

Quality of working life, knowledge-intensive work processes and creative learning organisations:

Information processing paradigm versus self-organisation theory

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Abstract: This paper discusses the requirements that are necessary to render the organisational potentials of modern information and communication technology usable for the development of creative learning enterprises. It is known that knowledge-intensive work processes require new co-operative, self-organising forms for work, organisation and learning that support creativity and that can be supported by information and communication systems (in particular teleco-operation systems). The problem is that within the framework of the information processing paradigm it is not sufficient in itself to treat only the emergence of information. The concept of self-organisation has justification here, because during this process information is itself generated.

Key words: quality of work, teleco-operation, learning organisation, knowledge creation

1. INFORMATION CREATION

Based in the movement for the improvement of the Quality of Working Life (QWL) and the basic requirement of job enlargement and job enrichment, with the aim of improving job satisfaction (Trist, 1981; Jenkins, 1981; Mansell, 1983) are today's design of socio-technical systems (Ulich, 1992; Frei et al., 1996) and an orientation toward qualifications with the aim of guaranteeing individual and organisational learning processes for the evolution of creative learning organisations (Fuchs-Kittowski, 1998a). There are important issues in today's global economy.

Modern information and communication systems enable new work and organisational forms. In particular, this is due to the relative independence of

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work from space and time provided by teleco-operation systems, and the formation of flexible, team-based organisations, as well as virtual and creative learning enterprises. These, in turn, can promote personality and organisational development (Fuchs-Kittowski et al., 1998a).

The central theoretical concept here is self-organisation. One can only speak of self-organisation in cases where new information is created, i.e. where creative (and not just instructive learning processes) take place (Fuchs-Kittowski et al., 1998c; Fuchs-Kittowski et al., 1999a). It demands and enables a fundamental move away from the machine/computer model of organisations towards a creative learning organisation.

2. THE SEMANTIC OF SOCIAL INFORMATION IS GENERATED IN SOCIAL PROCESSES - SEMANTIC FEEDBACK IS NEEDED

In the information processing paradigm, information is always already existing. How information develops, or how it is generated IS NOT ASKED. In nature information generation is connected with the development of life. Information generation occurs in phylogenesis and in ontogenesis of living systems (Fuchs-Kittowski et al., 1998c). Information generation is also typical of developing social systems.

As Søren Brier points out, the information processing paradigm will not succeed in describing the central problem of mediation of the semantic, the content of a message, “from the producer to the user, because it does not deal with the social and phenomenological aspects of cognition” (Brier, 1994). This insight is important for a rational and human use of information and communication technologies, especially in work processes; it is important for understanding certain new developments in biology, and social sciences and also in library and information science.

However, if information is always regarded as a previously existing structure, then one cannot or can only insufficiently see the social and cultural processes of information creation (Fuchs-Kittowski et al., 1998c).

The semantic of social information is generated in a social process. When for instance a biochemist looks for literature about the therapeutic effect of COX-2 (cyclo oxygenase-2), he can find this via various descriptors. But in this context, one must take into account that the meanings of the indexes and of the retrieval concepts have not emerged in the same 'language game'. In most cases the social surroundings will be different from those in which the meanings have emerged. Thus the meaning of the words will differ from those used by the author, later by the indexer, and finally by the

retriever/user. This shows the significance of feedback effects that become possible in an enlarged or multiplied knowledge transfer cycle, (Fuchs-Kittowski, 2001). The meanings of concepts are not set out in advance, but they emerge in a social process of self-organisation. Hence, if there is no feedback between this knowledge producer (the author of the document, the indexer and the user), then information/knowledge is not really produced in the system. In another case it can happen that the user receives not the correct document, but a number of documents that are useless to him.

In social or societal organisations, communication happens by means of generalised media, such as science and culture. Language games according to Wittgenstein, or discourse communities as studied by socio-linguistics, point out the pragmatic aspects of the self-organisation processes in social systems that determine the meaning of the words in the social context. These semantic fields are the really decisive means of knowledge organisation and of the document retrieval community (Brier, 1996).

