

ORGANIZATIONAL AND MANAGERIAL LEARNING IN HYBRID R&D ORGANIZATIONS

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Session G-3

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Competence centers are hybrid organizations as they operate within fragmented and heterogeneous organizational frameworks. The managers are thus faced with multiple management challenges. In order to develop sustainable learning and innovation processes, adequate concepts and methods are required.

By applying an organizational learning perspective to the management of university-industry organizations, an action learning approach has emerged as a promising instrument for enhancing strategic management capabilities of hybrid R&D organizations.

This paper presents the findings of an organizational learning case study of Austrian science-industry competence centers. It shows how R&D managers learn from and with each other as they identify and implement solutions ('action') to their real-world problems and simultaneously improve their management practices and strategies ('learning').

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Suggested track:

A Managing organizational knowledge and competence
G Organizational learning

1 Introduction

Current paradigms in science, research and development emphasize the need for multi-disciplinary and interactive knowledge production. This has recently led to the emergence of a new type of joint knowledge infrastructure between universities and companies, so-called 'science-industry competence centers'. These centers are temporary collaborative R&D arrangements between research organizations (mostly university departments) and innovation-oriented firms engaged in pre-competitive research of both academic and industrial relevance.

These "hybrids" operate within the fragmented and heterogeneous organizational frameworks of academia and industry. R&D managers are thus faced with multiple management challenges. By applying an organizational learning perspective to the management of such hybrid R&D organizations, action learning has emerged as a promising instrument for enhancing both organizational and managerial learning.

The paper is organized as follows: First, the significance of new modes of scientific knowledge production is described and its relevance for the emergence of new collaborative R&D arrangements in science-industry relations – hybrid R&D organizations - discussed. The characteristic properties of hybrid R&D settings, however, pose serious challenges for management. Thus, providing effective organizational and managerial capacities is significant policy goal.

To achieve this goal, an action learning system for collaborative hybrid R&D is proposed. This learning system provides a conceptual framework for facilitating organizational learning and strengthening management capacity in hybrid R&D settings that reflects essential elements and principles of organizational and action learning.

Design and implementation of the learning system is then presented in a case study of Competence Centers in Austria. Some of the preliminary results of the action learning process will be presented. Finally, some conclusions on the applicability of the action learning system approach to hybrid R&D organizations are given.

2 Theory & Issues

2.1 The new mode of knowledge production in science, research and development

In order to participate more effectively in a knowledge-based economy, knowledge production and utilization are essential ingredients. Linking the heterogeneous knowledge bases of science and industry is regarded as a crucial competitive

advantage. These developments are reflected in such paradigmatic concepts as ‘mode 2 of knowledge production’ (Gibbons, 1994; Nowotny et al., 2001), or the ‘triple helix university-industry-government’ (Etzkowitz, 2000; Leydesdorff, 2000).

In the realm of research and development (R&D), the strict division of labor between knowledge producers (science and research) and knowledge users (industry) is dissolving. As R&D is carried out with a view to potential applications, it is increasingly organized on a multi-disciplinary and interactive basis.

The growing and changing role of knowledge in science-industry relationships in knowledge-based growth has been widely acknowledged (OECD, 2002). New R&D settings are emerging at the interface between academia and industry. Collaborative R&D between universities and firms is increasingly organized and financed in new ways and in new institutional arrangements.

The aim of establishing collaborative basic R&D settings at the interface between science and industry is to set up bridging-mechanisms to reduce the barriers between academic and industrial research and creating an innovative environment for future strategic research. Based on the theoretical justifications of reducing transaction costs (Menard, 2002) and the issue of improving the interaction performance between scientific knowledge producers and users in the innovation system (Etzkowitz, 2000), science-industry centers are often supported by government through new policy initiatives and public co-financing (cf. Figure 1).

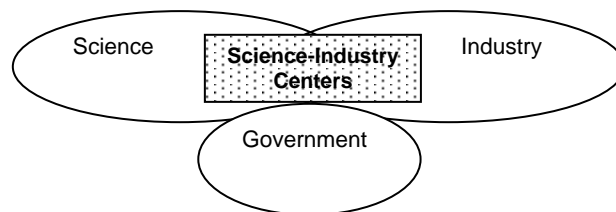


Fig. 1. Competence Centers as hybrid R&D organizations within the Triple Helix

2.2 Characteristic features of hybrid R&D organizations

Collaborative basic R&D organizations between science and industry are hybrid phenomena. They are institutionalized with public intervention and/or funding because markets are perceived as unable to adequately bundle the relevant resources and capabilities between science and industry in basic research, while complete integration would represent a loss in flexibility and incentives (Menard, 2002).

