

EDITORIAL

The latest research shows that we really should do something with available research outcomes: overcoming the “Valley of Death” to enhancing commercialization of research outputs

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Abstract

This article was inspired by a dialogue that transpired during the 5th All Africa Higher Education Week and Biennial Conference of the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM), held in October 2016. The conference gathered over 850 participants from 72 countries and is usually a convening event that brings together several stakeholders in the two key sectors of Higher Education and Agriculture. The theme was “Linking Agricultural Universities with Civil Society, the Private Sector, Governments and other Stakeholders in support of Agricultural Development in Africa”. From the seven plenary sessions and 49 parallel/side meetings a key concern that stringed through all the deliberations was that of the “valley of death” (also referred to as translational research) in relation to enhancing the usability of research outputs by translating knowledge to practice. It was apparent that the stakeholders in attendance was a good mix, in terms of the different walks of life, designation and vocation, for articulating the urgency of moving research outputs from bookshelves to application in the hands of end-users. The observation was that there is limited application of otherwise useful research-generated interventions to key challenges in Africa’s agri-food systems. This Volume 14 (2) of The RUFORUM Working Document Series, (a peer-reviewed serialized publication, ISSN 1607-9345), features 147 articles accepted for publication mainly from university-based research and clearly if a fraction of the recommendations were put to use there would be less hunger and poverty in Africa than is currently the case. Apparently, there is not just one death valley but for any give technology and/or intervention to reach the end-user (s) there are many potential death-valleys between research and outcomes. In light of this, the convening considered a different conceptualization of knowledge translation (KT) as a dynamic and interactive process that includes synthesis, dissemination, exchange and ethically sound application of knowledge to improve uptake on interventions and thereby strengthen livelihoods. It is widely recognized that the process of KT takes place within a complex system of interactions between researchers and knowledge users which may vary in intensity, complexity and level of engagement depending on the nature of the research and the findings as well as the needs of the particular knowledge user. This Editorial provides selected actions among others that would help unlock the inertia from knowledge to practice, and enhance research-into-use practices in an innovation ecosystem.

Key words: Africa, Higher Education Week, innovation ecosystem, knowledge translation, research-into-use, translational-research

Résumé

Cet article a été inspiré d'un dialogue lors de la 5^{ème} Semaine africaine de l'enseignement supérieur et de la Conférence biennale du Forum Régional des Universités pour le Renforcement des Capacités en Agriculture (RUFORUM), qui s'est tenue en octobre 2016. La conférence a réuni plus de 850 participants de 72 pays, et est en général un événement de mobilisation qui réunit plusieurs acteurs de deux secteurs clés ; l'enseignement supérieur et l'agriculture. Le thème était "Mettre en relation les universités agricoles avec la société civile, le secteur privé, les gouvernements et les autres parties prenantes pour le soutien du développement agricole en Afrique". Sur les sept séances plénières et 49 rencontres parallèles, la préoccupation majeure assortie de toutes les délibérations était celle de la « vallée de la mort » (également appelée recherche translationnelle) en ce qui concerne l'amélioration de l'utilisation des résultats de recherche par la conversion des connaissances en pratiques. Il est évident que le mélange des acteurs présents à cette rencontre était bien varié, en termes de modes de vie, de désignation professionnelle et de vocation, pour articuler l'urgence du transfert des résultats de recherche des rayons des bibliothèques en application dans les mains des utilisateurs finaux. L'observation était qu'il y a une application limitée des interventions utiles générées par la recherche aux défis majeurs des systèmes agroalimentaires africains. Ce volume 14 (2) de la série de documents de travail du RUFORUM (une publication sérialisée à comité de lecture, ISSN 1607-9345) comporte 147 articles acceptés pour publication principalement à partir de recherches universitaires ; et clairement si une fraction des recommandations avaient été mises à profit, Il y aurait moins de famine et de pauvreté en Afrique que ce n'est actuellement le cas. Apparemment, il n'y a pas qu'une seule "Vallée de la Mort", mais de nombreuses "vallée de la Mort" potentielles entre la recherche et les résultats pour qu'une technologie et /ou intervention donnée atteigne l'utilisateur final. À la lumière de cela, la mobilisation a considéré une conceptualisation différente d'application des connaissances (AC) comme un processus dynamique et interactif qui comprend la synthèse, la diffusion, l'échange et l'application éthique approfondie des connaissances pour améliorer l'adoption des interventions et ainsi renforcer les moyens de subsistance. Il est largement reconnu que le processus du AC se déroule dans un système complexe d'interactions entre les chercheurs et les utilisateurs de connaissances qui peuvent varier en intensité, en complexité et en niveau d'engagement en fonction de la nature de la recherche et des résultats ainsi que des besoins de chaque utilisateur de connaissances. Cette édition fournit entre autres des actions sélectionnées qui aideraient à débloquer l'inertie des connaissances à la pratique et à améliorer l'utilisation des pratiques de la recherche dans un écosystème d'innovation.