Therefore we take a concept originally elaborated by Brier. He drew it up to make clear the necessary semantic feedback processes, but we have added to it in particular a feedback loop concerned with user evaluation and we stress again (Fuchs-Kittowski et al., 1975) the importance of 'Information Centres' or competent 'Information Communities'.

The possibilities for interaction via the internet allow increasingly for customised supplies and the formation of large communities. This allows for the emergence of services different from conventional search services. The novel services are consistently transferring competent end user or user groups to the production of information and in particular the evaluation of its quality. As compared with conventional catalogues, each internet user has the possibility of evaluating the found web page or documents. This proves to be an important way to improve the quality of information by services on the internet and on an intranet as well.

Within a document-disseminating information system as a self-organising system by means of semantic feedback relations, feedback relations in the form of negative or positive evaluation of the document contents or of the system's performance can arise from:

1. Direct interaction from the circulation of documents between the producer and user. In particular, scientists do this when they dispatch prints. In 'Knowledge-Co-Production', producer groups are also formed in the scientific community.
2. A librarian's direct access to a document collection. In the case of an appropriate specialisation, for example, as a biochemist or molecular biologist who continuously attends current specialist conferences, the language game of the biochemist or molecular biologist as a producer and user is well suited.

3. The end user's access via an on-line system. Here, however, difficulties can occur with regard to the differing utilisation of concept meanings in the organisation of science.
4. The librarian or information broker as a mediator of the collection or also as a system designer in supporting the electronic search by improving the systems. Here it is possible to improve the global quest by search engines, such as systems for retrieval, selection and presentation, in particular by a purposeful specialisation of the data or knowledge bases.
5. The 'Evaluation Submission Programme' introduces a further feedback relation - evaluation by the competent user or user groups. In our view, this feedback loop is particularly important in semantic and syntactic terms (Brier indeed implied it in 3 and 4, but had not taken it sufficiently into account). This aspect is particularly important in the search for scientific literature, when asking for medical documents. But it also acquires general importance for the normal user with regard to non-useful material on the internet.

3. KNOWLEDGE-INTENSIVE WORK PROCESSES

Service processes in particular are increasingly customer-oriented and knowledge-intensive (as, for example, customer consultation, support and care) and require new co-operative, self-organising forms for work and organisation, as well as for learning, that support creativity (Fuchs-Kittowski et al., 1999a; Fuchs-Kittowski, 2001).

In knowledge-intensive work processes, the integration, combining and grouping of the distributed and heterogeneous knowledge available in an organisation, as well as the creation of conditions for creativity, become an important task. It is important to distinguish whether knowledge that is already available must merely be provided and integrated for the fulfilment of tasks in knowledge-intensive processes, or whether new knowledge must actually be developed.

Knowledge-intensive processes are characterised in that not all knowledge relevant to the situation is available (knowledge gap); rather, it must be gained or created by the persons involved during the course of the process. In other words, it must evolve from scratch (closing the knowledge gap). Such processes are characteristic in that they are not continuously algorithmable and formalisable. Furthermore, such processes contain partial tasks that are new and occur only within these processes. Methods and tools, for example, software tools and data, coming from a potential of methods and tools, such as method and data banks, must be provided in order to work on these tasks.

Complex, knowledge-intensive processes, especially problem-solving processes, require that the design and control of co-operative work process are left to the participating individuals, who thus need to co-ordinate regarding co-operating participants, activities and responsibilities. This way, self-organised, dynamic (competence) networks are created in accordance with the requirements of a specific problem or process.

The concept of self-organisation promises autonomy for those people in the work process. This is counteracted by an extraneous organisation (external determination), which is based on the determination of a process in advance (predefined sequence of activities) and leads to rigidly automated systems, which can be reduced by flexibility. In the reality of social organisations, permanent change between extraneous- and self-organisation takes place. This permanent change should be taken into account when designing and using systems for computer support of knowledge-intensive processes.

Rigid structures should be avoided when using computers in complex, self-organising social systems. Instead, a flexible and dynamic support of information and communication processes should be aspired to. The permanent linking of syntactic (computer-based) and semantic (human) information processing and, simultaneously, the constant change from an already organised system (function system) to a self-organising system (action system) is necessary.

