Knowledge arrangements in the green sector: co-creation, circulation and transfer

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Abstract
This paper presents the results of a number of studies conducted by Wageningen UR. The studies focused on three types of knowledge arrangements developed by agricultural educators, researchers, entrepreneurs and policy makers: co-creation, circulation and transfer. The primary objective of the respective arrangements is to share, create and disseminate knowledge in response to complex, often multidisciplinary innovation challenges. In practice, however, it appears to be unclear what people actually mean when they refer to knowledge processes and which factors are conducive to knowledge creation in dynamic settings. This paper provides the reader with insight into the differences between knowledge arrangements. The case 'Developing entrepreneurship in Dutch agricultural education' is discussed to illustrate the characteristics of a co-creation arrangement. Furthermore, this paper offers four main critical success factors (CSFs) for monitoring and evaluating knowledge arrangements: vision, competence, culture and support.

Keywords
Knowledge arrangements, agriculture, research, education and entrepreneurs

1. Introduction

The environment in which the agricultural sector operates is subject to continuous change. Small business owners (e.g. farmers and growers) must adapt to the vagaries of the market, changing consumer habits, stricter environmental regulations and other societal demands. In order to respond adequately to these demands effective use of knowledge is becoming increasingly important. In our new knowledge-based economy, which is challenged by globalisation and sustainability issues, survival depends on the capacity of individuals and organizations to generate and exploit knowledge (Boreham and Lammont, 2000). In such dynamic settings, the creation of new knowledge is not a linear process ('technology push'), but follows an interactive, often interdisciplinary path in which knowledge is actively constructed and thus not merely absorbed, unaltered, by individuals, companies or networks (Gibbons, 1994). In order to bridge the gap between knowledge production, its application and adaptation in innovations, different forms of cooperation in the Dutch agri-food complex can be discerned between education and training, research and development (R&D) institutes and business (Lans et al., 2004). We call these forms of cooperation knowledge arrangements. In this paper we try to contribute to the collective search for new innovative routes to create and exploit knowledge by generating 'knowledge about knowledge'. First of all, the different types of knowledge arrangements are defined and discussed. Second, the case 'Developing entrepreneurship in Dutch agricultural education' is presented as an example of a co-creative knowledge arrangement. Third, four CSFs for effective innovation are identified that can be used in evaluating and monitoring knowledge arrangements. Finally, this paper concludes with three questions for further research and discussion.

2. Three knowledge arrangements: co-creation, circulation and transfer

In this paper the networks in which cooperation between educators, researchers and entrepreneurs takes place are referred to as knowledge arrangements (Kupper et al., 2006; Lans et al., 2006). A knowledge arrangement is "a smart combination of hardware, software

and intellectware as a result of cooperation between mostly heterogeneous parties within the knowledge infrastructure which leads to effective contributions to the knowledge economy" (Nijkamp, 2002). In our view, these arrangements can be distinguished with reference to different knowledge processes that are dominant within such arrangements. We distinguish three types: co-creation, circulation and transfer (Beuze et al., 2004; Geerligs et al., 2005; Kupper et al., 2006; Lans et al., 2006):