However, we identify a number of management challenges based on the following characteristics of hybrid R&D settings:

The 'hybrid' as a governance structure emerges in situations of mutual interdependence between parties and which is neither pure market nor pure hierarchy. Although hybrids are based on legal contracts (among its members, in case of public funding with a financing agency), the relationship of its member is coordinated on the basis of combinations of trust and power. This poses the first management challenge.

Moreover, the co-ordination of co-operative relations between hybrid organizations may be expected to pose another management challenge: hybrid R&D centers are made up of the heterogeneous and sometimes conflicting rationales, interests and needs between the academic research and the industrial research spheres. On a more operational level, there may be differing dominant modes of collaborative decision-making on investments, profits, research topics, etc. The barriers are also caused by differences in R&D cultures which may impact on expectations, values and criteria of industry and researchers in evaluating the performance, productivity and outputs of their collaborative research projects.

Another potential disadvantage of hybrids is the mix of competition and cooperation ('co-opetition') that characterizes and challenges this type of multi-lateral organizational arrangement. Since the Competence Center and its 'founding' firms and research institutions active in the same field of research, they may sometimes find each other in competition for research projects.

These properties may seriously inhibit the formulation of a jointly committed business policy, strategy and identity. However, despite of the complex dynamics found within such collaborative hybrid R&D arrangements, there remains the expectation that research will produce knowledge that is of immediate use to industry, which in turn will promote economic development. The underlying assumption is that research generated in this setting will have direct and immediate applicability in joint problem solving.

2.3 Managing multi-level complexity in hybrid R&D organizations

Collaborative R&D between industry and research organizations may produce positive knowledge creation effects, as long as barriers within this hybrid partnership as described above can somehow be overcome. To achieve high quality collaborative R&D, effective management and entrepreneurial skills and capacities are required. The multi-level complexity of managing R&D in hybrid organizations poses serious

challenges for R&D management which is acknowledged (e.g. (Erno-Kjolhede et al., 2001).

It is important not just to develop an understanding of the processes underlying the creation, diffusion and utilization of knowledge in hybrid R&D settings, and the relationships among them, but how this might translate into management practices that would optimize the utility of knowledge created in such settings. What is of particular interest then, is:

- How collaborative research settings might be best managed in order to maximize the utility of knowledge emerging through them?
- How can management ensure effective knowledge transfer in this domain?
- Will there be improved ways of working and learning?
- What do we need to know to effectively manage hybrid R&D cultures? Etc.

However, as hybrid research settings are a novel, emergent form of collaborative scientific knowledge production, there is little experience yet to inform our understanding of how management handles such complex R&D management settings.

2.4 The science-industry Competence Center program 'Kplus' in Austria

Most countries are trying to attain some form of science-industry 'triple helix' to sustain their competitive advantage. In Austria, this has led to the creation of a new type of institutional knowledge infrastructure between science and industry, so-called science-industry 'Competence Centers'.

The Competence Center Program 'Kplus' is a key policy instrument in Austria to foster long-term science-industry R&D cooperation in Austria. Competence Centers are temporary research organizations targeted at conducting high-level, internationally competitive research in areas of relevance for both academia and industry.

The first Competence Centers were set up in 1999. After three rounds of competitive bidding, there are currently 18 Competence Centers with a total of 270 partners from industry and 150 from science. A typical Competence Center operates with an annual budget of 2 to 4 mio. €, employs between 5 to 15 key scientists and an additional 20 to 40 scientific staff.

Centers are established as limited companies through an agreement among the partners, and a contract between the Center and the Government Funding Agency. Public funding is limited to 55% of costs, firms contribute 40% and academic research

5%. Public funding is limited to seven years, with Centers usually fully operational after two to three years. Initial funding is granted for a four-year period, with additional three years granted after positive evaluation.

Over the limited seven-year public funding period, a Center conducts collaborative basic research, financed by public funding program, so called “Kplus” activities. In order to “survive” beyond the official funding period, however, it has to increase its market-orientation. Thus a Center has to build up its “non-Kplus” activities, i.e. research financed by other, external sources to the Kplus program.