Therefore, it is only possible to undertake a rough pre-structuring of the superordinate processes that can be structured (in advance). Tasks and activities within the pre-structured processes are not determined by the system or pre-defined. Instead, control of the work processes remains with the co-operating persons. Co-ordination amongst participants follows in accordance with the specific situation. Through dynamic selection of suitable co-operation partners and the possibility of including further partners if necessary, problem- and context-related knowledge and problem solution networks can evolve dynamically.

In order to depict complex organisational processes dynamically, the following are necessary: (a) interaction systems for communication and co-ordination amongst the participating persons; (b) support systems for providing a potential range of methods and data, for example, for structuring workflows, finding suitable co-operation partners, the possibility to access knowledge already available (organisational memory systems) etc.; and (c) methods for integrating computer operations (support systems) in human interaction and activity. These need to be integrated such that the process can be supported as a dynamic network.

Such support is possible using synchronous teleco-operation systems. On the one hand they enable support of social interaction using communication

tools (interaction system) such as audio and video. On the other, they enable the integration of computer operations (function systems) in human activity using co-operation tools such as application sharing and shared applications.

Creating the unity of syntactic and semantic information processing and combining self-organisation and extraneous-determination in a sensible manner are the primary tasks of designing and using information and communication systems to support knowledge-intensive processes. (Synchronous) teleco-operation systems can be used so that they will support human capabilities, and are so flexible that organisational processes can be developed from the inside, meaning that they hamper the self-organisation of social systems less. People, being the only creative productive force, must remain involved in work processes as carriers and creators of knowledge.

4. CONCLUSION AND SUMMARY

The decentralised and networked utilisation of modern information technologies, the development of formal theories for documentation retrieval to use the new technologies, accords with the general development of the cognitivist understanding of cognition and thus with its paradigm of information processing. However, the limitations of the information processing approach become clear here also.

The information-processing paradigm differentiates insufficiently or not at all between the reception of signals, the manipulation of signs and the generation of meanings in the process of self-organisation. The epistemological and methodological implications of the conception of creativity, of information processing and information generation in the process of self-organisation, can influence our human choice. The new work and organisation forms developing on the basis of the information and communication technologies have ambivalent effects.

It is shown that modern information and communication technologies disburden from formalised routine and support the reunion of formerly (tayloristic) separate activities (competence profit). At the same time, however, they can lead to raised monotony and the destruction of work (devaluation of human labour). By speaking of qualified e-work, however, a lower demand or monotony of the work can hardly be expected; on the contrary, a competence profit is likely to be the result. However, this can also lead to an overtaxing. Such a mismatch between the performing person and his work can in consequence result in a 'burnout' situation. This can lead in turn to a decrease in work quality, as well as to health problems. That is why the problem of "job burnout" is becoming an issue of increasing concern in today's working world (Maslach and Leiter, 1997).

The conventional view is that burnout is primarily a problem of individuals, because of personal capabilities, character or behaviour. However, investigations show that burnout is not an individual problem, but rather a major sign of dysfunction within the organisation. From the view point of an integrated design of technology, work and organisation, it is a systems design problem to avoid the negative and to promote the positive effects like competence development of the individual and the organisation. This can be achieved not only by closer integration of work and (pre-determined) learning contents, but particularly by learning that is the result of activities performed in the concrete work process. This type of competence promoting work requires qualifying work content, and in particular complete, challenging, and integrated tasks (cf. Hacker, 1991; Ulich, 1992). However, in addition to competence-promoting work contents, autonomy in fulfilling and improving the work tasks is necessary. The development of on-the-job competence requires an orientation toward the potentials of self-organisation (Erpenbeck and Heyse, 1999).

We all have the opportunity to make human choices about the quality of jobs created, what kind of working environment will be designed, about new forms of organisations, about what our future will be like. The choice we make today will create the world in which we will live tomorrow.

