DESIGN 2002

RADICAL INNOVATION AND DESIGN RESEARCH

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*Keywords: innovation competence, innovation management,
innovation knowledge, innovation education*

1. Aims and objectives

Global competition has forced companies to redesign themselves (Leifer et al., 2000). The goal of redesign has been to strengthen a company's position as one of leading companies in the world. One well-known example is Metso Corporation with its three core business areas. Two of these business areas have about half of global markets. This means that Metso cannot grow anymore by acquisitions. Only way to the growth is through radical innovations.

The above presented general motivation in industry has been the reason that companies have started to gather knowledge how to innovate their innovation business system (i.e., their innovation structures and processes). Plenty of approaches have presented by many well-known authors, e.g. [Bacon & Butler 1998, Kuczmarski et al. 2000; Leifer et al. 2000; Miller & Morris 1999; Tidd et al. 2001]. However, the open question is how to get a big corporation with 40 000 people and with the very tight product development schedules and budgets to ensure a successful system and culture of radical innovation? In our study we have reviewed the contemporary literature of radical innovation and product development. We have collected and reviewed knowledge of innovation founded from design research (the first author), professional knowledge work, professional education, and administrative science (the second author), and senior vice presidents of the industrial company (the third author).

The basic aim has been to initiate a developmental programme of radical innovation business system and its methodology covering today's industrial demands.

In this paper we present our preliminary work and the plan how to continue it in industry. Later it is planned to extend the programme into the other areas of professional innovation (e.g., education, science).

2. Project RID: A development programme for radical innovation competence

Project RID is the specific name of our whole 5-year programme. We have borrowed many core ideas from Harvard University Graduate School of Education's Project Zero. Especially, we are thankful to Davis N. Perkins whose many books and articles have given fruitful concepts like 'knowledge as design,''knowledge by design,''theory-one,''mindware,''design that design itself,''knowing your way around,''creativity by design' and many others. Without any explicit references to his specific works, we will recommend anybody to examine his broad production about designing and inventive thinking. Especially, we want to underline Perkins' notion of "by design." As members of design society, it seems to be appropriate to consider both innovation systems and all kind of innovation knowledge as products of designing: entities which have (1) a purpose, (2) a structure, and (3) the arguments (justifications). When developing a systematic radical innovation system, it is necessary to consider both its structures and processes (methodologies) and its intended products "as designs" and "by design".

3. Knowledge surveys

Effective designers must have, by definition, the appropriate knowledge bases. These include, for example, the repertoires of concepts, conceptual frameworks, methodologies, design experiences and cases (incl. benchmarks and best-practices), and so on. Especially educators and newcomers must explicitly to ask the good sources for them, because nobody has opportunity to acquire them through the first-hand experiences.

3.1 The search of conceptual frameworks and "best-practices"

The notion of 'theory-one' refers to the core knowledge base that is required as a basis of any effective design in a design domain. In other words, the focus of search is the generic core knowledge. We have reviewed the contemporary literature of innovation in order to identify a 'theory-one of radical innovation management,' i.e., the generic knowledge base for the developers of radical innovation business systems.

Three simple models seem to be promising for our current practical purposes. The first one is the *Guaranteed Innovation* model presented by Thomas Kuzmarski and his fellows [Kuczmarski 2001]. It consists of seven components: priority, policy, platoon, process (called together as a "funnel"), and problem orientation, platform, payback measures (called together as "fuels"). The main benefits of this model is the strong connections to customers, business strategy and other "fuzzy front-end" issues.

The second framework is Miller and Morris' *4th Generation R&D* framework. It seems to be easily combined with GI-model and it provide some important extensions like the differentiation between three levels of activities: operations, improvement$_1$ or R&D$_1$ and improvement$_2$ or R&D$_2$. It contains also a differentiation between to kinds of marketing: marketing$_1$ and marketing$_2$. These conceptual differentiations of design activities help us locate the development of innovation business system to its proper place in a organizational hierarchy.

The third model is the *generic phase model* presented by Joe Tidd and his fellows [Tidd et al. 2001]. Although there are many specific differences in the innovation systems and processes of specific companies, it is possible to find behind of them the same generic structures. Innovation consists of four necessary phases (scanning, selecting, resourcing, implementing) and one optional phase (reflecting & learning). The question is about their specifics in the context of radical innovation.

We are starting our pilot developmental work in companies using these models as the conceptual frameworks. They are used as scaffoldings, as schemas for constructing the company- and product-specific solutions of a innovation business system. They are not considered as competing alternatives, but rather as complementing frameworks for different topics and aspects of radical innovation systems. Therefore, we want to use them together by a "method of juxtaposing".

