Supporting Technology Transfer via Web-based Platforms

Guenther Schuh[1], Susanne Aghassi[1], André Calero Valdez[2]
[1]Fraunhofer Institute for Production Technology IPT, Aachen, Germany
[2]Human-Computer Interaction Center, RWTH Aachen University, Aachen, Germany

***Abstract*–In order to stay globally competitive enterprises face an increasing pressure to be innovative. Furthermore, the rising complexity of new technologies forces enterprises into RnD-cooperations with third parties as technology development can often not be handled by one organization on its own. In spite of this need for technological innovations, lots of excellent research results from academia remain unexploited. The reason for this often lies in a lacking industrial partner for commercialization of developed technologies, which again is often caused by lacking visibility. Although several measures are taken to bridge the gap between research and industry, their success is not broadly achieved. In the past years, with the rising technical capabilities of modern Web 2.0 and social software technologies, several web-based platforms were built up in order to support technology transfer, and increase the visibility of the developed technologies at various research establishments. In this paper of ongoing research, different types of platforms are introduced and analyzed. Based on this analysis of existing platforms and the characterization of specific transfer situations we introduce a concept of a social technology transfer platform which is currently established within the Cluster of Excellence in Aachen "Integrative Production Technology for High-Wage Countries".**

I. INTRODUCTION

The recognition of technologies as a strategic relevant competitive factor has only been established by the mid-eighties [19] [7]. With an increasing market saturation and shorter product life cycles, technologies as a means of securing long-term business success are continuously gaining importance. Research, technology, and innovations are now the driving force behind economic growth in different nations [19]. This development also led to a growing importance of technology management, which is reflected by the large number of research papers and publications in this field [14], as well as its increasing manifestation in companies' organizational structures [19] [21]. In the past years, technology management evolved from a process- and tool-driven discipline to a dynamic, cooperative system. Cultural and collaborative aspects as well as a systematic network management have become a decisive factor for successful technology management today. The rising complexity of new technologies forces enterprises to open up their development process and enter RnD-cooperations with third parties, as technology development can often not be handled by one organization on its own. [20] Especially small and medium sized companies, having only limited resources themselves, depend on external sources for new technologies in order to keep up with their competitors [19]. One of the key challenges in this context is the search for suitable cooperation partners and technologies. Potential partners for cooperation and technology transfer can be found within academia research, who in turn also need industrial companies to provide resources for further development and commercialization of technologies.

Since the beginning of the information era and the establishment of the Internet, information and knowledge became widely accessible. The latest developments of web-technologies as well as faster Internet connections allow for a more dynamic user interaction and faster information retrieval. In the course of this development web-applications with more and more "social" character evolved. Virtual social networks have experienced a boost within the past years. Social software solutions put the user, as well as its relationships, and knowledge in focus. Having already penetrated the public sector, social networks are also gaining importance in the scientific community. Making oneself and one's expertise visible in the right network becomes one of the crucial preconditions for inter-organizational technology transfer, especially in its early phases. However the potential of social software solutions for supporting inter-organizational technology transfer is still not utilized comprehensively.

II. RESEARCH APPROACH

Within the Aachen Cluster of Excellence (CoE) "Integrative Production Technology for High-Wage Countries" we pursue the development of an interactive and social web platform for supporting inter-organizational technology transfer. Having successfully implemented the first phase of the CoE, one of the key goals within the second funding phase is to convert the excellent research results into sustainable structures. For this purpose, the Aachen CoE follows a multiple technology platform approach. Seven technology platforms are build-up, each focusing a specific technology and application field and bundling the experts and technological know-how in one industry-faced platform. The technology platforms of the CoE integrate product-related, manufacturing-related, material-related, processing-related as well as management-related topics. Figure 1 shows the starting configuration of the technology platforms in the Aachen Cluster of Excellence.

The technology platforms consolidate both, unique technological and application know-how as well as the corresponding experts and thus depict an optimal development platform for the research on technology transfer portals. The conception and implementation of the technology transfer platform will thus be conducted along the technology platforms of the CoE ensuring a user-centered development approach.

