

Business Process Modelling as an Element of Knowledge Management – A Model Theory Approach

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Abstract

The increasing importance of Business Process Modelling and Knowledge Management within economic reality as well as their common epistemological problem are good reasons to look for an integrative approach to both disciplines. The widely recognized lack of epistemological foundation in information systems research also applies to Business Process Modelling and Knowledge Management, thus making this effort more difficult. An analysis of current works shows that most authors, consciously or otherwise, take a positivistic view when talking about models, knowledge, processes and the like. Bound to this view is a naïve ontological and epistemological realism that leads to a mapping-oriented understanding of the terms “model” and “knowledge”. This position is currently under increasing criticism, as it does not take subjective aspects of cognition into consideration. In more recent literature, an increasing number of authors take alternative positions, predominantly a radical-constructivistic point of view. As critics of both positivistic as well as radical-constructivistic positions, our starting point is a conception of a socio-pragmatic-constructivistic approach that takes the subjective aspects and their social contextualization into consideration. Knowledge and model are no longer objective circumstances, but constantly changing results of subjective, socialized interaction. Thus, Knowledge Management and Business Process Modelling should not be focused on representatives or representations of knowledge or models, but on human societies. These have the permanent task of communication about models (and their use) and approximation and optimization of their corresponding worlds of meaning (Sinnwelten) within common practice.

1 Introductory Background

The increasing relevance of knowledge for the economic success of an enterprise is widely recognized nowadays. As early as 1776 in his work “Inquiry into the nature and the causes of the wealth of nations”, ADAM SMITH identified knowledge as a cause for technological progress: 1) inventions and improvement by the workmen who use machines, 2) improvement by the specialized makers of machines and 3) improvements made by “those who are called philosophers or men of speculation, whose trade it is not to do anything, but to observe everything; and who upon that account are often capable of combining together the powers of the most distant and dissimilar objects” [SMITH 1776, BOULDING 1959]. CHURCH and ALFORD state the systematic use of experience as one of their three “principles of management” and define experience as knowledge of passed achievements, which includes “know what” as well as “know how” [CHURCH and ALFORD 1912]. In economics, VON HAYEK in particular initiated the discussion on the role of knowledge [VON HAYEK 1937]. In the section “Knowledge is the business” of his book “Managing for results” DRUCKER supplies an analysis of the influence of knowledge on the success of organisations, proving that the success of basically similar organisations within an industry is different due to different knowledge within the organisations.

Economic results are the results of differentiation. The source of this specific differentiation, and with it of business survival and growth, is a specific, distinct knowledge possessed by a group of people in the business. But while there is always at least one such knowledge area in every successful business, no two businesses are alike in their distinct knowledge [DRUCKER 1964].

In social sciences, the work of BOULDING contributed greatly to the discussion regarding knowledge in human society [BOULDING 1964, 1966, 1970]. BERGERS and LUCKMANNs basic knowledge-sociological approach in “The social construction of reality” is also important [BERGER and LUCKMANN 1966] because of its parallels to epistemological constructivism. Despite this historic background, it took quite some time for the topic “knowledge” to attain an outstanding role in the agenda of research and practice in business administration. This finally occurred with the advent of concepts such as Learning Organisation [ARGYRIS and SCHÖN 1978, SENGE 1990] and Knowledge Management [SVEIBY and LLOYD 1987, DRUCKER 1988, NONAKA 1991].

Knowledge in both the epistemological and sociological sense must be regarded as a constituent for human existence. Thus, it is not surprising that Knowledge Management has spread into many areas of scientific effort – be it as an object of research or as a means to an end. The idea of managing knowledge is closely tied to other approaches for strengthening the competitiveness of the organisation, such as Total Quality Management (TQM), Lean Management, Kaizen or Continuous Improvement and above all Business Process Reengineering (BPR). Different authors regard Knowledge Management as a supplement to Business Process Reengineering. The fact that John Wiley’s Journal “Business Change and Reengineering” was renamed as “Knowledge and Process Management” in March 1997 supports this thesis [BARCLAY and MURRAY 2000].

The approach of Business Process Reengineering expressed the importance of a process-oriented design of organisational structures (going away from resources efficiency with its local maximums, going towards process efficiency with a global optimum) [HAMMER and CHAMPY 1993]. But the original focus on the organisational (structural) and technical aspects neglected the human dimension. The knowledge dimension hardly played any role in the initial conception of BPR. In its course of development people found out that entrepreneurial success does not solely consist of the production and sale of products. In order to ensure the survival of a business in a dynamic environment, it is necessary for an organisation to be able to deal with large and mostly unpredictable changes. A single focus on the increased efficiency of the

services rendered can be strongly counter-productive if there is no space for creativity or learning for those involved in the execution of processes [LEVAS et al. 1995]. The meaning of knowledge in BPR is directly linked with creativity and learning, according to [SCARBROUGH 1996]. The various types of knowledge that play a role in BPR form a suitable starting point for re-connecting Knowledge Management and process orientation.

In the context of BPR, the focus of interest has been on business processes. Business processes are considered as substantial structures ensuring business success, with their efficiency placed in the foreground. Consequently, a second look at Knowledge Management should be taken from the process point of view. Knowledge Management is a continuous process and its object is not only the distribution of knowledge resources in the enterprise, but also management of knowledge processes: Knowledge is generated, passed on, used and in turn contributes to its re-generation. If we regard the rendering of services within the organisation as a process or a sequence of functions performed on an object, then we should observe the influence of knowledge along with these business processes. Thereby, it is possible that knowledge processes run parallel to performance processes or alternate between them, thus forming a network structure. A function of Knowledge Management can be seen in the management of knowledge that is necessary for the execution of the processes and generated at the time of execution (in reference to these business processes). However this interpretation of process oriented Knowledge Management is not particularly new. Numerous IT projects executed in the context of BPR already had goals such as the improvement of communication, co-operation, co-ordination and the information supply on their respective process functions. At that time, the focus was on “information supply”, whereas today it is called “knowledge transfer”.