Corporate and scientific partners jointly operate and govern their Center: its management, strategy, own staff, etc.; they also determine the structure of ownership. The Centers’ management structure resembles that of companies, governed by a Board and led by a director/manager reporting to a Board. The constituting firms and scientific partners contribute to Center operations in terms of human, financial and in-kind resources.

2.5 The Competence Center Learning Project

Being newly established firms and a novel hybrid organization, Competence Centers may greatly benefit from organizational and managerial capacity building. Five years into the program, several ‘generations’ of Centers with different sets of challenges in terms of organizational and managerial learning can be discerned: the first Centers have just passed their four-year evaluation and are concerned with their organizational future after the seven-year-funding limit; the latest generation is still grappling with start-up problems.

The government funding agency TIG is not only responsible for funding Competence Centers but also for measures for a sustainable program impact, i.e. supporting Centers to continue collaborative R&D beyond the seven-year public funding period. In the latter function, TIG acts as mentor and change agent, through initiating and various supporting initiatives.

As a member of the Society of Organizational Learning (SoL) Austria, TIG invited SoL experts to design and implement an organizational learning project together with Competence Center managers. The focal question was: “How can we create a setting for Competence Center managers to learn more effectively as a team with a view to fostering strategic organizational and managerial learning?”

The need for a comprehensive and dynamic approach to management capacity-building called for a participatory and reflective learning setting. At the same time, learning should have tangible outcomes of direct value to the participating Competence Managers.

A pilot project was successfully conducted in 2002 to create both awareness for the need for organizational learning as well as trust in the proposed method. Some good practice organizational learning processes for managing hybrid R&D centers emerged from extensive experience exchange. As intended by the designers, the link between organizational learning and strategic development emerged as a key learning topic. In 2003, an even larger group - consisting of Competence Center managers, the funding agency TIG, and organizational learning experts - implemented an organizational learning project.

In the following section, the conceptual and methodological framework designed to address the focal question and describe its implementation will be outlined.

3 Conceptual and Methodological Framework

3.1 Organizational learning

The topic of organizational change and learning is certainly not new to management science. Yet one may come to the conclusion that much rhetoric was followed by few practice. With the advent of knowledge-based approaches to management (Nonaka, 1995; Pawlowsky, 2001b), the concept seems to regain strategic relevance for management practice. Senge's understanding of organizational learning as "continuously expanding the capacity of an organization to create its future" (Senge, 1990) is of particular importance in the context of new science-industry arrangements as the example of Competence Centers shows.

An organizational learning approach thus considers learning not merely as adaptation to contingencies, but as learning through insights, understanding and interpretation (Pawlowsky, 2001b). This includes e.g. creating open spaces to discern new futures, or crafting new identities and seeking alternatives that may be obscured by current dominant discourses.

Learning is usually conceptualized as a cyclical process of action and reflection. Argyris & Schoen further developed this concept in their organizational learning through feedback loops: single loop, double loop, and deuterio (or multi-loop) learning. Most organizational learning approaches also distinguish learning modes such as (simple) adaptive learning and

(higher-order) reflective and generative, learning (Argyris, 1977; Argyris and Schoen, 1978). Adaptive learning, often associated with single-loop learning is concerned with developing capabilities to manage new situations by making improvements and amendments; reflective and generative learning focus on developing new perspectives, options and possibilities.

Most conceptual frameworks for organizational learning incorporate at least four different analytical system levels of learning (Pawlowsky, 2001a): the individual level of learning, the group or interpersonal level, the organizational or intra-organizational level, and the inter-organizational, or network level of learning.

It is only when the influence of these four levels of learning is acknowledged, addressed and managed effectively - depending on the situation and specific needs accordant to it - that there exists the potential for maximum knowledge gains.

3.2 Action research and action learning

Action research is a qualitative methodology for describing “processes involving intervention in organizations that have the dual purpose of bringing about practical transformation and of advancing knowledge” (Huxham and Vangen, 2003: 384). According to Lewin (Lewin, 1951), action research represents a continuous cyclic approach of acting and reflecting to be conducted simultaneously to solve problems and generate new knowledge. The assumption is that “it takes time for the actors to acquire new knowledge, or more precisely, to change their cognitive structures in such a way that their reality constructions change” (Gronhaug and Olson, 1999: 10). The experience-based knowledge of the “client” in the organization and the theory-based knowledge of the researcher are combined in action learning sets to solve real-world problems.