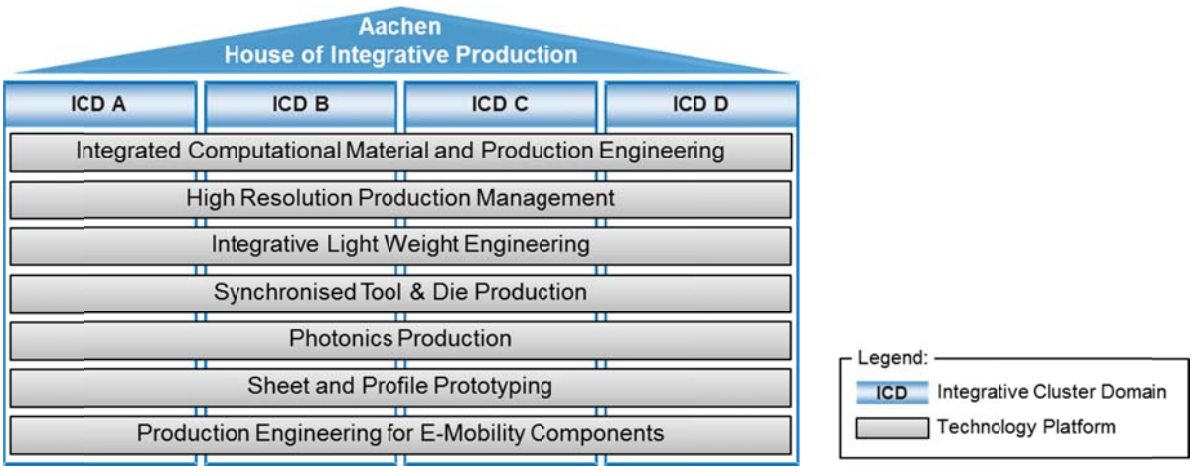

Figure 1: Starting configuration of technology platforms of the Aachen CoE

The research question to be addressed is how can technology transfer platforms be customized in order to build up a webbased support for technology transfer within and beyond the Cluster of Excellence. For the concept development of the technology transfer platform an action research based approach is followed. In a first step, existing web platforms from different applications fields, such as technology transfer, open innovation, expert networking etc. are analysed and aligned with the theoretical view on technology transfer via literature analyses. Based on this, a classification scheme is developed allowing the clustering and comparison of the existing platforms. After having defined the basic evaluation criteria, the analysed platforms are evaluated according to these criteria and allocated in the classification scheme. In order to include future platform users at an early stage of development, interviews are carried out accumulating the requirements on technology transfer platforms from both, industry and academia side. Based on the preceding analysis of existing platforms, literature review and the conducted interviews, a platform model is developed giving support to the configuration and use of a web-based technology transfer platform for users from industry and academia.

III. STATE OF THE ART

Having defined the theoretical view on technology transfer and its constituting elements in the first place, existing transfer platforms will be introduced and exemplified. In order to enhance these existing concepts, the possibilities of modern web-technologies, especially social software solutions are demonstrated. These two dimensions span the solution space for the social and user-centered technology transfer platform to be developed within the Cluster of Excellence.

A. Technology transfer

In literature a number of different definitions of technology transfer exist. GESCHKA defines technology transfer as "… the transfer and application of technological knowledge and know-how from one field of application to another" [8] [16] whereas CORSTEN defines technology transfer as " a planned, timely limited and voluntary process of transferring a technology inter- as well as intrasystematic …" [6]. For enabling efficient support of technology transfer, the specific transfer situation must be characterized. In the first place it must be investigated which phase of the technology transfer process should be focused on, secondly the object that should be transferred must be defined. Finally the involved parties have to be identified.