DAVENPORT demonstrates a substantial weakness of today's approaches of Knowledge Management towards Process Management: It is simply not sufficient to collect and store process-monitoring data in databases, because data graveyards (which already exist in most organisations) would be the result. Process data is of course helpful when controlling Workflow Management Systems, but knowledge is not regarded at all in this way [DAVENPORT 1997]. By distributing reports, spreadsheets and the like, we still don't take knowledge into consideration. The process has to be run in a knowledge(able) environment, a learning organisation.

The coherence is evident: Knowledge cannot be generated without learning, which preferably takes place in some kind of community. Knowledge is based on experience, and is a result of realization. Only a (human) being is capable of such realization—there is no knowledge without a knower. In the case of process orientation, the concerns are process knowledge (knowledge about the process as such) and process-relevant knowledge (knowledge which, apart from the process knowledge, is necessary for the process performance). Further to the collection of process performance data, process modelling is a common method of “raising knowledge” about processes. In doing this, it is insignificant whether existing processes are modeled (modelling of the actual state) or processes which are yet to be implemented (modeling of a planned or future state). If all modelling takes place explicitly, this results in possibilities of a further use of the model representations.

The term “explicit modelling” can already serve as a starting point for an analogy. In Knowledge Management, a differentiation is made between implicit and explicit knowledge [NONAKA and TAKEUCHI 1995]. Explicit knowledge is thereby understood as externalized knowledge. If we regard externalized knowledge as what it is, a knowledge representation, then the connection between explicit business process models (model representations) and the term of explicit knowledge becomes evident. Explicit knowledge (as understood by NONAKA and TAKEUCHI), can be distributed, internalized or combined, everything that can be done using representations of models. However, yet another aspect refers to a possible connection between Business Process Modelling and Knowledge Management. For both, ‘externalization’

by means of a language is necessary, regardless of whether natural or formal. LEVAS et al. characterize this circumstance as follows:

Those involved in business today are acquiring a new language for thinking and talking about business. BENJAMIN WHORF, the well-known linguist, argued that we cannot conceive of ideas that cannot be represented in a language; moreover, learning new languages allows us to think differently. A lingua franca of business process is growing up around us, with immediate impact on all those who learn and use it [LEVAS et al. 1995].

The development and spread of this “new language” correspond to a paradigm change, similar to the change from functional to object-oriented programming [LUKER 1994], since process orientation and object orientation are not limited to learning a new language alone. A conceptual reorientation is required, the generation of new patterns (models) of perception, meaning a change of practice for all people affected.

Modelling and models are substantial, if it comes to the collection of knowledge or the creation of a common understanding about certain circumstances. Models do not reflect the objective reality, but they reflect its understanding by the model builder. In the sense of a social or socio-technical perspective on measures for ensuring entrepreneurial success it is not the ‘objective’ reality that is crucial, rather how the individual concerned understands it.

1.1 Motivation

Up to now, structural design as a major parameter affecting process efficiency has been the main focus when looking at organisations with a process-oriented point of view. However, with the advent of Knowledge Management a new aspect has to be added: knowledge transfer. The execution of processes requires not only the representation of knowledge, it also creates knowledge (for the persons involved). Consequently, the creation and subsequent management of processes involves technical and human resources in combination with knowledge as an immaterial factor. This leads to a newly integrated treatment of process and knowledge [SCARBROUGH 1996, KARAGIANNIS and TELESKO 2000, JABLONSKI et al. 2001, ABECKER et al. 2001, HEISIG 2001].

Traditionally, designing organisations is closely related to models that initially found their way into schematic representations of structures and processes. The arrival and dissemination of process-oriented organisations resulted in an increasing importance of process models or so-called Business Process Models in business practice. These are applied in such areas as Systems Analysis [WYSSUSEK 1999], Business Process Reengineering [HAMMER and CHAMPY 1993, BAL (without date)] or Quality Management [COSTIN 1994, VON FEIGENBAUM 1991], and are used for the documentation, analysis and creation of process structures including communication support [CURTIS et al. 1992, GAITANIDES 1983, LEVAS et al. 1995, BAL (without date)]. Another important field of application for Business Process Modelling can be found in Requirements Engineering in the early stages of information system development. In Software Engineering, the term “software process” is being used, which has some similarities with the concept of a business process [WARBOYS 1994].

More recently, first signs of use for business process models in Knowledge Management can be found, applied for either modelling processes (for managing knowledge) or as a form of representation for process knowledge.

A closer look reveals a number of correspondences between Business Process Modelling (BPM) and Knowledge Management (KM), which motivates an integrated treatment of both areas from a practical point of view:

- (Externalized) Models as knowledge representations are used in BPM as a basis for communication about certain issues, similar to externalized ‘knowledge’ in KM.

- (Externalized) Models serve as a storage medium for ‘knowledge’ on an issue, again similar to knowledge representations in KM.
- Given the ability to store knowledge, there is a possibility of reuse that is commonly described by the term “best practice” in KM [O’LEARY and SELFRIDGE 1999]. In BPM, this case is referred to as “reference models” which allow for reuse in similar cases due to their genericity (for example, customizable standard software) [SCHEER 1994].
- The externalization of models allows for the integration of model representations from different model builders. In KM, this is regarded as ‘knowledge’ combination (which is in fact not the case, since it is not knowledge that is combined, but knowledge representations).
- Modelling may be seen as an intentional mapping (ignoring unimportant details) of knowledge about certain facts. This requires knowledge about these facts, and modelling can therefore be interpreted as creation of knowledge representations regarding the facts, which in KM is seen as the elicitation of knowledge.

In addition to these practical aspects, there are also many theoretical ones that motivate an integrative approach.