Mots clés : Afrique, Semaine de l'enseignement supérieur, écosystème d'innovation, application des connaissances, utilisation de la recherche, recherche-translationnelle

Introduction

The Regional Universities Forum for Capacity Building in Agriculture (RUFORUM), a Network of universities in Africa organizes as part of rolling out its functions and mandate an Africa-wide week long convening event. The convening, dubbed “Africa Higher Education Week and RUFORUM Biennial Conference” represents one of the most comprehensive events for actors in higher education and agricultural sectors (Nampala *et al.*, 2016). The RUFORUM dedicates this convening to fostering networking among its member universities and to link universities to other actors and stakeholders in the two sectors that relate to the Network mandate and interest, i.e., Higher Education and Agricultural sectors. At each convening, a dedicated theme is selected to serve as the nub for dialogue and agenda for action. During the 2016 Fifth Higher Education Week and RUFORUM Biennial, held 17 - 21 October 2016 in Cape Town, South Africa, the selected theme was “Linking Agricultural Universities with Civil Society, the Private Sector, Governments and other Stakeholders in support of Agricultural Development in Africa” (RUFORUM, 2016). This is a topical theme in contemporary development contexts, and for this reason, the convening attracted a diversity of stakeholders including representatives from policy-decision making, academia, Development Partners, farmers, industry and private sector.

The key note address at the plenary session of the convening on “Linking Universities with the Private Sector for Agribusiness Innovations”, by Her Excellency Mrs. Ammenah Gurib-Fakim, President of the Republic of Mauritius and Guest of Honor highlighted the issue of the “Valley of Death” and challenged the “August Assembly” of the over 850 to address the gaps and enhance translation of research outputs and outcomes to commercialization as part of the broad agenda to better the livelihoods of millions in Africa. The objective of this article therefore is to contribute to this dialogue and give impetus to stakeholders to rise to the call for action with a focus on addressing the “valley of death”.

Definitions: “Valley of Death” and Innovation Ecosystem

The “Valley of Death” is a phrase that has been used in research to describe the fundamental challenge of applying research and development advances to operations. In terms of innovations, the valley of death describes the point where a business, often a technology based business, has a working prototype for a product or service that has not yet been developed enough to earn money through commercial sales. The company needs to find sufficient money to develop the prototype until it can generate sufficient cash, through sales to customers, that would allow it to be self sufficient and grow. Growing companies will generate both jobs and wealth, a key objective for the global economy.

It is a metaphor that illustrates gaps in the translation of laboratory discoveries to end-users delivered through applied research and/ or deployment of innovations for development (Fig. 1). It also recognizes the translation of resulting evidence from research and its

application to practice and policy towards establishment of a sustainable global good and/or service to society (i.e., the innovation and/ or research outcome).

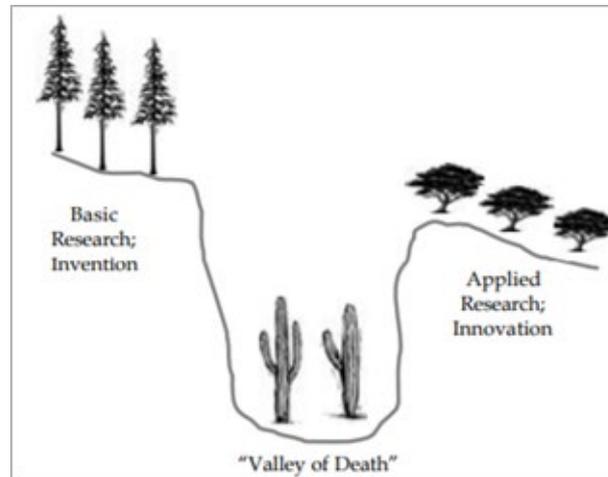


Figure 1. Schematic diagram illustrating the “Valley of Death”