REFERENCES

- Brier, S. (1994) What is a Possible Ontological and Epistemeological Framework for a True Universal 'Information Science'? - The Suggestion of a Cybersemiotics. In W. Hofkicher (ed.) *The Quest For A Unified Theory of Information, World Futures General Evolution Studies, Volume 13*. Australia, Canada, Amsterdam: Gordon and Breach Publishers
- Brier, S. (1996) The Usefulness of Cybersemiotics in Dealing with Problems of Knowledge Organisation and Document Mediating Systems. *Cybernetica*, 39, 4
- Erpenbeck, J. and Heyse, V. (1999) *Die Kompetenzbiographie*. Munster: Waxmann Verlag
- Fuchs-Kittowski, F. (2001) Wissens-Ko-Produktion und dynamische Netze – Kooperative Wissenserzeugung und -nutzung in wissensintensiven Geschäftsprozessen. In H. Schurr, S. Staab, R. Studer, G. Stumme and Y. Sure (hrsg.) *Professionelles Wissensmanagement – Erfahrungen und Visionen*. Aachen: Shaker Verlag
- Fuchs-Kittowski, F., Fuchs-Kittowski, K. and Sandkuhl, K. (1998) The use of synchronous telecooperation to design virtual, creative organisations - Conclusions based on empirical research. Poster presentation at the XV IFIP World Computer Congress 'The Global Information Society', Vienna/Austria and Budapest/Hungary.
- Fuchs-Kittowski, F., Fuchs-Kittowski, K. and Sandkuhl, K. (1998) Synchrone Telekooperation als Baustein für virtuelle Unternehmen – Schlussfolgerungen aus einer empirischen Untersuchung. In T. Herrmann and K. Just-Hahn (hrsg.) *Groupware und organisatorische Innovation (D-CSCW'98)*. Stuttgart: B.G. Teubner
- Fuchs-Kittowski, K., Lemgo, K., Schuster, U. and Wenzlaff, B. (1975) *Man Computer Communication: A Problem of Linking Semantic and Syntactic Information Processing*. -

- In Workshop on Data Communication. International Institute for Applied Systems Analysis. Laxenburg, Austria.
- Fuchs-Kittowski, K. and Rosenthal, H.-A. (1998) Information, Selbstorganisation und Evolution. Selbstorganisation, Information und Evolution - Zur Kreativität der lebenden Natur. In N. Fenzel, W. Hofkirchner and G. Stockinger (hrsg.) Information und Selbstorganisation - Annäherung an eine vereinheitlichte Theorie der Information. Innsbruck. Wien: Studienverlag
- Fuchs-Kittowski, K., Heinrich, L. and Rolf, A. (1999) Information entsteht in Organisationen - in kreativen Unternehmen. In J. Becker, W. König, R. Schütte, O. Wendt and S. Zelewski (hrsg.) Wirtschaftsinformatik und Wissenschaftstheorie – Bestandsaufnahme und Perspektiven. Wiesbaden: Gabler
- Frei, F., Hugentobler, M., Alioth, A., Duell, W. and Ruch, L. (1996) Die kompetente Organisation - Qualifizierte Arbeitsgestaltung - die europäische Alternative. Zürich: VdF Hochschulverlag AG an der ETH
- Hacker, W. (1991) Projektieren von Arbeitstätigkeiten. In Zeitschrift für Arbeitswissenschaft, 4, 193-198
- Jenkins, D. (1981) QWL - Current trends and directions. In Issues in the Quality of Working Life. Ontario, Canada: Ministry of Labour
- Krogh, G. von, Ichijo, K. and Nonaka, I. (2000) Enabling Knowledge Creation. Oxford: Oxford University Press
- Mansell, J. and Rankin, T. (1983) Changing organisation - the quality of working life process. In Issues in the Quality of Working Life. Ontario, Canada: Ministry of Labour
- Maslach, C. and Leiter, M.P. (1997) The Truth About Burnout. San Francisco, CA: Jossey-Bass
- Simon, H.A. (1997) The Sciences of the Artificial. 3rd ed. Cambridge, MA: The MIT Press
- Trist, E. (1981) The evolution of socio-technical systems - a conceptual framework and an action research program. In Issues in the Quality of Working Life. Ontario, Canada: Ministry of Labour.
- Ulich, E. (1992) Arbeitspsychologie. Stuttgart: Schäffer-Pöschel Verlag

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