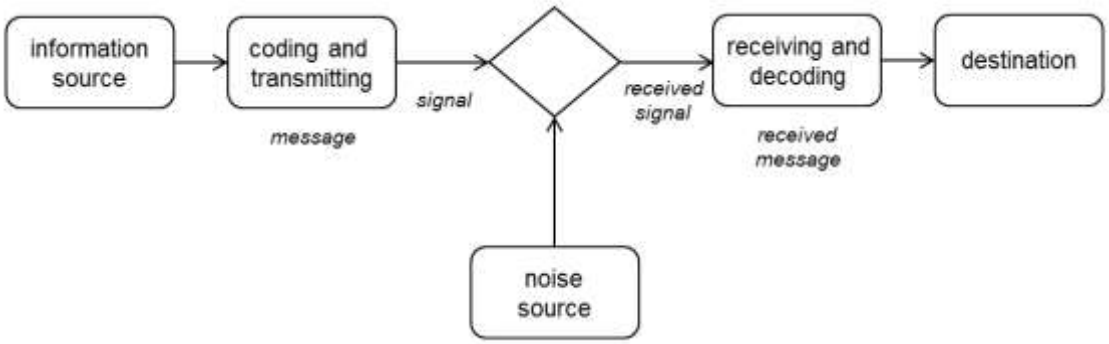

Figure 7.1 – Communication flow according to the model of Shannon and Weaver (1949)

This type of communication is at the basis both of dialogic interaction (e-mails, forums, social networks, etc.) and of artefact-mediated interaction (documents, wikis, conceptual maps), in other words every time a piece of information needs to be first coded then decoded in order to pass through the technological channel.

Clearly, the principle by which it is coded must be the same as the one by which it is decoded, and this leads to the need for a syntax which all the interlocutors (mediated by technology) must respect.

The syntax may be that of the natural language in which a text artefact (e.g. a wiki) is written, or in which a verbal exchange occurs, or it may be a formal language, as in the case of graphic representations (e.g. concept maps).

Apart from its need for codification, the process illustrated in Figure 7.1, information transmission, does not differ greatly from the flow of a liquid from one container to another. And this is why it is often defined as an *information flow* (IF).

[1] In communication theories the concept of "noise" is considered in a broader sense. Besides the actual physical noise introduced by technology (e.g. electromagnetic perturbations), it includes noise caused by the following: semantic factors (i.e. different interpretations of the meaning of what is being communicated); entropy and overabundance of information transmitted; difference in interlocutors' cultural levels; technical jargon of the specific communication context, etc.

2. Communication technology and knowledge flow

While Figure 7.1 adequately represents an IF process, it is inadequate for representing KF processes. In fact as Steen Larson states:

"Information can be transmitted but knowledge must be induced" (Larsen, 1986)

In support of his theory he listed the three key stages which in his opinion bring about the flow of knowledge from a source to a receiver:

- *transformation of personal knowledge into public information* - The sender transform and organize their knowledge in public information to be transmitted to the receiver;
- *information transfer* - The sender transmit their knowledge, transformed into public information;
- *transformation by the receiver of the public information into personal knowledge* - The receiver transforms the information provided by the sender into personal knowledge.

In other words, the mechanisms for the acquisition of new knowledge must not so much be comparable to the decanting of a liquid from one container (the sender's head) to another (the receiver's head), as rather a process involving absorption, integration and systematisation of the information received by the receiver into his/her own pre-existing cognitive structures, which are the result of personal experience, earlier knowledge, etc.

In formulating this hypothesis, Larsen clearly espouses some established learning theories, in particular the theory of Meaningful Learning proposed by Ausubel 1968, which describes how new knowledge must be constructed based on the learners' prerequisite knowledge, named superordinate concept. Gagne 1985 also suggested that prior knowledge is the necessary internal condition of learning. Thus, how to provide meaningful learning activities according to learners' ability of concepts is an important and challenging issue to improve learning efficacy.

On the basis of these considerations, for a better representation of a KF process the scheme of Figure 7.1 should thus be extended as shown in Figure 7.2.