Beside these three frameworks, we have more alternatives for later use. But in this starting phase of our programme, it seems to be wise to focus on the careful application of a few promising conceptual models. These tentatively selected models seem to be simple and generic, and therefore they can be considered as an initial design for the "theory-one" of designing the radical innovation systems.

3.2 The ultimate innovation library

Busy business managers and R&D personnel cannot be expected to review concurrently with their daily activities all the available innovation bibliography and its updates. They may have big problems in the retrieval of relevant books and articles. And students of innovation management may have unnecessary troubles in selecting a good set of readings. Therefore the members of academic societies are expected to provide their help in these problems of knowledge management.

Stuart Craine has done *The Ultimate Business Library: 75 Books That Made Management* [Craine 2000]. It provides to readers a reading list with short presentations and commentaries. We have developed a similar, tentative library for radical innovation: *The Ultimate RID Library: 100 Books That Will Make Radical Innovation.* Its current proto-version consists of four parts: (1) Design: Theory and Methodology, (2) Creativity (Imagination) Engineering, (3) Innovation Management, and (4) Foundational Themes. Each part contains 25 books. The evaluations and refinments of this "library" will be a part of our whole programme.

Beside this generic library of radical innovation, we need more dedicated libraries for firm- and person-specific uses. During our action research experiment, we will develop and update them as a part of the search of conceptual frameworks, benchmarks and best-practices. Every modern corporation must have this kind of specific "libraries" as parts of its innovation knowledge base.

4. Knowledge assessments

The working with an action research approach gives many opportunities to test the relevance and useability of current theoretical concepts, models and principles. A central challenge is to tailor this knowledge for context-specific uses. In this work, there are many opportunities for a collaboration between companies and academic societies.

4.1 The quest for intelligent uses of innovation knowledge

Every practitioner knows from his/her personal experience that it is not trivial to decide what generic knowledge is really relevant and useable when we are designing truly innovative structures and processes for the future that contains always many uncertainties. The real measure of innovation expertise is the competence in transfering the past-based knowledge to the contexts of uncertain futures. In other words, the knowledge bases of innovation must be applied intelligently – wisely.

4.2 Innovation knowledge management and knowledge as design

When approaching the issues of innovation knowledge management, the focus is not those technical problems and solutions that are usually considered by information science professionals (like problems of documentation and information retrieval). The challenge is the broad, deep and critical understanding of available multitude of knowledge sources and the real meaning of knowledge as design. Knowledge is assessed by considering radical innovation knowledge as a potential basis for systematic or purposeful radical innovation practices. Instead of efficiency issues the focus is the relevancy issues. Innovators are problem finders/posers and problem solvers; and we are studying innovation opportunities of innovation business systems, especially the opportunities for radical innovations.

5. Knowledge acquisition and use in action

Real knowledge is not in documents but in human heads. Innovative entrepreneurial organizations must have people who have this know-how in use as their second nature. How to help organizations to promote the acquisition of radical innovation knowledge? One approach is to do the systematic, concrete attempts of radical innovation and actively search and critically experiment with the available knowledge sources. This is our way to proceed.

5.1 The implementational focus with the action research experiments

Project RID may be considered as a set of action research experiments. We have some vested scientific objectives, but the main intention is the successful implementation – "footing" – of radical innovation competence in the contexts of specific industrial corporations. Currently, we are focusing on the following themes.

5.2 Innovation mind-sets and innovation cultures

A real danger in the contexts of organizational changes is that the attention is directed one-dimensionally to the questions of specific techniques and tools. In other hand, there are many examples of studies of organizational development which have considered people as psychological entities (i.e., as systems of character traits, personality styles, and so on). Our approach is of necessity both people-oriented and socio-historical-cultural oriented, but we consider only the well-specified and concrete patterns of behavior. We consider a mind-set as a well-specified and trainable pattern of behaviors.
Thomas Kuczmarski has characterized in details the structure and development of an innovation mind-set of chief executive officers (CEOs). Many other authors are, too, underlined the importance of

mind-set training in the context of innovation. It is possible to consider the challenge of innovation culture development at least partially as the task of innovation mind-set training.

In this connection, it may be informative to refer to the notion of design mindfulness. Tom Peters presented his views on this notion as the keynote speaker in 45th International Design Conference in Aspen 1995 [Kao 1996]. One way to approach on the concept of innovation mind-set is to ask its correspondence with design mindfulness; in other words, is it fruitful to promote the innovation cultures via the development of innovation mindfulness?