- The understandings of the terms model and externalized ‘knowledge’ have many correspondences in both disciplines: mapping orientation, objectivity, inter-subjective comprehensibility and being bound to speech.
- Learning as a process for knowledge generation is not satisfactorily considered in both BPM and KM as due to their techno-centric points of view, the human computer interface represents the limit of the *domain of discourse* (DoD).
- Both BPM and KM do not take the subjective and social dimensions into account. In Knowledge Management, this becomes obvious with the focus on external knowledge within the techno-centric perspective. Tacit knowledge defies control (and management) by technical Knowledge Management systems [TAKEUCHI 1998]. With regard to BPM, the objective of the participative Systems Analysis is normally to integrate the user’s requirements, and not to build a common understanding concerning a certain circumstance.
- Because BPM and KM deal with an epistemological problem, it is astonishing that only a small number of works exist, and that an epistemological foundation is still non-existent for both approaches. We regard a common epistemological foundation as vital for a subsequent integration of BPM and KM.
- A positivistic epistemological position is predominant in both BPM and KM.
- Within information systems research, a tendency towards more recent epistemological positions is recognizable. This can be seen in a number of works based on a constructivistic position [e.g. FITZGERALD and HOWCROFT 1998, RIDLEY and KEEN 1998, FLOYD et al. 1992].
- BPM and KM are governed by techno-centrism, and from our point of view, a change towards anthropocentrism is overdue. We have arrived at this conclusion as the domain of discourse for BPM and KM are socio-technical systems. BPM and KM are concepts that only make sense in a social context, that is, they only derive meaning against a socio-pragmatic background.

- The symbolic character of information systems (and also of knowledge representations) suggests a reference to semiotic approaches to information system development [STAMPER 1973, LIU 2000].

1.2 Objective

The integration of Business Process Modelling and Knowledge Management requires a common epistemological foundation. The predominant, mapping-oriented understanding of the terms “knowledge” and “model” in both disciplines, which is based on a naïve-realistic epistemological position, does not consider their involvement in a social practice. Therefore, we need to look for alternatives to this understanding.

By means of the socio-pragmatic-constructivistic approach, we propose an epistemological position that takes the social contextualisation of knowledge and models into consideration and thus may serve as a starting point for the derivation of methodological consequences for the use of Business Process Modelling in the context of Knowledge Management.

1.3 Method

Focusing on an integration of Business Process Modeling and Knowledge Management, we begin our observations with an analysis of the prevailing understanding of the terms “model” in Business Process Modelling and “knowledge” in Knowledge Management. In the field of Business Process Modelling, we start by analyzing common definitions and the purposes of models and modeling from the literature, followed by a description of positivistic and constructivistic model concepts, concluding with a critical review of these concepts.

Similarly, we look at the common views on knowledge and identify two streams. These streams are classified according to a comparison of different Knowledge Management frameworks and the model concepts previously described. In doing this, we intend to expose the predominant epistemological position on which today’s research and development in Business Process Modelling and Knowledge Management are based.

An excursion to the topics “knowledge”, “model” and “socio-pragmatic constructivism” with an illustration of the position of the respective authors from the epistemologically relevant literature follows. We criticize the understanding of terms used hitherto as well as the epistemological position we deduce from the analyses previously undertaken. Additional weak points resulting from the prior understanding of concepts are also demonstrated. These shortcomings are a sufficient basis for the development of a new concept using an alternative model concept.

We wish to propose a new concept derived from our epistemological criticism and based on approaches from information systems research literature. This concept takes both the cognitive processes of modelling and knowledge acquisition into account, and thereby delivers an epistemologically founded basis for the use of Business Process Modelling within Knowledge Management.

Finally, we will summarize the consequences for Knowledge Management, Business Process Modelling as well as Business Process Modelling as an element of Knowledge Management, and will present a conclusion we draw from the understanding of concepts, their critics and our socio-pragmatic approach.

2 Business Process Modelling

2.1 Business Process

Up to now, there is no generally accepted notion of business processes in the literature [KUENG and KAWALEK 1997, WYSSUSEK 2001, FERSTL and SINZ 1994, HAMMER and CHAMPY 1993, FEILER and HUMPHREY 1993, RIDDLE 1996] which hinders the definition of the term “business process model” as it is not possible to define the subject of the modelling process (which is an ontological problem). A superficial analysis of related papers reveals the following terms used in descriptions or definitions of business processes:

relation, structure, customer, transaction, activity, task, process step, working step, function, method, output, input, information, material, speech act, human beings, machine, agent, resource, performer, organizational unit, individual, team, role, data, goal, purposes, object, product and service.

Basically, we can differentiate between two interpretations of the term “business process”. The first one is closely related to the definition in the context of Business Process Reengineering and considers business processes as the kernel processes which define the services of a company and produce value for the customer [HAMMER and CHAMPY 1993]. The other definition has a broader scope, and defines business processes as processes that contribute to the performance of the company, including service and support processes. This differentiation is usually ignored in the context of information systems research, and a business process is considered as a set of partially ordered activities, necessary for the processing of a relevant business object intended to reach a (process) goal.

2.2 Business Process Models

Models of business processes can be understood as simplified, abstract representations of business processes. Their structure represents the logical-temporal sequence of functions considered. Process models may be utilized in different ways. A review of some relevant publications reveals the following purposes for the use of process models:

- Facilitating human understanding and communication [CURTIS et al. 1992, FRASER 1995, LEHMAN 1997, HABRA (without date)]
- Supporting process improvements [CURTIS et al. 1992, LEHMAN 1997]
- Supporting process management [CURTIS et al. 1992, DERSZTELER 2000]
- Automating execution support [CURTIS et al. 1992, BENJAMIN et al. 1995]
- Facilitation of organisational learning [SCHÄL 1996, SENGE 1990, LEHMAN 1997]
- Benchmarking process performance and facilitating determination of potential process improvements [CHILDE and SMART 1995, LEHMAN 1997, BENJAMIN et al. 1995]
- Support of process evolution [ROBERTSON 1996, LEHMAN 1997, DERSZTELER 2000]
- Help in integrating technical aspects and organisational issues [KAWALEK and KUENG 1997]
- Facilitating the transfer of know-how (reference process models, best-practice models) [SCHEER 1994, LEHMAN 1997]
- Supporting process simulation [BENJAMIN et al. 1995]
- Supporting the configuration / customizing of standard software

However, not only models are considered useful, the actual modelling activity should also not

be neglected. Process modelling

- Is a learning process [KAWALEK and KUENG 1997, FRASER 1995]
- Helps users develop cognitive processes and representations [LEVAS et al. 1995]
- Facilitates the gathering of knowledge [KAWALEK and KUENG 1997]
- Helps achieve a full understanding of processes (for example, objectives and characteristics) [BAL (without date), LEHMAN 1997, CURTIS et al. 1992]
- Facilitates the creation of a shared vision and understanding [BAL (without date), LEHMAN 1997]
- Supports the testing of hypotheses [KAWALEK and KUENG 1997]

In spite of the variety of uses, there is no consensus in the literature concerning epistemological and ontological presuppositions that have a great impact on the way we deal with modeling, models, and model representations.