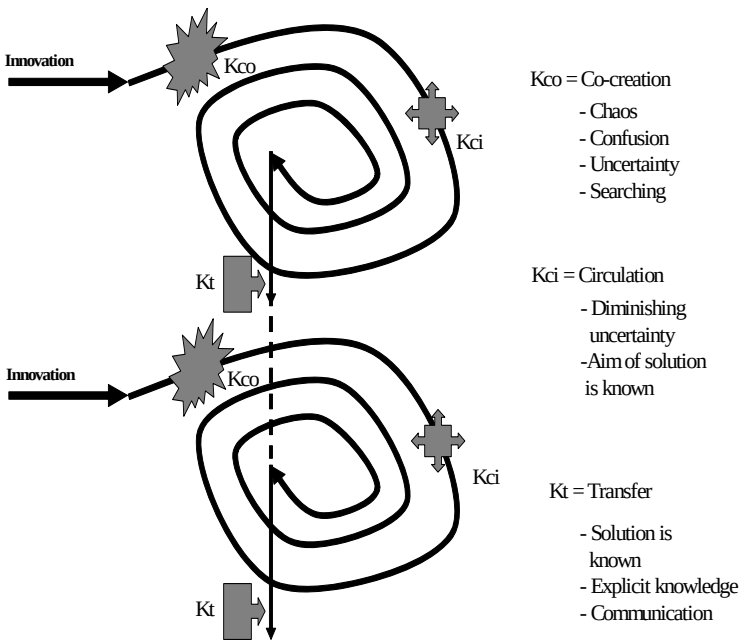

Figure 1: Knowledge and innovation

1. Knowledge co-creation: exploration of goals and solutions to questions pertaining to a reorientation in existing routines, principles, norms and values. It is a creative process in a dynamic social environment in which problems are characterized by a high level of uncertainty and complexity. The result of co-creation is shared awareness of a certain problem.
2. Knowledge circulation: sharing of theoretical and practical knowledge in an interactive process between mostly heterogeneous parties. Confronting each other, discussion and learning from one another are important aspects of circulation processes. It often concerns the integration of relatively implicit knowledge (e.g. gained through experience) with more explicit knowledge (e.g. new scientific insights).
3. Knowledge transfer: transmission of explicit, codified knowledge (Nonaka and Takeuchi, 1995) from sender to receiver (Van Cuilenburg, 1992). It is often a linear process in which it is important to address the target group properly so that they interpret the received information (more or less) correctly (Shannon and Weaver, 1949). Transfer is mainly at stake when there are clear solutions to (innovation) problems. The knowledge is robust and can play a role in upgrading the level of knowledge of target groups, optimizing existing routines or (widely) disseminating information. ICT plays an important role in the process of knowledge transfer.

These three arrangements are to be seen as circular movements from (1) co-creation, via (2) circulation via (3) transfer, leading to innovation (Figure 1). In general it can be argued that the nature of the innovation question determines whether co-creation, circulation or transfer is dominant. Innovations that require just an upgrade of existing knowledge demand an emphasis on knowledge transfer, whereas in the case of 'open innovations', knowledge needs to be created and exploited within a heterogeneous group of stakeholders. This type of innovation is mostly dominated by knowledge co-creation processes. In the next section, a case of knowledge co-creation is presented and discussed to illustrate this type of knowledge arrangement.

3. Entrepreneurship in agrarian education: a case of knowledge co-creation

Stimulating and embedding the topic of entrepreneurship in Dutch education is an important political issue for the government (Kamp, 2004). To investigate the possibilities of reforming education and developing educational tools to stimulate agricultural entrepreneurship among students, a knowledge arrangement between researchers, educators and policy makers was formed (Hurkens, 2005). We examined this arrangement during the process in which the R&D mission and strategy were formulated to realize this objective. To this end, several interviews and a workshop were held. The mission and strategy will be further developed and implemented in 2006 and 2007.

In the process of knowledge co-creation, the participants in the arrangement sought first of all to articulate a shared *vision* that integrated different perspectives. The (agrarian) entrepreneur of tomorrow (the student) is both manager and professional and fully aware of his[1] environment. He feels part of the (regional) network in which he operates. He is the pivot in his society and has competencies like confidence, creativity, innovativeness, social skills and curiosity. Therefore education and educational tools must focus on competence development in the individual student instead of merely teaching specific professional skills. The role of the teacher is to coach the student to discover what type of person he is, what he stands for and to identify a job which would allow him to fulfill these needs. The relationship between teacher and student is therefore no longer top-down, but takes the form of a transparent and respectful co-partnership. Both educators and researchers have to become *competent* themselves in coaching and facilitating the student in his personal development and offer a challenging educational environment within and outside the campus. They have to work together to design suitable training materials and tools. Therefore they need to gain knowledge and insight into the student's interests and (regional) societal needs. Students should develop the capacity to creatively adapt to these needs in their future professions. Teachers need to be facilitated in developing their coaching skills, to the extent that they are adequately equipped to develop their own particular style of coaching. Researchers need to listen and work closely together with educators to be able to deliver demand-driven educational products. The tools developed should adequately reflect societal needs and demands. Furthermore, (scientific) knowledge needs to be better communicated and transferred to create better and more relevant educational materials. Within their research *culture*, researchers are not used to working directly with educators to develop educational products and vice versa. The participants in the arrangement have therefore formulated several concrete tasks for both educators and researchers on which they will work together.