In literature one can find various definitions of the *technology transfer process* and the phases it consists of. On the basis of a linear approach CORSTEN defines four sequential phases in his model to describe technology transfer [6]: The *searching phase* has two different actors: On one hand the technology provider, whose main task is to find an adequate technology consumer; On the other hand the technology consumer that has to select the right technology provider to cooperate with. The phase starts with offering a technology by the provider and ends with first contact between the transfer partners. The *negotiation phase* starts on the basis of the first contact between technology provider and consumer and ends with the contract, that contains the general framework. The *realization phase* includes the implementation of the technology at the technology consumer side, based on the contract. The *utilization phase* comprises the continuous use and marketing of the technology at the consumer site. [6] Having defined the process of technology transfer, the *transfer partners* have to be investigated. Within technology transfer different individuals or organizations are participating. Technology *provider* or producer offer technologies to the technology *consumer*. To bring the parties together as well as to ensure successful transfer, *transfer mediators* are sometimes involved, who give support

especially in early phases of the transfer process. [18] Public research institutes and universities, private research institutions, and industrial companies are potential technology providers. [16] Research institutes can further fulfill the role of a technology consumer like existing or new industrial companies, which use technologies to strengthen their position in existing and emerging markets or for gaining additional market shares. Transfer mediators are mainly technology transfer organizations, established by universities in order to market their developments, improve reputation, and oppose the lack of innovation in industry. [16] The crucial part that influences a specific transfer situation are the *transfer objects*, i.e. the technologies to be transferred from a technology provider to a technology consumer. Transfer objects can either be the technology itself (materialized technology), or explicit as well as implicit technological knowledge. [16]

B. Technology transfer platforms

Due to the companies' increasing need for technologies on one hand and the growing exploitation pressure put on research organizations on the other hand, several technology transfer platforms have been set up and established during the past years. Advances in web-technologies and the digital era paved the way for these modern web-based platforms. Most of the existing technology transfer platforms are run by universities or research centers themselves, in order to present their own technological findings and find cooperation partners for commercialization or further development. The functions of these platforms are similar, such as presenting and offering technologies or technological know-how to interested consumers and potential transfer partners, giving contact details about the inventers or experts, or even supporting the actual transfer of these technologies via licensing forms and workflows. The way technologies are structured and presented on the platforms range from very structured approaches to flexible forms of presentation. Another striking difference between the existing platforms is their differing range of application. Some solely focus on technology transfer itself, others additionally offer brokering of project partners or funding programs.

1. Platform types

To describe and structure the existing technology platforms two different dimensions are used: their openness to different user types and their level of social media integration. *Openness* can be described as the level of accessibility. Accessibility has different facets. It can be open to any user, be they private or professional, affiliated to an organization or not, or even a closed platform for the operation organization to publish its own technological offerings. *Social media integration*, the second criterion describes how far social media functions, such as user profiles, interpersonal communication channels, user-specific newsfeeds, visualization of relationships or communities are integrated. These two criteria allow the classification of the platforms into three different platform types of which we present one representative in more detail (Figure 2).