The lack of an epistemological foundation in the field of information systems research is pertinent since its conception. At least since KEEN's paper in 1980, this problem is part of the scientific discourse within the field [KEEN 1980, KLEIN and HIRSCHHEIM 1987, FITZGERALD and HOWCROFT 1998]. An analysis by KLEIN und HIRSCHHEIM reveals that (data) modeling methods can be placed on an ontological-epistemological continuum with the endpoints of subjectivism and objectivism [KLEIN and HIRSCHHEIM 1987]. The authors state that most (data) modeling methods in Software Engineering are to be placed at the objectivistic end of the continuum. This conclusion corresponds with the results of an analysis by ORLIKOWSKI and BAROUDI of mostly North American publications [ORLIKOWSKI and BAROUDI 1991]. They found that researchers and practitioners who hold a positivistic epistemological position dominate the field of information systems research. An analysis of publications by mainly Australian authors revealed nearly the same result [RIDLEY and KEEN 1998]. A similar development can be stated for Germany where a conference on the topic "Information Systems and Philosophy of Science" was established as a platform for the discourse on methodological issues in information systems research [SCHÜTTE et al. 1998, BECKER et al. 1999] as recently as 1997.

The dominant positivistic epistemological perspective can be considered as the primary cause for a widespread notion of model: A model is an abstract representation of reality, created by the mapping of features of reality onto features of the model.

Positivistic Model Concept

The ontological presupposition of positivism is marked by a naïve realism. Reality consists of tangible pre-existing structures. The corresponding epistemological position is objectivism. The researcher holds a neutral (objective) position, and discovers the true existence of nature (reality). The only possible methodology is (empirical) experimentalism. The notion of "knowledge" is bound to a notion of truth referred to the correspondence theory of truth, which is also the basis for the representational (mapping-oriented) notion of "model". Knowledge exists if "real objects" with their "innate" properties and relations are represented (mapped) in the human mind with the same properties and relations. The human being with its consciousness is then understood as a medium for the representation of reality. Also, modelling is a creation of the mapping of the "true" reality. The simplification (abstraction) of the representation is realized by the intensional neglect of 'objective' properties and relations of the original (model source). This representational notion of the model presupposes a direct relation between the model (representation) and the original (model source), as depicted in figure 1).

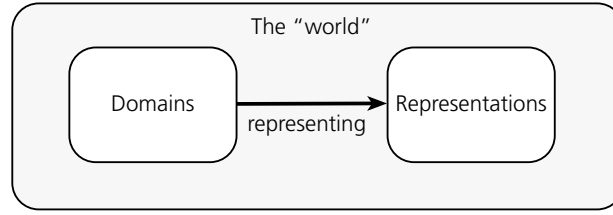


Figure 1: Positivist model concept

Positivism in the context of modelling is faced with increasing criticism, particularly because of its negligence of subjective cognitive efforts by the model builder [FLOYD et al. 1992, HABRA (without date), FALKENBERG et al. 1998, BEN-ARI 1998].

Radical-Constructivistic Model Concept

Radical constructivism in information systems research has gained increasing attention in recent years as an alternative epistemological position to the positivism. Reality does not exist a priori – instead, it is assumed that many “realities” are possible, as subjective mental constructions. Socially contextualized notions (terms) define how the individual perceives the world. Social contextualization is provided by language and culture, and reality consequently differs with different language and cultural backgrounds [VON GLASERSFELD 1998]. The researcher no longer holds an objective position, but is part of the research situation. Research findings are a result of the interaction between the researcher and the research situation, and are influenced by the knowledge, attitudes and values of the researcher, that is, they are subjective.

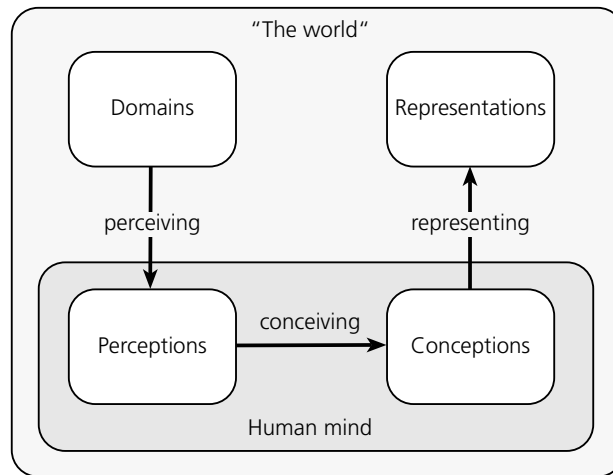


Figure 2: Radical-constructivistic model concept [FALKENBERG et al. 1998]

We have depicted the relationships in figure 2. The *domain of discourse* (the original) is part of “the world” as well as the representation (the model) and the model builder themselves. Business process models are not discovered but invented, and represented in a natural or formal language. A direct relation between the domain (of discourse) and the representation does not exist. As a consequence, models do not have an existence in themselves – they are created by their subjective use. Business process models are then unthinkable without an individual using it as a model.

Criticism

Our perspective is beyond positivism and radical constructivism, or, epistemologically stated, between objectivism and subjectivism. We will justify our position in the following criticism (a more detailed discussion is provided in section 5 of this paper).