An important critical success factor in accomplishing this change in education is *support* from the management teams of both educators and researchers. According to the educators in the knowledge arrangement, the education system is bureaucratic and the schools' budgets are often too small to accommodate the necessary structural reforms. Therefore it is important that the school management team sees this change in education as an opportunity to secure future success. The team needs to make available the necessary time and financial resources for training and developing educational material and tools. Formulating a joint R&D mission and strategy to develop the focus on entrepreneurship in education was a first step to tackle these problems. To strengthen these ideas, participants in the knowledge arrangement also came up with a proposal to conduct a study of the educational changes to be expected in view of future societal developments. Their aim is to discuss with their management teams the concrete impact of these developments on the current education system. In order to further develop educational materials and tools, the management of the research institutes needs to make explicit the importance of cooperation between education

[1] For convenience we use the masculine pronoun, but it refers to both male and female students/entrepreneurs.

and research. In this particular case, the researchers have had several meetings with the board of directors who made available the time and resources to allow the researches to contribute to the knowledge creation process. Further integration and cooperation between research and education is a focal point in the research institute's new strategy (Strategy Social Sciences Group Wageningen UR 2007-2010, expected in September 2006).

4. Success factors for knowledge arrangements

Since 2003 Wageningen UR has conducted several studies on the three types of knowledge arrangements in the green sector which were commissioned by the Dutch ministry of Agriculture, Nature and Food quality (Figure 2). In addition to the study discussed in section 3, 11 other exemplary knowledge arrangements were studied by conducting semi-structured (group) interviews (n=64), questionnaires (n=42) and (participative) observations (n=16). The cases were situated within the domains of horticulture, animal husbandry, food/nutrition and the environment (Geerling-Eiff et al., 2006; Lans et al., 2006). Based on the case studies, an instrument is being developed for monitoring and evaluating (M&E) knowledge arrangements. Initially, the instrument consisted of eight critical success factors (CSFs) that showed similarities with studies on quality management in large companies (Ehms and Langen, 2001; European Foundation for Quality Management: www.ink.nl). During the course of the study, the eight factors were reduced to the following four main factors:

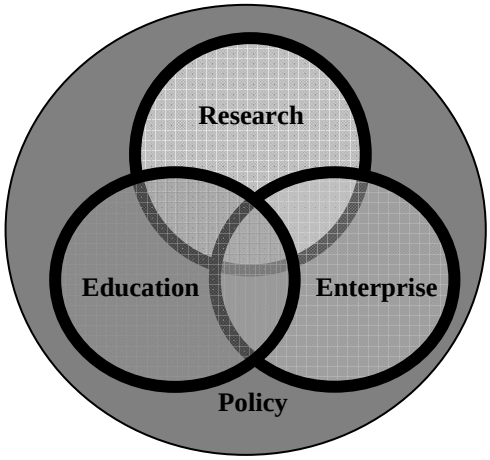

Figure 2: Knowledge arrangements

1. Vision: comprises the shared and individual objectives which focus on the meaning and effect of shared and developed knowledge regarding ambitions and strategic choices for innovation;
2. Competencies: the different experiences, motivations and skills of individuals and organizations that are combined within the knowledge arrangement;
3. Culture: the explicit vision (hardware) among individuals and organizations participating in the knowledge arrangement can diverge from actual attitudes (software) towards collective norms and values for knowledge;
4. Support: this factor relates to the pragmatic effect of vision and culture. Both individuals and organizations need to truly support the knowledge that is being developed within a knowledge arrangement in order for this knowledge to be efficiently transferred, communicated to target groups, and embedded. Support relates to both moral and financial means, both human and ICT oriented.

As we are studying knowledge processes between organizations, it is important to note that these factors can be studied at (1) individual, (2) organizational and (3) knowledge arrangement level. The discussion of the co-creative knowledge arrangement in section 3 illustrated the importance of the four factors. The participants in the arrangement sought to develop a shared vision on bringing entrepreneurship into sharper focus in education. Both researchers and educators need to develop the necessary competencies to realize this vision. Therefore a culture of co-partnership based on mutual trust has to be cultivated. Finally, management teams of both educators and researchers should support this development to make structural reforms in education happen.

