Managing Boundaries in the Multifocal Innovation Model

Abstract

In the multifocal innovation model, technology development and innovation is understood to occur in a field of social practices, where different communities of practice generate local systems of meaning. A challenge in managing innovation processes in such diversified and heterogeneous landscapes is that the realization of latent innovation opportunities in one social practice often requires adjustments and change in other social practices and in their systems of meaning. This paper describes four different ways in which local meaning systems can be coupled to allow development. In the multifocal model, innovations become realized when social practices change. The management of meaning system boundaries, therefore, is a critical task for innovation management when a multifocal view on innovation is adopted.

1. Introduction

During the last two decades, it has been widely noted that innovation and knowledge creation does not occur only inside individual firms. In practice, innovations emerge in a complex iterative process where communication, learning, and social interaction play important roles. Already Carter and Williams [4], and Allen and Cohen [5,6] observed that external knowledge flows are critical in the innovation process. Rogers [7], in turn, noted that communication among users is necessary for the diffusion of innovations. Lundvall [8], Freeman [9] and others highlighted the point that innovation is a highly interactive and non-linear process, whereas von Hippel [10,11] emphasized that users and other stakeholders often play an important role in the process of innovation by modifying and improving products. Nonaka [12], Dougherty [13], and others [14] noted that internalization of customer and market knowledge is critical for successful product creation.

Although innovation is still often studied from an organizational and product development point of view, it is now well understood that the traditional manufacturer-centric view on innovation does not accurately describe innovation processes [10,11]. Innovations are developed in organizational and social networks [15], where social learning is important [16-23], where the characteristics of innovation are articulated among multiple stakeholders and across heterogeneous groups [24-32], and where innovations can be co-constructed in spaces of interaction and meaning creation [2]. Studies on social shaping and domestication of technological innovations have also dislocated innovation from its traditional organizational locus, extensively documenting the point that users are often key drivers in the innovation process [33]. Researchers in the actor-network paradigm [34,35], distributed and situated cognition [36,37], socio-cultural cognition [38-41] as well as research on boundary objects and boundary infrastructures [42-44] have shown how human and non-human actors often play complementary and dynamically changing roles in the innovation and problem-solving process, thus implicitly redefining the traditional "artifact centric" model of innovation and illustrating the socio-technically networked nature of innovation processes. Research on agricultural innovation [45] and internet-related innovations [46] has emphasized the importance of parallel creative processes in multiple stakeholder groups in the realization of latent innovative opportunities, essentially distributing the focus of innovation to a field of mutually evolving social practices.

2. The multifocal innovation model

In the multifocal innovation model of Tuomi [46], the interdependences, interests, and tensions among social activity systems and related communities of practice define constraints and drivers for the articulation of the meaning of technological opportunities. When a new technological opportunity emerges, people engaged in different social practices try and figure out how the latent opportunity could meaningfully be integrated into the social practices of the community. The potential users construct the meaning of the latent opportunity using the local system of meanings as a starting point. If the users are successful in "reinventing" the technical opportunity, i.e., what its pragmatic meaning is in the context of the present social practice, the latent innovation becomes real. This step of "reinventing," therefore, is the step that actually "produces" the innovation, in a form that can subsequently be registered in historical and economic accounts of innovations and technical progress.

The multifocal model dislocates the conventional organization-centric model of innovation, puts the locus of innovation to "downstream," and describes the evolution of innovative artifacts as structural drift in a field of diversified social practices and their heterogeneous stocks of knowledge. It starts from the historical observation that socially and economically important innovations are often invented several times before they eventually start to have real impact. In addition, the model starts from the assumption that parallel discovery dominates in socio-economically important innovations. This implies a rather radical redefinition of the traditional firm-focused view on

innovation. In essence, as a first approximation, the multifocal model reverses the linear model of innovation claiming that the bottlenecks of innovation can rarely be found from inside an organization, and that a critical task for innovation management is about managing and facilitating social learning, knowledge creation, and change processes in "downstream" activity systems and communities. As key innovation processes do not occur inside organizational boundaries, the adoption of the multifocal model also leads to new models of coordination, control, and division of labor, thus requiring that we rewrite some basic concepts of organization and management theory.

In the multifocal model, innovations become real when they change social practice and when they become embedded in the activities of the community in question. The "same" innovative technological artifact can simultaneously be used in many different social practices and it can have multiple different user groups [46]. For example, the user groups of a medical diagnostic system could include hospital administrators, physicians, nurses, maintenance engineers, patients, equipment manufacturers and distributors, insurance firms, and educators. Similarly, the users of innovative technical artifacts, such as a mobile phone, adopt the capabilities of novel artifacts in many different social practices, where different functionalities and features become salient and meaningful. In the multifocal model, "users," therefore, become redefined as socially embedded practitioners in a complex system of social division of labor, and they cannot anymore be represented simply as the "consumers" of manufacturer-developed innovations. Manufacturers, in turn, become interpreted as only one special case of "innovation users" among the various stakeholder groups. Consumption, itself, becomes reinterpreted as active productive use of outputs and products created in other social practices. In economic terms, consumption becomes reinterpreted as intermediate production and circulation in a continuously evolving system of technology-mediated practices [47].