Positivism/Objectivism – philosophical tradition from empiricists (BACON, HOBBS, LOCKE, HUME, CONDILLAC) to neo-positivists, naturalists, agnostics, sensualists, empirio-critics, logical empiricists and logical positivists (Wiener Kreis) assumes that all experiences on the basis of sensual experiences of the given (positive), and the inexperienceable are not real or at least not recognizable. Its advocates try to establish final, general and constant laws. The problem is that the decision regarding the meaning of the given must be made in advance. However, the meaning of experience is not given by experience itself, but is grounded in preconditions of all experiences. Questioning the a priori reason for the possibility of experiences and the given are rejected by positivism as metaphysical. Providing instruments for scientific propositions is insufficient if one refers to one's own research in a reflective way.

Constructivism pursues the grounding of scientific propositions on the rules of scientific discourse and argument. It is related to pragmatism and behaviorism, and considers science as a system of precise and repeatable actions (operations). The radical constructivism [VON GLASERSFELD 1998] is turned towards the old direction of rationalism.

3 Knowledge Management

The perception of Knowledge Management as an independent, institutionalized management function has become common only in its recent development (since the last decade of the twentieth century). Indeed, companies are increasingly concerned about their “knowledge as a resource”. However, since these origins exist, a strong “knowledge management hype” also exists which is driven by consulting and IT organisations which have adapted to the trend, quite similar to what happened some years ago in Business Process Reengineering [TAKEUCHI 1998].

3.1 Approaches to Knowledge

During the development of the field, it still remained unclear what to consider as knowledge or Knowledge Management. SVEIBY proposes using two perspectives, classifying different research directions as illustrated in figure 3. Basically, he distinguishes two tracks (“IT” and “People”) and two levels (“Organisation” and “Individual”). Using these tracks, SVEIBY assigns several groups researching in Knowledge Management topics to their “corresponding” track/level combinations, thereby admitting and hazarding the consequence of a possible oversimplification. However, the quadrants of the matrix show that there are paradigmatically different approaches to Knowledge Management: The points of view regarding a certain aspect within Knowledge Management of, for example, an organisational theorist and an AI specialist will surely be different, as will their judgments and choices in courses of action. As a result, there are several options on how Knowledge Management and Knowledge Management research are to be conducted – with different premises and results. Because of this, there has been no universally accepted notion of knowledge or Knowledge Management in the literature up to now.

Level	Track	
	IT-Track Knowledge = Object	People-Track Knowledge = Process
Organisation Level	“Re-engineers”	“Organisation Theorists”
Individual Level	“AI-specialists” “E-specialists”	“Psychologists”

Figure 3: Knowledge Management classification [SVEIBY 2000]

It is possible, however, to identify two main streams using the classification shown above, which differ strongly in their roots and terminology: the techno-centric and anthropocentric streams.

The techno-centric stream is based upon an information theory perspective: Knowledge is regarded as an entity that can be processed or handled by information systems (Knowledge Management systems). This field is addressed predominantly by engineering and information sciences. The primary goal is the conception and implementation of information systems (in technical terms) by employing relevant technologies such as Management Information systems, Groupware, Data Warehousing, and so on.

Anthropocentric views are normally held by organisational theorists or economists with a sociological, psychological or philosophical background. Here, the basic supposition is that knowledge is not an entity, but a process (or a result of one). Contrary to the techno-centric stream discussed above, it is therefore not a matter of collection, dissemination and use of existing, but of the generation of new knowledge by means of appropriate methods. Mainly based upon the work of POLANYI, there is a distinction between internal (tacit) and external (explicit) knowledge [POLANYI 1958, 1962, 1966, 1969]. This concept of external knowledge is based on the assumption that thoughts can be articulated and that the resulting linguistic constructs or models incorporate our knowledge.

There are many combinations of both viewpoints, especially within research cooperatives between people from different areas – information science, economics, organisational theory, psychology and sociology.

In the following section we wish to expose the common position we believe to be inherent to all described positions. This “mainstream” needs to be analyzed more closely, and we will therefore analyze some works from authors of the different categories described above, with a focus on the understanding of the epistemological concepts employed in order to subsequently distinguish these positions from ours.

3.2 Knowledge Management: Management of Knowledge or Management of Knowers?

We use an analysis of different “Knowledge Management Frameworks”, performed by HOLSAPPLE and JOSHI which documents and analyses several frameworks from research and consulting practice for a closer look at the views concerning Knowledge Management [HOLSAPPLE und JOSHI 1999]. First of all, our point of view that there is no common or standard way to characterize Knowledge Management activities is validated. The frameworks are categorized by

- Focus of the Knowledge Management framework
- Roots (origin)

- Knowledge Resources
- Knowledge Manipulation activities
- Influences on the conduct of Knowledge Management

On inspecting the results, one fact attracts attention: In most cases, only organisational or technical connections are reflected. Either the knowledge of the employees is regarded as a management entity (that is, externalizable, therefore electronically processable), or the concern of management is the cataloguing of employees' knowledge by cataloguing the employees instead of cataloguing their knowledge ("characterization and measurement" approaches). Resources for knowledge generation and processing are limited to "knowledge of employees" (which is consequently externalized or at least externalisable and therefore processable) and the structures (of the company and/or of the processes), which are also expected to carry inherent knowledge. The activities that – according to the framework concepts – must be employed in the context of Knowledge Management generally refer to the creation, collection or acquisition, redistribution (sharing, transfer) and application of knowledge (decision making). NONAKA, on the contrary, uses the terms "socialization, internalization, combination, externalization", for describing different stages in the conversion from internal to internal and/or external knowledge [NONAKA 1994] and thus also takes an anthropocentric position of the kind discussed above.

The presumption of knowledge as an entity, at least as externalisable, processable and mutable (for example, tacit to explicit), can be found in all of the inspected frameworks. Based on this result, it can be stated that the current predominant view in Knowledge Management is clearly mapping-oriented in the same way this was already shown – based on the epistemological position of positivism described above – for Business Process Modelling. The inspection conducted here could be continued ad infinitum with regard to the vast literature currently available in Knowledge Management. Some well-known Japanese precursors of the current Knowledge Management development see the same problems, but more with regard to Western culture. TAKEUCHI, for example, describes the differences between "Knowledge" in Japan and "Knowledge Management" in the Western world from his point of view, writing:

Although the growing recognition of knowledge as the critical resource is welcome news, the hoopla in the West associated with knowledge management could be a blessing in disguise. As we have seen, the focus in the West has been on (1) explicit knowledge, (2) measuring and managing existing knowledge, and (3) the selected few carrying out knowledge management initiatives. This bias reinforces the view of the Organization simply as a machine for information processing [TAKEUCHI 1998].