Action learning is closely associated with the work of Revans (Revans, 1980). His concept of action learning emphasizes the notion of learning from experience: learning takes place when individuals critically reflect on their experiences, generalize from their reflection, and experiment with new behaviors, thus constructing experience for further action and reflection. Action learning is a process in which a group of people gather more or less regularly to support each other to learn from each other’s experience. It enables individuals to develop a broad range of strategic and creative skills, and facilitates organizational change, i.e. the capacity-building goals of organizational learning.

Vince and Martin (Vince and Martin, 1993) summarize the features of action learning: first, learning means learning to take effective action; second, learning needs to be expressed through actions on real world problems which must involve implementation as well as analysis and recommendations; and third, learning as a social process in which individuals learn from and with each other.

Action research has been applied in management settings before (Pedler, 1996; Coughlan et al., 2001). Action research may be transferred into R&D management settings. R&D managers like other executives, in their impatience to move forward and solve problems, can find it difficult to take time to reflect on what has been achieved. When they are encouraged to do so, reflection on learning can represent both a positive individual growth experience and an organizational development process. As hybrid R&D organizations are novel institutional arrangements, action learning has not yet been applied in the context of hybrid R&D management.

3.3 The Competence Center learning system

In order to create ample learning opportunities and spaces, the design and methodology of the learning system for the Competence Centers reflects the principles of organizational learning and action learning. The following dimensions of the learning system are distinguished:

- the learning group,
- the learning process,
- the learning modes,
- the learning levels,
- problem framing,
- outcomes and transfer mechanisms.

These dimensions will be addressed in turn.

The learning group. A cross-section of people from different organizations and backgrounds to work jointly on a problem generally creates additional value. It can also contribute to organizational integration through creation of networks that did not exist before. The Competence Center learning group consisted of three types of participants, in total nineteen persons: fourteen managers of seven Competence Centers with different disciplinary backgrounds, two program managers of the government funding agency TIG, and three organizational learning experts from SoL Austria.

By engaging two management executives from the Competence Centers into the action learning setting, managerial learning could be stimulated.

The learning process. At the core of action learning was a series of visits and workshops where experiences were exchanged, potential paths for solutions discussed and elaborated, and space created for new ideas to emerge. Over a six months period, a series of nine one-day learning workshops was conducted: a kick-off workshop, seven individual Center workshops, and a transfer workshop at the end (described in more detail below). The transfer workshop closed the learning cycle by linking the results back to the problems framed at the beginning.

Learning spaces were also “designed” in that the group committed to the following rules of participation: openness of discussion, regular attendance by all participants, and de-central organization in the form of on-site workshops in the individual Centers.

Learning modes. The organizational learning experts were primarily responsible for the design to ensure that different learning modes – adaptive, reflective, generative – were adopted. They were primarily “present” at the start, then quickly faded out only to “return” at the end of the project. They facilitated the action learning process, they provided perspectives related to action learning but did not instruct the group on how to deal with an issue.

Learning levels. Competence Center managers participating in the organizational learning project were given possibilities for learning at different levels (cf. Table 1).

Table 1. Learning levels in the Competence Center learning project

Learning level	Competence Center learning system
Individual	Managerial
Group / Inter-personal	Managers project group
Intra-organizational	Managers and their center staff
Inter-organizational / Network	Managers network

The primary goal of the project was to stimulate organizational learning within and between Competence Centers. The design of the project included several instruments to foster learning at different levels: a series of workshops, learning reports, etc.

The most obvious learning levels is at the individual manager and the project group level. Learning is, however, extended into the individual Competence Center because at least two additional Center staff had to take an active part in the Center workshop (= intra-organizational level). Each of the participating Centers hosted a one-day on site learning Center workshop. The hosting Center had the possibility to tailor the learning event to its specific needs: within the framework of the four focal questions formulated

at the kick-off, they were given the opportunity to pose their very own, specific, real world problems in managing a hybrid R&D organization. The workshop participants contributed their expert knowledge and experience, thus providing the Center with a wealth of best practice. The Center hosts then jointly prepared a “learning report” where they reflected on the knowledge gained and the actions planned as a result.

The inter-organizational, or network level, emerged from the group level as an outcome of the learning project (see below).