The multifocal model implies that technology trajectories are generated in a field of social interests. In some special cases, when one dominant user group defines the present uses of the "product," this complex field of interactions can be reduced into a simple bipolar network of "producers" and "consumers." This dyadic model characterizes many mass-produced "consumer goods" that are used in common cultural practices, where the "user" may relatively easily be represented as a generalized category with relatively homogeneous characteristics. In general, however, many different user groups exist simultaneously, and the evolution of the innovation is shaped in a potentially complex field of social forces, driven by different groups at different times.

The multifocal model means that the capabilities of "downstream" communities are critical for the realization of latent innovation opportunities. It also means that technology development trajectories are formed in an essentially political process, where different stakeholders try and define how the latent opportunity could be made real within their own horizon of meaning, and where the co-evolution of multiple potentially incompatible interpretations of the practical meaning are negotiated.

3. The problem of boundaries

During the last decade, organization theory has moved beyond the traditional boundaries of the theory of the firm, noting that the knowledge-based theories of the firm require analysis of the social infrastructure that creates and maintains knowledge in organizations. Organizations are not homogeneous systems of activity or meaning. Furthermore, in the knowledge-based view, organizational activity and knowledge processes are embedded in larger social systems, and linked beyond formal organizational boundaries, making the traditional distinction between inside and outside problematic.

In recent organizational research it has been noted that organizations have to manage heterogeneous systems of meaning and associated groups and communities. It has also been noted that different communities interact using boundary objects and boundary infrastructures. For example, Boland and Tenkasi [29] proposed several mechanisms that could be implemented using electronic communication systems, and Carlile [30] argued that the boundaries between heterogeneous groups consist of syntactic, semantic, and pragmatic layers.

Whereas Boland and Tenkasi built their analysis on an essentially hermeneutic and phenomenological epistemology, Carlile used the traditional information theory as a starting point. An important difference between these approaches is that the information theoretic model of communication assumes a shared

reality, whereas phenomenological models start from the assumption that information can not be conveyed in any simple sense from a sender to a recipient. In the phenomenological analysis, the interpretation of information requires tacit meaning that remains unarticulated when knowledge is made focal. The "recipient," therefore, has to reconstruct meaning of communications, and as these reconstruction processes use different local meaning systems, it is not possible, in general, to "move information" over communication channels.

One way to conceptualize communications is based on the autopoietic systems theory, developed by Maturana and Varela [48,49] to explain the nature of biological systems. In autopoietic theory, biological and living systems are special because they produce and reproduce those elements that define them as systems. Living systems, in other words, are self-producing systems. The simplest living systems are mono-cellular units that interact across their boundary metabolically. When mono-cellular systems couple their self-producing processes with the self-producing processes of other mono-cellular systems through recurrent interactions, they can form “second-order units.” This, in turn, opens up qualitatively new domains of interaction for the multicellular unit. A special case of such a multicellular organization is the development of systems with neuronal subsystems. Communication, according to Maturana and Varela, emerges when second-order systems couple their evolution, forming “third-order units,” also known as social systems.

In the autopoietic theory, communication is based on historical co-evolution of structures of second-order systems. Communication, in other words, is impossible between units that do not have shared developmental histories. Without shared developmental history of the structures that allow second-order systems to make mutually coherent distinctions, signals generated in the environment can only be perturbations for a system.

Communication is defined in the autopoietic theory as coordination of behavior at the social level. Communication, therefore, includes, for example, the various chemical and material coordination mechanisms used by social insects. Linguistic domain, in turn, emerges as a special class of communicative phenomena, when communicative behavior is ontogenetic, in other words, learned during the history of the unit in question.

Autopoietic theory builds a model of communication from bottom up, starting from the basic characteristics of living systems. It therefore naturally leads to a coherent view that includes living, cognitive, and meaning systems. As its starting point is biological, it leads to considerably different model of communication than information theory, which was devised to model mechanical and artificial signaling systems, to be used by humans. At the same time, the systems theoretic view implies that all self-producing systems have to produce boundaries that maintain the autonomy of the system.

In the autopoietic context, traditional information and knowledge transfer models are conceptually flawed. The question on how local meaning system boundaries can be crossed can not be reduced to problem of noise reduction, or for example, channel bandwidth. Instead, it becomes a problem of creating processes and mechanisms that couple independent meaning systems and their development.