The allegation that the Western world considers its organisations, and therefore their employees, only as an information processing system and not an information generation system, makes clear the dangers a techno-centric approach to Knowledge Management holds. Therefore, we expect a shift in the main focus of Knowledge Management in favor of:

- An extension of the usage of implicit knowledge – instead of explicating the implicit to make it manageable,
- The promotion of creativity – instead of the measurability and controlling of corporate knowledge and
- A socialization of knowledge – instead of the codification of knowledge and the distribution of knowledge representations

to be necessary if means of Knowledge Management initiatives are to contribute to sustainable corporate success and the affected companies should remain competitive. Such a Knowledge Management concept will be only achievable with socially contextualized knowledge, which is

created within a necessary scope for development and – above all – constituted in a constructivist fashion. To be able reach this goal, we need to make clear what the meaning of socio-pragmatic constructed knowledge is and how this can be achieved. The following excursion into philosophy is intended to contribute to clarification.

4 Knowledge, Model and Socio-Pragmatic Constructivism – An Epistemological Excursion

4.1 The Correspondence Theory of Knowledge in Philosophical Tradition

The problem of knowledge has concerned philosophers for centuries. In this paper, only the most important positions can be outlined and discussed.

From PLATO to the Age of Enlightenment

In the philosophical tradition “knowing” was always set in relation to “believing” or “thinking”. Plato’s distinction between “epistēmē” and “doxa” establishes for the first time an epistemic model based on a correspondence theory of knowledge [PLATON, *Politeia* 477 b–e, *Gorgias* 454 d]. This kind of dualism between “the original” respective “the real” and its “representation” respective “model”, always relying on the *adaequatio rei et intellectus*, has been enhanced in the course of time since antiquity. In this context three major tendencies can be distinguished:

- Knowledge as “realistic representation”, as knowledge of the “Divine” [CRAMER 1967]
- Knowledge as an inherent ability for rational thinking (DESCARTES, SPINOZA, LEIBNIZ) [HECKER 1978]
- Knowledge as a psychophysical sensation of external things (BACON, LOCKE, HUME) [CRAMER 1967, DESCARTES 1637/1969, TOPITSCH und STREMMER 1981]

KANT

The correspondence theory of knowledge remained the prevailing concept until the advent of classical German and present-day philosophy and beyond. KANT tried to overcome the empiricist approach to knowledge by confronting it with a rationalistic one, and finally succumbed to a (pre)-radical constructivism that tried to explain knowledge and its acquisition as a result of the a priori given epistemic capabilities of a transcendental subject. KANT availed of a techno-centric vocabulary oriented towards mathematical sciences [EISLER 1930/1984, HEIDEGGER 1965, 1987, MARQUARD 1982].

HEGEL

HEGEL concentrated his efforts on overcoming KANT’s subjectivism by taking the impact of the forms of social life (objective spirit) in addition to that of the acting individuals (subjective spirit) into consideration. According to HEGEL, the forms of social life become ‘transparent’ in their structures in the course of time (via the dialectical triad: thesis, antithesis and synthesis), that is, they obtain a kind of “self-consciousness” [HEGEL 1999, PÖGGELER 1973].

Modern Philosophy

After German idealism there are various movements back to the “old masters” KANT and HEGEL – followed by the “emancipation” from them. Generally speaking, two major “camps” crystallize out with regard to the correspondence theory approach, which, based on our

scheme, cannot be assigned to either techno-centrism or anthropocentrism. The techno-centric paradigm embraces positions such as positivism, utilitarianism and materialism, and to a certain extent pragmatism, new KANTism and neo-positivism. The anthropocentric paradigm embraces existentialism, phenomenology, and mentalism [STEGMÜLLER 1954ff., HUSSERL 1950, DÜRR 1948, KOLAKOWSKI 1966, KÖHNKE 1986].

4.2 Criticism

We do not consider either the techno-centric model or the anthropocentric model to be suitable for explaining Knowledge Management in business processes, as these models present their arguments either on a basis of mapping theory or radical constructivism.

Critique of the Techno-Centric Approach

All techno-centric approaches adhere to the classical correspondence theory of knowledge that has to distinguish between subject and object. The vocabulary used for describing objects and states of affairs is applied without reflections on human actions, thus missing their ontological specificity [BLUMENBERG 1981, KUSCH 1995].

Critique of the Anthropocentric Approach

The anthropocentric approaches take into consideration the specific status of human actions. However, they deal with them in a reduced fashion. Either they look for so-called “anthropological constants”, or they examine the behavior of single subjects and isolate action sequences, intentions or mental status.

In this manner they fall victim to a modern psychologism known as radical constructivism [KUSCH 1995]. The anthropocentric approach fails to grasp the constitutive conditions of humans being, in contrast to the techno-centric approach that does not provide an adequate description of the human condition, namely the coming into being in a social environment as the condition for the emergence of individuality, knowledge and, finally, “the world”. Our aim is therefore to formulate a theory that does not exhibit the flaws mentioned above. We refer to it as *socio-pragmatic constructivism*.

4.3 Socio-Pragmatic Constructivism

The aim of socio-pragmatic constructivism is a non techno-centric and non radical-constructivistic approach to the integration of Business Process Modeling and Knowledge Management. Several prerequisites must be fulfilled for this purpose:

- Due to its dualistic subject-object-scheme, the correspondence theory approach is not suited to describing knowledge and modelling processes. For this reason, this scheme is not acceptable. Also, the radical constructivistic approach misses its aim because it insists on the individual mental states of single individuals as the sole instance of knowledge acquisition and management.
- The mode of description should neither be techno-centric nor anthropocentric in a reductive way.
- Objects of description should not be the solidified representations of the processes, but the processes themselves.