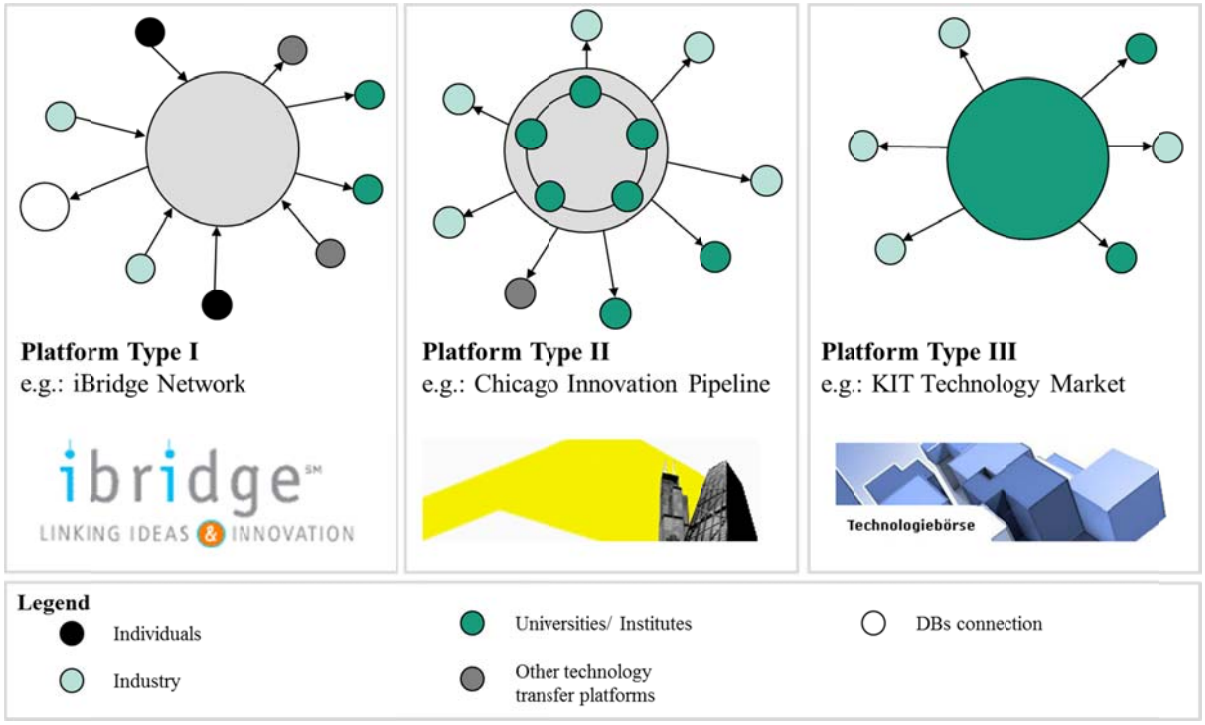

Figure 2: Different types of technology transfer platforms

The KIT Technology Market is a representative of a closed platform with limited access, that does not include any social media integration, and can be allocated to the third type. The Chicago Innovation Pipeline represents a limited-access platform with low-to-medium social media integration and can be assigned to the second type. The iBridge network represents an open platform with medium social media integration and represents the first type.

2. Selected examples

The presentation of technologies or technological know-how is a crucial aspect of technology transfer support, which is addressed by the different technology transfer platforms in various ways. In the following paragraph, exemplary technology transfer platforms will be presented focusing on how they enable technologies to be presented and how they are offered to potential transfer partners.

Representing platform type III (Figure 2) the *KIT*[1] *Technology Market* will be introduced. With the aim to simplify the partnership between the KIT and its affiliated institutes and also to accelerate knowledge transfer, the platform was founded in the year 2011. Users of the platform are the institutes of the KIT as the technology providers. Economic actors, industrial partners and other research organizations can be technology consumers. The platform offers several functions such as a specialized search function and a tag cloud to ensure an easy access to the offered technologies. Furthermore the KIT offers non-gratuitous participation in the business club, working as a communication and networking platform, to offer a VIP access to knowledge and services of the KIT. On the KIT Technology Market technologies are clustered into five different technology fields: 1) materials and nanomicro, 2) applied life sciences, 3) earth and environment, 4) information, communication, and organization as well as 5) systems and processes. Each technological offering is assigned to one of these clusters. Technologies themselves are presented in fact sheets and have a standardized layout and structure (Figure 3).

Every presented technology at KIT Technology Market is indexed and described in a one-pager fact sheet. The fact sheet contains a title respectively the name of the technological offer and a short description. If there are already associated patents or patent applications of the technology, they are downloadable within the offer. Additionally, pictures can be uploaded by the technology provider and seen by the consumer for illustration. Finally the fact sheet contains the contact information to the KIT innovation manager, but not the inventor respectively expert itself.