5. Discussion

Since 2003 researchers of Wageningen UR have been studying a number of knowledge arrangements which lead to the first steps being taken to develop a common language for monitoring and evaluation. We formulated four main CSFs for different knowledge arrangements to be innovative: vision, competencies, culture and support. Although at this moment many educators, researchers, entrepreneurs and/or policy makers work together efficiently, it seems that there are still many questions and uncertainties about the true meaning of these success factors in knowledge arrangements. Moreover, the term knowledge arrangement may suggest that the primary focus is on knowledge instead of innovation. Awareness of the CSFs can support practitioners in planning and risk-analysis, self-evaluation, monitoring the arrangement, adjustment and self-reflection (lessons learnt). However, three important questions remain for further discussion and research:

1. How can we optimize the use of CSFs as instruments for monitoring (adaptation) and evaluating (measuring results and effects) knowledge arrangements?
2. Are specific CSFs more relevant to some knowledge arrangements than others? E.g. transfer knowledge arrangements could require more specific focus on infrastructural dimensions like support (e.g. budget for ICT) for communication, whereas co-creation knowledge arrangements could require more focus on creating a stimulating culture and developing the right competencies in the network.
3. How can the CSFs be translated into concrete instruments for different research purposes such as surveys, but also workshops and group interviews?

Our team is currently conducting research into these questions and publication of the findings is forthcoming.

References

1. Beuze, M., Geerling-Eiff F.A. and A.E.J. Wals (2004) *Van verkennen met vertrouwen naar verder bouwen: kennisdoorstroom en –circulatie tussen groen onderzoek en onderwijs*, LEI Wageningen UR, Den Haag*
2. Boreham, N.C. and Lammont, N. (2000) *The Need for Competencies due to the Increasing Use of Information and Communication Technologies in Work*. CEDEFOP Panorama Report. Luxembourg
3. Cuilenburg, J.J., Scholten O. and G.W. Noomen (1992) *Communicatiewetenschap*, Coutinho BV, Muiderberg
4. Ehms, K.and M. Langen (2001), *Ganzheitliche Entwicklung von Wissensmanagement mit KMMM*. Knowledge Management Maturity Model, Siemens AG, Germany
5. Geerligs, J., A. Jager, and K. Mittendorff (2004). *Innovatieve kenniscirculatie en kennisdoorstroming in de praktijk*, Stoas Onderzoek/LEI Wageningen UR, Den Haag*
6. Geerling-Eiff, F.A., ed. (2006) *Kennisarrangementen in de praktijk: naslagwerk pilots P420*. Communication Services Wageningen UR, Wageningen*
7. Gibbons, M., Limoges, C., Nowothny, H., Schwarzman, S., Scott, P. en Trow, M. (1994). *The new production of knowledge.* London: Sage
8. Hurkens R. (2005) *Ondernemerschap in het groen onderwijs via Agrocenter en hoe verder*, LEI Wageningen UR, Den Haag
9. Kamp, J. (2004) *Van ondernemend naar ondernemer: een verkenning naar de stand van zaken inzake onderwijs en ondernemerschap in het groen onderwijs*, Q-point BV, Naaldwijk
10. Kupper, H.A.E., Lans, T.L., Wals, A.J. en Geerling-Eiff, F.A. (2006). De akoestiek van kennisarrangementen, in: *IK-magazine*, vijfde jaargang, nummer 1, pp. 22-27*

11. Lans, T.L., Wesselink, R., Biemans, H.J.A. and Mulder, M. (2004). Work-related lifelong learning for entrepreneurs in the agri-food sector, in: *International journal of training and development*, no. 8: 73-89
12. Lans, T.L., Kupper, H.A.E., Wals, A.J., Beuze, M., de and F.A. Geerling-Eiff (2006) *Alles is kennis?*, Communication Services Wageningen UR, Wageningen*
13. Nijkamp, P. (2002). *Groei, kennis en overheid. Een meta-analytische verkenning naar Kennisinfrastructuur*, KNAW, Amsterdam
14. Nonaka, I. en H. Takeuchi (1995). *The knowledge creating company*. Oxford University Press, New York.
15. Potters, J., Hoeven, N. van der and P. Gielen (2006) *Leren met toekomst.* Communication Services Wageningen UR, Wageningen*
16. Shannon C.E. and W. Weaver (1949) *The mathematical theory of communication,* University of Illinois Press, Urbana

* These publications can be downloaded from: www.kennisonline.wur.nl/BO/BO-09/420/producten