Analysis of Sociality versus Correspondence Theory

Our socio-pragmatic thesis is that common action is realized on the basis of symbolically constituted “worlds of meaning” (Sinnwelten). A completely isolated human action – even thinking, knowing, believing – is from a genealogical point of view impossible: This claim explains

a socio-pragmatic position that roots the concept of knowledge in a pre-existent common practice of communicating and acting, thus regarding subjective self-ascriptions of mental states such as “I know that...” as derivative phenomena [FOUCAULT 1969]. Analyzing the community means looking for the conditions that render possible common human action. Taking the KANTian (unfortunately to a transcendental subject) reduced constructivism as a starting point, we propose a socio-pragmatic constructivism that poses the primacy of the social over the individual.

One point of difference between socio-pragmatic constructivism and classical radical constructivism is that the former does not look for specific human capacities at the level of single individuals, but seeks to explain human actions and their consequences (institutions, models, knowledge) by giving an accurate description of the underlying forms of practice. Human action is distinguished by its specific form of co-operative organisation that manifests itself in the form of practices such as communication. The acquisition and teaching of language takes place in a human community – it is not the sole achievement of a single individual. Exchange by means of symbols transports and modifies the horizons of meaning (Sinnhorizonte) [STEKELER-WEITHOFER 1995]. This process, however, can be regarded also as the “construction of worlds of meaning” – in a broad sense – as an active and creative process, because language, pictures, and models are *media*, that is, vehicles for the transportation of meaning. Accepting this point of view also helps to understanding BERGER’s and LUCKMANN’s thesis that social reality can be grasped only in a “double mode”, both as objective fact *and* as subjective meaning [BERGER and LUCKMANN 1966].

We do not use the concept of construction in a logical or mathematical sense, that is, for the formal justification of a scientific statement according to the rules of scientific discourse, or in a radical constructivist sense. We use it rather in the sense of a socially, “life-worldly” (lebensweltlich) and pragmatically-oriented description of inter-subjective processes, in which humans always develop, acquiring knowledge about the world, reassuring, controlling and further transferring it in the frame of society, and in the same instance individually acquiring and modifying it by means of their interpretational capacities [MUSGRAVE 1983]. A closer look at these practices of cultural integration and knowledge acquisition reveals that they are not solipsistic acts of creation *ex nihilo*, but actions guiding the structures of aims and needs embedded in the life world (Lebenswelt).

In addition to learning language, how to handle material objects and deal with emotions and other humans during knowledge acquisition, we also learn how to deal with the rules, structures and models that make up “the world”.

Holistic versus Reductive Description

Techno-centric and anthropocentric-individualistic modes of description are reductive. They describe things from a certain point of view without asking if this description is adequate or not. They choose modes of description that have the form of causal explanations (cause-and-effect scheme). The socio-pragmatic approach differs at this point by trying to give an appropriate description of its “object” in a hermeneutical manner of understanding the interconnections between common action and understanding of meaning. Nevertheless, this approach takes into consideration that its holistic aim remains a permanent task because of the grammar and the temporal structure of our language and of our culturally and historically limited capabilities of experience.

The approach is connected with a new orientation in Business Process Modelling and Knowledge Management: away from a techno-centric positivism and from radical-constructivist anthropocentrism. Our position argues for an anthropocentrism that does not focus on the single individual and his epistemic capabilities. In our view, it is possible to speak from an in-

dividual only under the condition that a pre-existent social frame is presupposed. This frame would not have any relation to the world and to itself without its specific modes of human communication via language, pictures, models and constructions. The fact that humans have access to the world is the result of their socio-pragmatic behavior in the community – of their constructivistic communitarism.

Following HEIDEGGER we can also say that only humans have access to the world and reality in this sense [HEIDEGGER 1993]. Talking about man is always equivalent to talking about his relationship to the world, the community and to himself. Therefore, attention must be drawn to the specific human social modes of correlation, namely on claims and on the conditions for mutual recognition, for exerting power and for participating in discourse.

Processes versus Objects

Describing human practices is different to describing objects or states of affairs. Describing human practices includes looking for prerequisites, self-descriptions and for variable historical and cultural contexts. Truth and reality must therefore be interpreted in the same relative manner as their models. However, that what we seek to describe is always in a more progressive state than that which we define as knowledge or model. Forms of practice therefore cannot be defined. Even in the case of well-established forms of practice such as logic or mathematics that claim to provide universally valid and intelligible knowledge and methods (for example, counting), this universality is guaranteed solely by their acceptance and continuation in a practice that is common (today) to all humans world-wide, and not because mathematics and logic are ‘wired’ as a structure in the brain or contained in ‘our genes’.

From the above, we can conclude that regarding knowledge, there is no such thing as “progress”, as well as that there is no progress regarding theories and models – that what we call “progress” is a paraphrase of the fact that we acknowledge the changes in perspectives and practices [KUHN 1962]. The aim of science is not to increase or improve one’s knowledge, but to acquire knowledge in and for the practice. Practices that aid the acquisition of knowledge, such as sciences, are modified by each new participant (for example, by means of the interpretative use of language or confirmative actions). This change is, however, not only due to the change in the material substrate of the world, but also due to the circumstance that the permanent social interaction by means of symbolic processes like modeling and representing sustains a permanent social change.

This fact urges us to differentiate between knowledge representation (i.e. in an reifying sense) and acquisition of knowledge as a non-reifying processual form of practice. This differentiation is analogous to that between model representation (reifying) and modelling (processual) [WHITEHEAD 1984].

The Concept of Model from the Perspective of Socio-Pragmatic Constructivism

Taking the above mentioned into consideration, the following consequences for the concepts of model and knowledge result:

We must first distinguish between model, model representation and modeling, and between the representation of knowledge (material substrates such as books and so on) and the process of “knowing”, making knowable (interactive exchange of know-how, language, action).

Business Process Modelling so far was concerned solely with the representation of knowledge and of models neglecting the interactive exchange of know-how. Its object was either a kind of reified knowledge (techno-centrism), or the treatment of processes (practices, interactions) as isolatable states of single individuals (individualistic anthropocentrism), or as representations of knowledge.