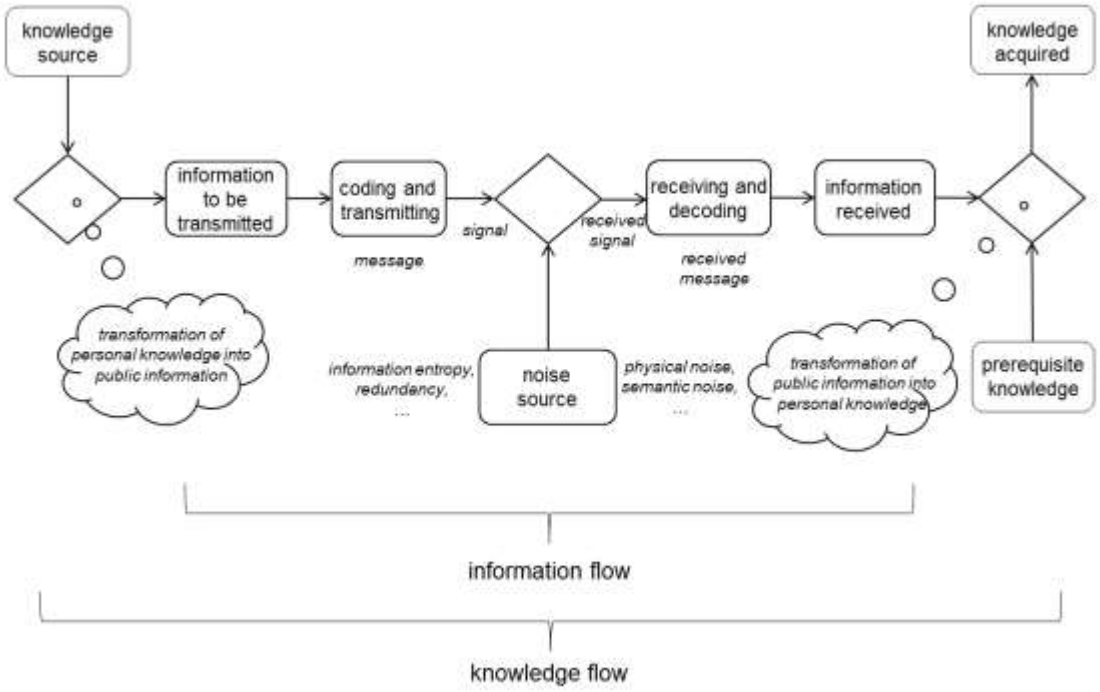

Figure 7.2 – From Information Flow to Knowledge Flow

Thus, the key point is to create the conditions for stimulating and favouring the process of *assimilation* and *accommodation* (Piaget, 1977), by proposing both individual and collaborative learning activities, problem-solving and artefact development, etc. (Trentin, 2010).

In this context, an interesting approach to the fostering of collaborative knowledge building (Scardamalia & Bereiter, 1994; Stahl, 2000) is the integration of face-to-face and online interactions within the virtual community environment, in other words putting into practice what is described in Kimmerle and colleagues' *co-evolution model* (Kimmerle et al., 2010; 2011), centred on the use of technologies which favour social interaction.

When we speak of social interaction, we are often referring to resources such as forums, wikis and social networks, but we should not forget other tools which equally effectively foster dialogue, collaborative interaction and *knowledge maturing* (Kaschig et al., 2010) within the professional communities.

Of these tools, those for graphic representation (discussed in the previous two chapters) have often shown their versatility in illustrating concepts, processes and other forms of knowledge (Donald 1987; Trentin, 1991; 2007; Olimpo, 2011).

Take for example Figure 7.2, and try to compare an exclusively verbal description of it with the one supported by graphics. Very probably, an exclusively verbal description would have proved less effective, or at least less effective in representing the conceptual image of the author of this chapter.

In other words, graphic representation facilitates the alignment of the two individual conceptual images of the sender and the receiver of the concept. In fact Figure 7.2 shows both the physical noise introduced by the technological channel and the semantic noise, i.e. interference related to a different way of understanding a word, a sentence, a concept, above all when the communication is not only exclusively verbal but also mediated. These different interpretations are often due to the different contexts in which the KF is developed (schools, companies, amateur associations etc.), as well as to the features of the interlocutors (age, education, culture, professional skills, etc.).

3. KF and informal learning processes

Figure 7.2 gave a possible representation of the KF process from the point of view of technology-mediated communication theories. It may now be useful to make a concluding consideration about the intrinsic features of these flows and their contribution to *knowledge maturing* processes (Kaschig et al., 2010).