The innovation ecosystem derives from a conceptual analogy with the biological ecosystem. As highlighted in Jackson, (nd) “In the biological system, the equilibrium state is described by modeling the energy dynamics of the ecosystem operations. In this context, the energy is simply the way the predator-prey relationship and the plants transfer energy; calories are burned consuming prey, thereby transferring the energy of the prey to the predator and as plants die and decompose, their energy is transferred to the soil where it is taken up again by other plants. Because the energy dynamics are a complex function, an ecosystem can only be considered as a whole, not piecemeal, as every part of the ecosystem has a functional effect on another. Thus, a biological ecosystem is a complex set of relationships among the living resources, habitats, and residents of an area, whose functional goal is to maintain an equilibrium sustaining state”.

“In contrast, an innovation ecosystem models the economic rather than the energy dynamics of the complex relationships that are formed between actors or entities whose functional goal is to enable technology development and innovation. In this context, the actors would include the material resources (funds, equipment, facilities, etc.) and the human capital (students, faculty, staff, industry researchers, industry representatives, etc.) that make up the institutional entities participating in the ecosystem (e.g. the universities, colleges of engineering, business schools, business firms, venture capitalists (VC), industry-university research institutes, industrial supported Centers of Excellence, and state and/or local economic development and business assistance organizations, funding agencies, policy makers, etc.).”

The innovation ecosystem comprises two distinct, but largely separated economies, the research economy, which is driven by fundamental research, and the commercial economy, which is driven by the marketplace. By design, the two economies are weakly

coupled because the resources invested in the research economy must be derived from the commercial sector. This definition includes government research and development (R and D) investments which are ultimately derived from tax revenues. In order to foster the serendipitous investigations that are essential to innovative discovery, it is also important that the incentives driving the research economy be decoupled from the financial incentives driving the commercial economy.

Valleys of Death and not just one “Valley of Death”

The road between a discovery generated from basic research and invention processes to commercialization of products or processes is long, and in practice, characterized by significant challenges. The “valleys” arise from transitions moving from basic research to implementation research and finally to commercialization/practice research. Researchers, Innovators and Inventors often view the “funding-gap” as the critical limitation and have associated this to constitute the “Valley of Death” at an intermediate stage of the process between basic research/invention to commercialization of a new product/innovation. To the extent that the funding limitations prevail, a new innovation and/ or discovery may never be transformed into a commercial product and the implication will be a diminished return on funding for early stage research for development (Ford *et al.*, 2007). This has implications for the “Research Economy” and “Commercial Economy” as presented in Figures 2 and 3. When the innovation induced growth (i.e., commercialization resources) in profits exceeds the initial R and D investment, there is growth in the innovation ecosystem (Jackson, n.d).

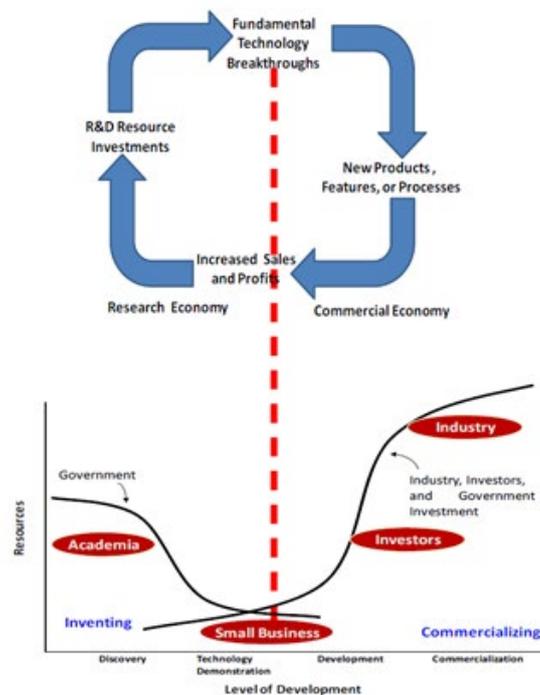


Figure 2. Cyclic process through which Research and Development resource investments are replenished through profitability of a commercialized innovation in a thriving innovation ecosystem