We believe that both techno-centrism and anthropocentrism do not focus enough on that what we refer to as “common form of human practice”. Reductive approaches fail to acknowledge the very kernel of modelling processes, namely the fact that they are socially constituted processes of acquisition and mediation of knowledge.

STACHOWIAK has pointed out three main “traits” common to all models:

- Representation (models are models *of* something)
- Simplification (models are reductive)
- Pragmatically (models are purpose-oriented) [STACHOWIAK 1973]

Taking these properties into consideration three new aims result for a socio-pragmatic approach:

- Due to the fact that models are models of something, the question of what a community regards as worthy of representation and that what is actually represented has to be raised. This means that one has to practically provide analytical results that clarify what is ‘really’ represented, or one has to enter an interactive process and find common models via participation in a common language.
- A similar approach holds for the consideration of the reductive trait of models: Models do not map all properties of the original they represent, but only those ones that seem to be relevant for the designers or the users of a given model. From a socio-pragmatic point of view, this means that one has to trace the appropriate horizons of meaning and the appropriate contexts, to elaborate the preferences of the already internalized “customary given” interpretation modes of the model users, and to make explicit (via common practical action and explicatory interaction) what has to be neglected in the given case, in order to integrate the various model interpretations in the process of modelling.
- Models do not stay in a one-to-one relation to their originals, rather they have a substitution function for certain subjects that is bound to certain situations in a given temporal space and with regard to given imagined or real operations. Also at this point it is possible to intervene only by means of communicative interaction or participation in a practice, both being forms of the mutual acknowledgement of the horizons of meaning (Sinnhorizonte) of model builders and model users.

The difference between the socio-pragmatic constructivistic concept of model and the radical constructivistic one consists in the introduction of a social context representing “the world”. The assumption of an “external world” (a “false paradigm” in HEIDEGGER’s words) is rejected, because “the world” is not constructed by a single individual. It is rather embedded in a social context with social practices that determine eventually the individual actions. Experience of the world is therefore a social phenomenon and not an individual (anthropological or biological) one.

5 Conclusions

We hope to have clarified that our concepts of model, knowledge and construction in a socio-pragmatic manner has nothing in common with a correspondence theory of model either in its subjectivistic, or in its objectivistic manner. Instead model and “knowing” are intrinsically linked. Getting acquainted with new symbolic worlds of meaning is equivalent with getting acquainted with forms of perceiving, dealing with, taking a perspective to something. Humans think in pictures, signs, symbols, analogies, and models, that is, in “forms” that have to be filled with life-worldly contents offered by the common practice. Models are thus nothing

else than patterns of managing every day life. From a socio-pragmatic point of view DESCARTES' dictum "cogito ergo sum" turns to an "I am modelling therefore I exist", whereby one has to expand pragmatically the "cogito" to "I think of something specific" [HEIDEGGER 1993]. This specific is, however, always related to the representations of the world.

From a socio-pragmatic point of view, Knowledge Management can be related only to acting individual persons or investigative (for example, scientific) communities permanently confronted with the necessity to communicate in order to negotiate new models of action for the purpose of establishing a common basis for participating in common actions.

It is our conviction that the "knowledge resource" cannot be archived or conserved in a database like data, but constantly requires new learning. It has rather to be permanently acquired. This acquisition is, however, diametrically different from all other forms of acquisition. Knowledge in this sense is neither inheritable nor can it be purchased. It also cannot be given away or be exchanged. Knowledge acquisition is an interactive and interpretative work of every single individual that is embedded in the community, a work that has to be performed each time from the beginning. Insofar is knowledge beyond the influence of the old fashioned forms of management. Human beings are not objects, they are persons, and must therefore be dealt with differently to material objects – because they are they only "carriers of knowledge" in a literal sense. Against this background, the concepts of Business Process Modelling and Knowledge Management only make sense if understood in a discursive manner of dealing with humanity, with its symbolic worlds of meaning and its model concepts. The claim is namely, that models are always only as good as the people who design them. The quality of the people on the other hand depends on their practices.

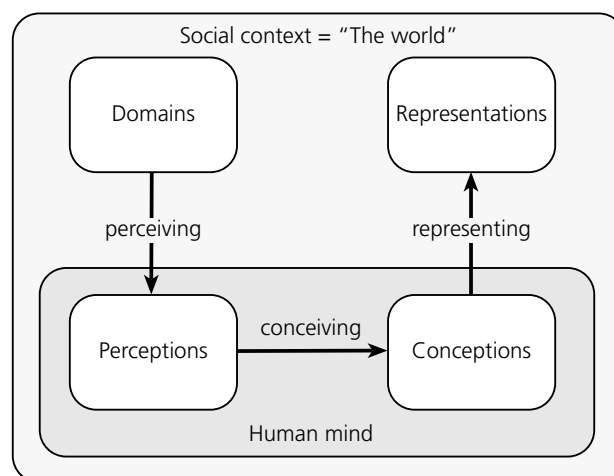


Figure 4: Socio-pragmatic constructivistic model concept

As shown in figure 4, the socio-pragmatic constructivistic model concept differs from that of radical constructivism by the introduction of a social context that represents "the world". The acceptance of an "outside world" is rejected because "the world" is not made up of a single individual, instead, this constitution in a social context is embedded with social practices which determine the practices of the individual. Experience of the world is therefore a social phenomenon and not an individual one (anthropological or biological), as it is perceived in radical constructivism.

6 Summary

The model-theory analysis proves itself to be suitable for expounding basic erroneous concepts in the areas of Knowledge Management and Business Process Modelling. The currently prevailing mapping-oriented understanding of models is inadequate for explaining various phenomena in Business Process Modelling and Knowledge Management. The neglect of subjective aspects and social contexts leads to illusory suppositions regarding their integration.

It is necessary to develop a method that takes account of critical aspects in order to achieve the full use of the possible potential for using Business Process Modelling in Knowledge Management. A further consideration of the analyzed subjects on the basis of the socio-pragmatic-constructivistic approach we propose opens a further perspective on the integration of Business Process Modelling, Organisational Learning, and Knowledge Management.

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