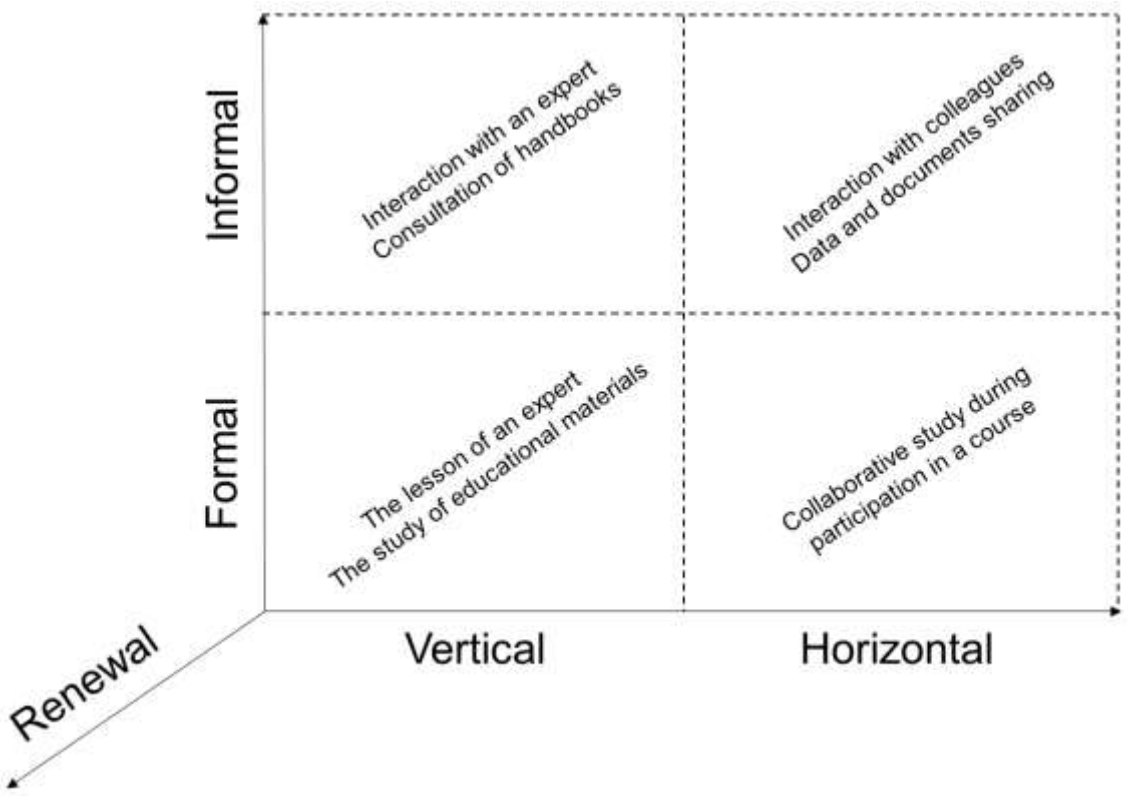

Figure 7.3 – A three-dimensional model to represent the different types of KF

The diagram in Figure 7.3 shows a three-dimensional model in which different types of KF are identified as indicated above.

- The ***Formal -> Informal*** axis identifies the context in which the flow is developed. Dynamics which are peculiar to a direct formative action, e.g. e-learning, belong to formal KF, whilst ICT used to access and share both explicit Web knowledge and tacit knowledge stimulated by interactions within online communities belong to informal KF.
- The ***Vertical -> Horizontal*** axis identifies the direction in which the KF spreads. The flow is vertical when the knowledge is drawn from an authoritative and certified source (a specialised information source, an expert); the flow is horizontal when knowledge is made to circulate within a professional community.

Four main squares may be identified where the axes cross:

1. *Formal/Vertical KF*: the lesson of an expert, the study of materials proposed within a course, etc.

2. *Formal/Horizontal KF*: collaborative study during participation in a course, etc.
3. *Informal/Vertical KF*: occasional interaction with an expert, independent consultation of handbooks and authoritative documents sources, etc.
4. *Informal/Horizontal KF*: peer interaction among colleagues, collaboration in problem-solving, etc.

These two dimensions may be crossed with a third one (*renewal*) which represents the time-flow of the knowledge and its constant renewal, in other words its dynamicity.

Form the point of view of learning processes, this recalls the concept of lifelong learning and the need for individuals to learn to update their knowledge in an autonomous way through increasingly informal types of learning process.

4. Knowledge as both an artefact and a flow

To end our book, and to better underline and explain the above concept (flow as knowledge renewal), we herewith offer as an example an intervention by Doug Cornelius posted on his blog KM Space in January 2008.

Referring to an intervention by Dave Snowden (2007), Cornelius makes an interesting reflection on the concept of knowledge understood as the synthesis? of *artefacts* and *flows*, and on the way some social softwares, particularly wikis (Bocconi and Trentin, 2011), are excellent tools for achieving this synthesis.

Cornelius writes:

Knowledge is both an artifact and a flow, the same way that electronics are both particles and waves (Snowden, 2007). *As part of the learning process, you learn the state of knowledge as it exists at that time. Then, as time progresses, things change and you now need to know the changes to the knowledge artifact. You need to know the flow.*

Take this inside the firm. A practices and procedures policy is a great knowledge artifact. Initially everyone needs to know this knowledge artifact. But once you learn the policy, you care about the flow of changes to the artifact. The new person joining the firm needs to only learn the revised policy in effect on their first day. The new person

may have some need to find out what the policy used to be, but the old flow is generally of limited value to them.

A wiki fits wonderfully into this paradigm of knowledge as an artifact and a flow. A wiki combines the knowledge artifact and the knowledge flow into one.