5.3 The RID mind-set and RID mindfulness

Because the basic aim is the development of radical innovation systems and processes, it is natural to study especially the characteristics of RID mind-set and the opportunities for its development. As a part of our programme we will consider the fuirtfulness of a special notion of RID mindfulness.

5.4 The seedings and seeds

Thomas Kuczmarski has underlined the importance of successful innovation teams as seeds for cultivating the innovation business systems in corporations. It is important to generate true "living examples of tiger teams" which give to the later teams both the "war stories" examples and the core parts in the form of experienced team leaders and senior team members. Radical innovation will require the true "tiger" teams and their physical and mental constituents.

5.5 Toward the CF-SIT methodology

Corporate innovation in moderns industrial contexts requires a large set of different methodologies. And the intention to facilitate radical innovation seems to require us especially to review and critically audit the available methodologies of customer research and conceptual design (invention).

The notion of *CF-SIT methodology* refers to an eclectic collection of methodologies which have had a well-proven success in industrial innovation. SIT or Strategic Innovation Technology is intended to focus the attention to the care of the strategic innovation potentials of selected methodologies. And CF or Context Focused is intended to underline the need to select and apply these methodologies with context-sensitive ways.

6. The current state of programme and the near-term activities

During summer and fall 2001 we have done an intensive preparatory work in the area of knowledge survey and assessment of invention methodologies (especially, TRIZ and its different modifications and hybridizations) for Metso Corporation. Now (January 2002) we are designing a specific implementation plan for the next five years. Many practical details are yet open.

We are interested in finding fellows who are working with the difficult themes and questions of radical innovation and its education. Moreover, as scientists and educators, we will welcome more discussions on the connections between design science and radical innovation studies.

7. Concluding remarks

Radical innovation will provide many theoretical and practical challenges to people who are proactively approaching the fundamental questions of innovation and entrepreneurship. We have, for example, problems of communication, which arise from the use of the same word 'radical innovation' with many different meanings. And this communication problem is complicated with the use of the many different words like 'discontinuous,''breakthrough,''revolutionary,''paradigmatic' and some others as synonyms with 'radical'. One basic challenge in the development of innovation systems in industry, education and science is to create a shared language.

In the context of Project RID it is not intended to do primarily the academic studies of conceptual analysis or any similar studies of design science. But as a side-effect of our work, we hope to trigger and aid the critical study of these academic themes. It is true that "nothing is so practical as a good theory." But we want to add to this phrase a supplementing comment: "Good theories emerge from the living practices."

Acknowledgment

References

Bacon, Frank R., Jr., and Butler, Thomas W., Jr., "Achieving Planned Innovation®: A Proven System for Creating Successful New Products and Services," The Free Press, New York, 1998.

Crainer, Stuart, "The Ultimate Business Library: 75 Books That Made Management," Capstone, Oxford, 2000.

Hesselbein, Frances, Goldsmith, Marschal and Somerville, Iain, (eds.), "Leading for Innovation and Organizing for Results," Jossey-Bass, San Francisco, 2002.

Kao, John, (ed.), "The New Business of Design: The Forty-fifth International Design Conference in Aspen," Allworth Press, New York, 1996.

Kuczmarski, Thomas D., "Innovation: Leadership Stategies for the Competetive Edge," NTC Publishing Group, Lincolnwood, Ill., 1996.

Kuczmarksi, Thomas , Middlebrooks, Arthur and Swaddling, Jeffrey, "Innovating the Corporation: Creating Value for Customers and Shareholders," NTC Business Books, Lincolnwood, Ill., 2001.

Leifer, Richard., McDermott, Christopher M., O'Connor Gina Colarelli, Peters, Lois S., Rice, Mark, and Veryzer, Robert W. "Radical Innovation: How Mature Companies Can Outsmart Upstarts," Harvard Business School Press, Boston, 2000.

Miller, William L. and Morris, Langdon, "Fourth Generation R&D: Managing Knowledge, Technology, and Innovation," John Wiley & Sons, New York, 1999.

Roussel, Philip A., Saad, K.N. and Erickson, Tamara J., "Third Generation R&D: Managing the Link to Corporate Strategy," Harvard Business School Press, Boston, 1991.

Tidd, Joe, Bessant, John and Pavitt, Keith, "Managing Innovation: Integrating Technological, Market and Organizational Change," 2nd edition, John Wiley & Sons, Chichester, 2001.

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