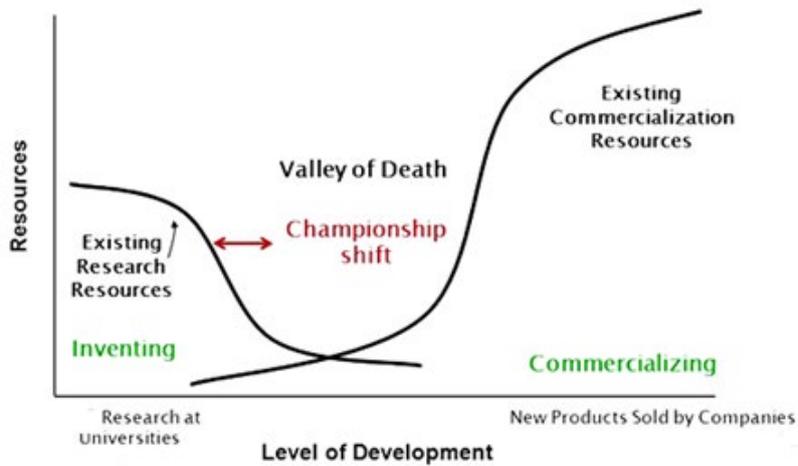


Figure 3. Level of development if a factor of the volume in scale and scope of inventions that cross the challenge basin and move to profit maximization – the shift requires champions

Rationalizing appropriate actions to minimize “Valleys of Death”

Consider technical and cost-effective efficiencies for the entire R and D continuum and not just at the technology development stages: Available literature on research-into-use presents concepts on the “valley of death” based on the traditional investment problems at the intermediate stage where it manifests. While several factors associated with financing including risk, uncertainty, spill-overs, and increasing returns to scale are apparent at intermediate stages and play a catalytic role for the “Valley of Death” to arise. These factors alone cannot explain the presence of a “valley” in the research for development continuum.

Many knowledge transfer and translation approaches promote the linear model of innovation. However, this assumes that there is only a single ‘valley of death’ with the thinking that is a linear process, and that financial obstacles were only found in one place.

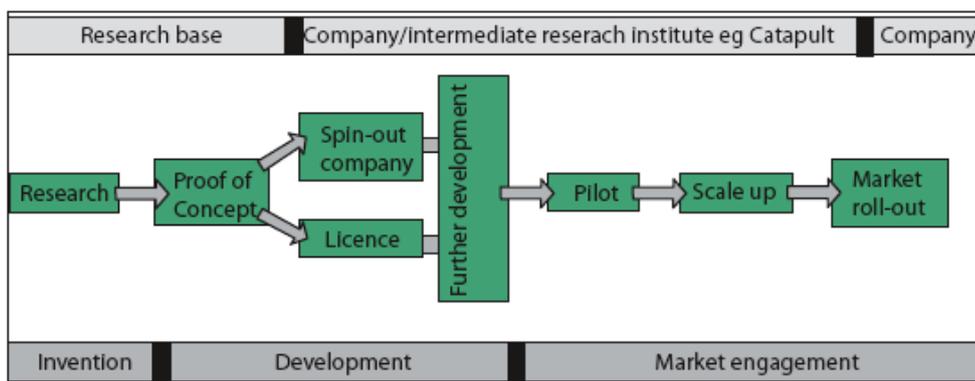


Figure 4. The linear idea of innovation

In practice innovations are generated through a cyclic process with the vast majority of new technologies in the world that become commercially adopted with engagement of several actors along the research for development continuum. The role of researchers/inventors and knowledge institutions may be less instrumental in the commercialisation process than is assumed. Instead the commercialization stage is devised and developed in the business world, by entrepreneurs, technology consultants, large and small businesses and in supply chains (albeit, infused and informed by research-informed ideas and human capital development).