Framing the problem. Real-world problems are at the heart of action learning. Because action learning is primarily strategic and designed to promote higher-order learning, the problems to be addressed need to be selected carefully. Particularly when problem selection should serve strategic interests of the organization. At the kick-off meeting, Competence Center managers posed their individual management problems for further exploration in the learning project. These were then framed into four focal questions (with a series of “individual” sub-questions):

- “How can we create a more market-oriented research organization?”
- “How do we view and govern the relationship between Kplus and non-Kplus phases as well as the role of our founders?”
- “How can we set up a quality management system to maintain knowledge through organizational design?”
- “How can we better align the goals of the center and those of its staff?”

Outcomes and transfer mechanisms. The transfer workshop at the end of the project had two goals. First, organizational learning experts wanted to ensure higher-order learning by reflecting with the participant’s on their experiences with the organizational learning process. Second, they also wanted to ensure the transfer of the learning experience into concrete actions at the intra-, but also inter-organizational level by committing the participants to prepare a joint final learning report.

The results of the action learning process in each of the Center workshops as well as the final transfer workshop were summarized and documented in “learning reports” with a clear focus on reflecting the “real-world” outcomes and consequences of action learning. The learning report included findings, consequences (actions to be taken) and joint outlook on future activities related to organizational learning.

4 Results

In the context of hybrid R&D organizations, managers are confronting more challenges than their intra-organizational counterparts if success is to be achieved in both research and its management. The case study of the Austrian Competence Centers has shown some critical factors of managing inter-organizational collaboration in hybrid R&D organizations: creating shared vision, culture and values in relation to excellence in research and innovation; knowledge management and sharing among partners; a strong market and customer focus in both science and industry; and developing a strategic position (through branding, marketing, etc).

The organizational learning project produced a number of concrete operational outputs in terms of action plans, dialogue groups, networks, etc. Limits of space preclude a detailed description of these activities, they are presented in detail elsewhere. What is more important is that the participating managers documented in the learning reports that the outcomes were indeed useful for their management practice. What is even more important is the fact that the action learning approach has also stimulated collective thinking and action. This resulted in the identification, discussion and subsequent implementation of joint activities in several areas of common strategic interest. Thus, the inter-organizational, or network level, of learning emerged from the group level as an outcome of the learning project.

5 Conclusions

In a time where science and research policies call for greater collaboration between science, industry and government, science-industry Competence Centers have emerged as new collaborative R&D arrangement. They are organizational hybrids, i.e. they operate under the heterogeneous rationalities and cultures of academic and industrial research within their organizational boundaries. The organizational and institutional complexity poses multiple management challenges.

In the context of the Competence Center learning project in Austria, action learning has proven as a pragmatic approach to intervene in hybrid &RD organizations to foster organizational and managerial learning. Action learning is achieved through focusing on real work problems and as a result of managers learning from and with each other.

The findings of the case study deepen our current understanding of the nature of management challenges in hybrid R&D organizations, how managers identify their

common real-world problems and through knowledge creation, diffusion and utilization are consequently able to improve their management practice.

In conclusion, the Competence Center learning project has shown that organizational learning and managerial may be fostered by applying an action learning approach to strengthen hybrid R&D management

- in their capacity to learn as managers (= individual learning level): Although managerial learning was not the explicit project goal, it was stimulated. Participating managers had to opportunity to improve their management practice through implicit self-assessment and informal benchmarking through best practice exchange between peers. In an open environment, participants not only opened to change in the process but were able to create new ideas and visions.
- in their capacity to learn as a group (= inter-personal level): Participants are able to get feedback on one's own Competence Center in a center-specific workshop.
- in their capacity to learn as a team/network (=inter-organizational learning level): Peer-to-peer learning on the basis of experience exchange facilitated strategic networking between Competence Center managers.
- in their capacity to contribute to organizational learning in their own competence centers (= intra-organizational learning level): awareness was created for the need to nurture Competence Center identity through more autonomy from founders, shared vision, culture and values.

The learning system approach - combining elements of action and organizational learning - can be considered an adequate method for fostering organizational and management learning in the challenging context of novel, hybrid R&D organizations. It has the potential for direct and immediate application to other hybrid research settings.

Follow-up work will be concerned with the effects of the intervention on the organizational learning capacities of the hybrid Competence Centers. Next steps would include monitoring and evaluating of the actions taken in the wake of the organizational learning project to reveal the extent to which organizational and/or managerial learning has taken effect, or might still be needed.

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