With a wiki page, as with any document, I discover the knowledge artifact as it exists and can learn it. The wiki then goes to the next step that a normal document cannot go to by creating a flow. With a wiki, I can subscribe to the wiki and have the wiki send me the flow of changes to the wiki.

If I have the need to see the historic changes in the knowledge artifact, I can use the history feature of the wiki. Even better, I can see who made the changes and when the changes were made.

In converting the practices and procedures policy from a word document to wiki, I convert it from dry document to more useful living document. In a wiki, the policy becomes both a knowledge artifact and a flow. As I update the policy, the wiki sends the subscribers the flow of changes. They get alerted that a change has occurred and see the change. They do not need to save the email notifying them of the change, because the change is now synthesized into the knowledge artifact. A wiki also saves a step for the drafter of the changes. The drafter need not remember to send out an email notice of the changes and need not decide who should be the recipients of the email. The wiki sends out the notification of the changes to its subscribers.

If I am away from operating in the area of the policy and then come back to operating in the area, I can quickly and easily compare the policy as I historically remember it to the policy in its present state. I can create my own combined flow of knowledge.

References

Ausubel, D.P. (1968). *Educational psychology: a cognitive view*. New York: Holt, Rinehart and Winston.

Bocconi, S., & Trentin, G. (Eds.) (2011). *Wiki Supporting Formal and Informal Learning.* Hauppauge, NY: Nova Science Publishers Inc. (printing).

Cornelius, D. (2008). Knowledge is an Artifact and a Flow. *KM Space: knowledge management, enterprise 2.0, and social networking for lawyers.* Available:

http://kmspace.blogspot.com/2008/01/knowledge-is-artifact-and-flow.html

Donald, J.G. (1987). Learning schemata: methods of representing cognitive, content and curriculum structures in higher education. *Instructional Science*, 16, 187-211.

Gagne, R. M. (1985). *The Conditions of Learning and Theory of Instruction*. New York: Holt, Rinehart and Winston.

Kaschig, A., Maier, R., Sandow, A., Lazoi, M., & Barnes, S. (2010). Knowledge Maturing Activities and Practices Fostering Organisational Learning: Results of an Empirical Study. *Proceedings of 5th European Conference on Technology Enhanced Learning, EC-TEL 2010*, Barcelona, Spain, September 28 - October 1, 2010., Lecture Notes in Computer Science vol. 6383, pp. 151-166. Springer.

Kimmerle, J., Moskaliuk, J., Harrer, A., & Cress, U. (2010). Visualizing co-evolution of individual and collective knowledge. *Information, Communication and Society*, 13(8), 1099-1121.

Kimmerle, J., Cress, U., & Moskaliuk, J. (2011). Wiki-supported knowledge building: theory, research and application. In S. Bocconi and G. Trentin (Eds.), *Wiki supporting formal and informal learning*. Hauppauge, NY: Nova Science Publishers Inc. (printing).

Larsen, S. (1986). Information can be transmitted but knowledge must be induced. *PLET*, 23(4), 331-336.

Nonaka, I. (1994). A Dynamic Theory of Organizational Knowledge Creation. *Organization Science*, 5, 14–37.

Olimpo, G. (2011). Information flows and graphic knowledge representations. In G. Trentin (Ed.), *Technology and Knowledge Flows: the Power of Networks*. Oxford, UK: Chandos Publishing.

Piaget, J. (1977). Problems of equilibration. In: M.H. Appel, L.S. Goldberg (Eds.), *Topics in cognitive development*. New York: Plenum, vol. 1, pp. 3–14.

Scardamalia, M., & Bereiter, C. (1994). Computer support for knowledge-building communities. *The Journal of the Learning Sciences*, 3, 265-283.

Shannon, C.E., & Weaver, W. (1949). *The Mathematical Theory of Communication*.

Illinois: The University of Illinois Press.

Snowden, D. (2007). The beginning of the Armadillos. *Cognitive Edge*. Available: http://www.cognitive-edge.com/blogs/dave/2007/12/the_beginning_of_the_armadillo.php

Stahl G. (2000). A Model of Collaborative Knowledge-Building. In B. Fishman & S. O'Connor-Divelbiss (Eds.), *Proceedings of the Fourth International Conference of the Learning Sciences*, pp. 70-77. Mahwah, NJ: Lawrence Erlbaum Associates,.

Trentin, G. (1991). Description of problem solving using Petri Nets. *Proceedings of the XXVth AETT International Conference*, "Realizing Human Potential", AETT (Aspects of Educational and Training Technology), Roy Winterburn (ed), vol. XXIV, pp. 122-128. London: Kogan Page.

Trentin, G. (2007). Graphic tools for knowledge representation and informal problem-based learning in professional online communities. *Knowledge Organization* 35(4), 215-226.