Allow for freedom to fail in the context of nurturing a culture of an innovation ecosystem: The cyclic nature of research for development leading to attainment of an innovation outcome/process implies that for a Valley of Death to manifest at an intermediate stage a noneconomic activity must be apparent in the initial stages. A noneconomic activity refers to investments at initial stages that are not taking into account what happens in later stages of the innovation development, i.e., the tail-end of the research for development continuum. If at the beginning decisions are part of the tail-end decisions which is expected with profit maximization arrangements, then a significant Valley of Death will be envisaged and stemmed from the start. This, however is not the case with the “Research Economy” and, in part underpins the importance of freedom-to-fail on the part of the researchers/inventors in the context of universities and higher education institutions and nurturing the culture of innovation ecosystems. The intended purpose of an invention is usually different from that of the researcher and users. New knowledge builds on old-knowledge and Researchers need the freedom to research technologies that have no hope of commercialization in their lifetime. Similarly, it is prudent for governments and development partners to support basic scientific research to undertake projects solely for the sake of generating new knowledge or at the full discretion of the researcher uninterested in commercial prospects.

Available data from the European Research Council indicates that “Statistically, 50% of the venture capitalists investment portfolios fail outright, 30% are marginal in that they don’t fail, but also don’t experience growth, 10% grow at a rate of about twenty percent a year, and 10% grow fast enough to provide returns in excess of 1000%. Venture capitalists only classify an investment enterprise as successful if its return on investment (ROI) exceeds a factor of 10. The reason venture capitalists require a minimum ten-fold ROI is to ensure that they can recover their investments on the other nine investments that “fail”. Like the venture capitalists, the innovation ecosystem must experience enough earnings growth to recover all investments in the R and D to be considered healthy and thriving.”

The high risk to investors leads to several important conclusions about healthy conditions that define innovation ecosystems. First, the increased productivity from successful enterprises must be profitable enough to compensate for the monetary investment in fundamental research and for the aggregated investment in both the successful and the failed Rand D ventures. Because there is a high probability most enterprises launched in the ecosystem will fail, a healthy ecosystem should also be structured to handle failures

in a way that encourages terminating losing investments early in order to facilitate more efficient utilization of ecosystem resources. Ideally, the ecosystem is structured to efficiently recover and recycle any resources (including human capital) that are released upon the failure of individual enterprises. Because resources within the ecosystem are limited, the dynamics of success and failure within the Valley of Death represents an important mechanism for regulating the consumption of the ecosystem's resources.

Handle intangibles and shift the Valley of Death into a challenge basin: The innovation ecosystem consists of actors (human resources), entities (e.g., institutions, partnerships, policies), and intangibles (mainly corporate intellectual property including items such as patents, trademarks, copyrights, business methodologies, goodwill and brand recognition). There is always more focus on actors and entities and less on the intangible issues/actions and in the process this facilitates the Valley of Death to manifest. The intangibles are “the complex actions that effectively move the valley walls inward and the valley floor upwards in order to replace the deep walled Valley of Death with the gentle slope of a challenge basin” (Jackson, n.d). There is no set recipe for effectively handling intangible issues within an ecosystem because it depends on the specifics of the technology, the cultures of the ecosystem entities, and the personalities of the players. The best way to describe how to approach the development of these relationships is to start by viewing the “valley” in a figurative sense (see Figure 5). In this context, the intangible actions of the innovation ecosystem comprise everything one does to the infrastructure to effectively move the research side of the valley wall further to the right; or to move the commercial side of the valley wall further to the left thereby improving the odds of an innovative venture successfully spans the Valley of Death. For example, training a cadre of champions to shepherd ventures toward commercial success represents a technology push that effectively moves the valley wall to the right.

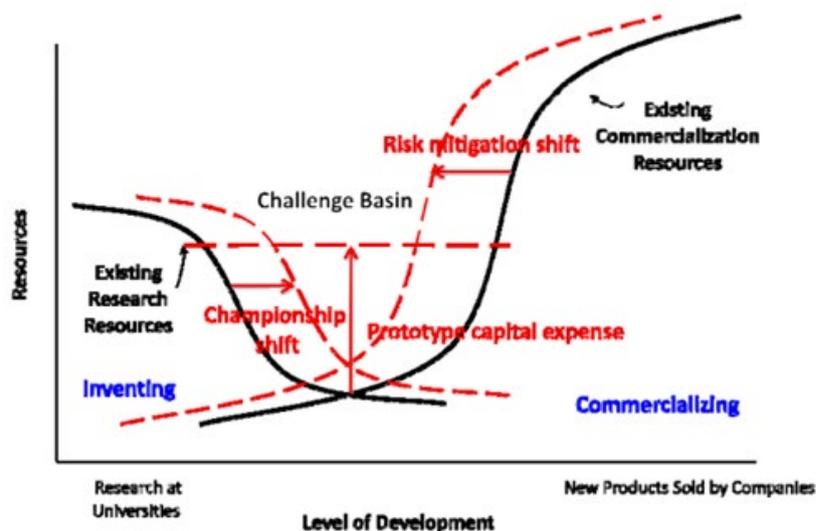


Figure 5. Illustration on narrowing the challenge basin (Valley of Death) to enhance commercialization of research outcomes