In the next section, I shall briefly describe different types of settings where heterogeneous systems of meaning exist.

4. Heterogeneity as a developmental phenomenon

In social systems, heterogeneity emerges through phylogenetic, socio-cultural and ontogenetic development [38]. The development of society occurs through increasing division of labor and specialization of social practices. By definition, heterogeneity can only be observed as a difference between homogeneous units of analysis. Homogeneity is expressed in society as specialized professions, disciplines, organizational functions, and, for example, communities of practice.

As homogeneity and heterogeneity are generated in a developmental process, time is an important parameter in distinguishing different types of units. In one extreme, homogeneous units are formed through extended historical processes that embed the unit in complex ways to its environment. In such as case, we can talk about “insitutionalized” structures. Examples include professions and their expressions as organizational “functions.”

At the other extreme, homogeneity is highly transient. Such homogeneous settings can be described, for example, as knowledge-creation ba's.[1] Somewhere

1 One should note that Nonaka and his colleagues have used somewhat different interpretations of the concept of ba in the

in the middle are stable social practices that can, for example, be described as communities of practice.

Heterogeneity, therefore, exists as a social level phenomenon, as a difference among homogeneous units of analysis. It is, however, also possible to organize such a heterogeneity. This, indeed, is what organizations do. At the "institutional level" they organize processes that link standardized activities. At a more transient but still stable level, they form cross functional teams. In the most transient level, they set up spaces for random interaction, with the assumption that new knowledge is created in creative abrasion and fusion of meaning horizons.

The possibilities for organizing heterogeneous structures depends on those developmental processes that generate homogeneity. In the next section, I shall describe four basic mechanisms that can be used to manage interactions across homogeneous meaning systems.

4. Boundary management mechanisms

4.1. Transactions

In the modern society, boundary-crossing interactions are often managed using transactions. Transactions are here defined as point-wise history-less events. The prototypical transaction boundary object is money. It can be used to couple independent meaning systems in a way that makes the local meaning structures invisible. The transacting parties, therefore, do not need to "know" anything about the other party. This also means that both systems can evolve their structures with great flexibility. As economic transactions fix only one of the degrees or freedom in the development of the system, system development is little constrained by developments in interdependent systems.

Pure transactions are rare, and social infrastructure is, in fact, required to actually make transactions possible. Transactions are often best understood as a signaling system that accompanies more material and structural couplings between systems. In principle, it is, however, also possible to operate in the "world of money" without any reference to the outside world.

last years. This is because Nonaka's starting point was his SECI model, where knowledge combination occurs across heterogeneous units [1]. Here we interpret the concept of ba in a phenomenological context, as originally developed by Nishida [3], and closer to Nonaka's more recent work [2].

4.2. Object-mediated coordination

Transactions are not very useful for knowledge-intensive coordination as they, by definition, lose all history and create an impermeable barrier between the transacting units. A richer coupling can be built using boundary objects. According to Bowker and Star [42], boundary objects are those objects that both inhabit several communities of practice and satisfy the informational requirements of each of them. Using Bijker's [50] term, they have "interpretative flexibility" that allows different meaning systems to couple their actions and development, at the same time having sufficient stability to couple the systems.

4.3. Dialogue

The third mechanism to couple independent systems of meaning is to use language. "Languaging" is defined in the autopoietic theory as self-referential coordination that occurs at the level of communication. Due to the referential and dynamic character of language, it is possible to create new concepts and references that can link independent systems of meaning. Language is also special as it can carry multiple meanings, as pointed out, for example, by Bakhtin [51]. As ethical theorists of communication, including Buber [52] and Levinas [53], have pointed out, human communication can be "double-sided" with each communicative act integrating the horizons of meaning of both communicative parties.

4.4. Political procedures

The third alternative to managing interactions across incompatible meaning systems is by a political process. Political processes can vary from a simple totalitarian domination to democratic processes that build a common path for development. As Sen [54] noted, the democratic process does not require building of a shared view of the world or a consensus. It simply requires that a procedure exists that can integrate the actions of social sub-systems with incompatible systems of meanings. Instead of a boundary object, political boundary management, therefore, is based on a shared process.

5. Summary

In this article, I have developed theoretical concepts that help us understand how heterogeneity

and incompatible systems of meaning can be integrated and managed. The starting point was the multifocal innovation model, where the realization of innovation is understood as a change in social practice. This leads to the question on how the different meaning systems that form around different social practices can coordinate and couple their activities, and how the different boundary management mechanisms enable and constrain the dynamics of development. Above, in the context of the developed theory, we outlined four main mechanisms, transactions, boundary objects, dialogue, and political processes, that can be used to cross the phenomenological boundaries that create homogeneity and heterogeneity in social systems.

10. References

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