Conduct research to make the results applicable to the population under study:

Increased uptake of research outcomes can be achieved through knowledge co-creation processes that should be imbedded in the research design and implementation. According to Wenger (1998), knowledge development is a communicative process which takes place within a shared practice. Therefore, translating knowledge into use should take into consideration the fact that knowledge emerges from and is justified by shared practice and activities among communities and should be contextualized and exemplified as part of the process of sharing. In light of this, the R and D continuum that is designed to promote uptake and commercialization of innovations should embrace models that use collaborative, participatory, action oriented, community-based, engaged scholarship mode to knowledge production. These models will secure end-user engagement in the research process and in the process give end users confidence in the results and in the researchers as well. End-user engagements with multi-disciplinary and transdisciplinary teams also translate into readiness for ownership of results and willingness to adopt effective practices, abandonment of ineffective ones, and moving results to practice and policy (Wit, 2005).

Conclusion

Understanding how advances in basic research are effectively translated into economic growth, a sequence of events involving contributions from several players, from researchers to inventors and investors to customers/consumers, is very critical to maximize potential of the economy. This process that transforms ideas and discoveries into commercial production is described as the “Innovation ecosystem”. It is possible that the “Valley of Death” arises mainly because of a focused attention on basic research and late-stage commercialization of R and D projects with limited attention for projects and programs that are intermediate between basic research and commercialization. The intermediate represents “implementation research” also referred to as translation research and focuses on technology translation gaps and doing research collaboratively with end-users. Implementation research should therefore, entail studying the determinants of knowledge use and effective methods of promoting the uptake of knowledge. Any clarification of the “Valley of Death” must explain why the “valley” is surrounded by “peaks” and respond to the call by Her Excellency Mrs. Ammenah Gurib-Fakim at the 5th All Africa Higher Education Week and Biennial Conference of the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM), held in October 2016. It is prudent for the research fraternity to pay equal if not more attention to the Implementation Research agenda between basic research and commercialization projects. Hopefully investments and interventions (particularly the deployment of proven methodologies for uptake) arising from the implementation research in the R4D continuum will offload research outputs from bookshelves and enhance uptake on innovations.

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References

- Ford, G.S., Koutsky, T. M. and Spiwak, L.J. 2007. A Valley of Death in the innovation sequence: An economic investigation. Discussion Paper, Phoenix Center for Advanced Legal and Economic Public Policy Studies, Available from: www.phoenix-center.org; Accessed: 1st September 2016.
- Groen, A. J. 2011. Innovative entrepreneurship: the NIKOS story : ten years of engaged scholarship in entrepreneurship at the University of Twente. Enschede, the Netherlands: University of Twente, Netherlands Institute for Knowledge Intensive Entrepreneurship (NIKOS).
- Jackson, D.J. (n.d). What is an Innovation Ecosystem? Available from: www.erc-assoc.org/sites; Accessed 10 August 2016.
- Nampala, M.P., Apio, J., Mkandwaire, S., Osiru, M. and Adipala, E. 2016 Building effective convening power for higher education in Africa. *RUFORUM Working Document Series* (ISSN 1607-9345) No. 14 (1): 313-325. Available from <http://repository.ruforum.org>; accessed: 30 October 2016
- Regional Universities Forum for Capacity Building in Agriculture (RUFORUM). 2016. The Fifth Africa Higher Education Week and RUFORUM Biennial Conference 2016 – Programme Booklet. Available from www.ruforum.org; Accessed: 20th October 2016.
- Wenger, E. 1998. *Communities of Practice, Learning, Meaning and Identity*. Cambridge University Press, UK. ISBN 052143017
- Wit, B. de. 2005. Interdisciplinarity and policy relevance in Research Programmes. A position paper 24, Den Haag, Advisory Council for Research on Spatial Planning, Nature and Environment (RMNO), Athena Institute VU University, Amsterdam.