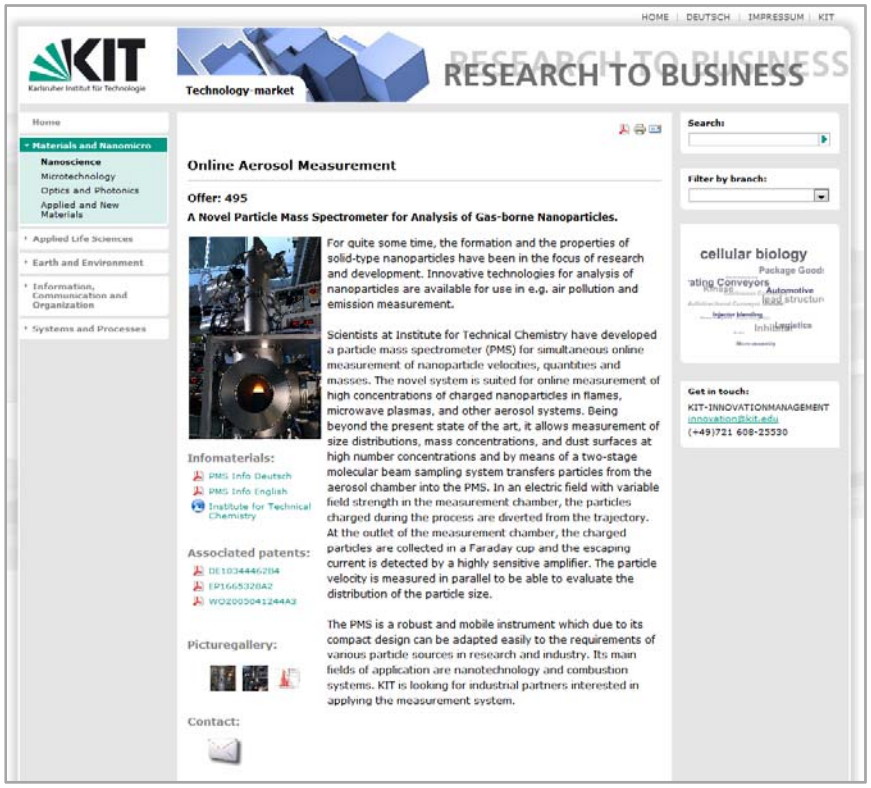

Figure 3: Fact sheet - KIT Technology-market [10]

[1] Karlsruhe Institute of Technology

As a representative of platform type II (see Figure 2) the *Chicago Innovation Pipeline* will be presented. The Chicago Innovation Pipeline focusses on biotechnology research and has a higher grade of accessibility than the KIT Technology Market as it assembles technologies of different research organizations from the same region. Technologies are also thematically clustered within the field of biotechnology, e.g. material sciences, diagnostics and biomarkers or Health care IT. Furthermore, in the summarizing view of these clusters, technological offerings are evaluated and positioned concerning their readiness level. These differ in the various fields of technologies: e.g. from concept stage to clinical validation in the field of pharmaceuticals (Figure 4), or from concept /prototype phase to pre- market validation in the field of robotics.

For further information related to the offered technology a summary can be downloaded in pdf-format. The fact sheet provides the title of the technology, a short technology description as well as its potential applications or benefits. Additional graphics can be embedded within the fact sheet. Furthermore the fact sheet contains a list of meta information regarding the primary inventor, possible publications of the technology, their patent and licensing status as well as the contact details to the technology providers.

Representing platform type I (Figure 2) the *iBridge Network* will be introduced, as a meta-platform, which obtains in comparison to types II and III additional functions, especially those enabling social user interaction. Besides the technologies offered by its own platform users, the iBridge Network comprises technologies that were uploaded and offered on partner platforms, such as EasyAccessIP. The iBridge Network was created in 2005 in the US with the aim to make ideas, knowledge, innovation and technologies available to everyone via a central web-based platform and community with an open access. As main users organizations, such as universities and enterprises, can be identified, but also individuals can participate. An outstanding characteristic is the integration of several social media functions. User profiles can be created and communities founded and joined. Besides that an individual newsfeed serves information about technologies related to defined fields of interest. Similar to the two previous mentioned examples, technologies are clustered in technological or application fields. These however are very dynamic in the iBridge Network and much more specific than in the other presented platforms. Technological innovations are presented in a fact sheet, that includes relevant details of the offered technology (Figure 5).

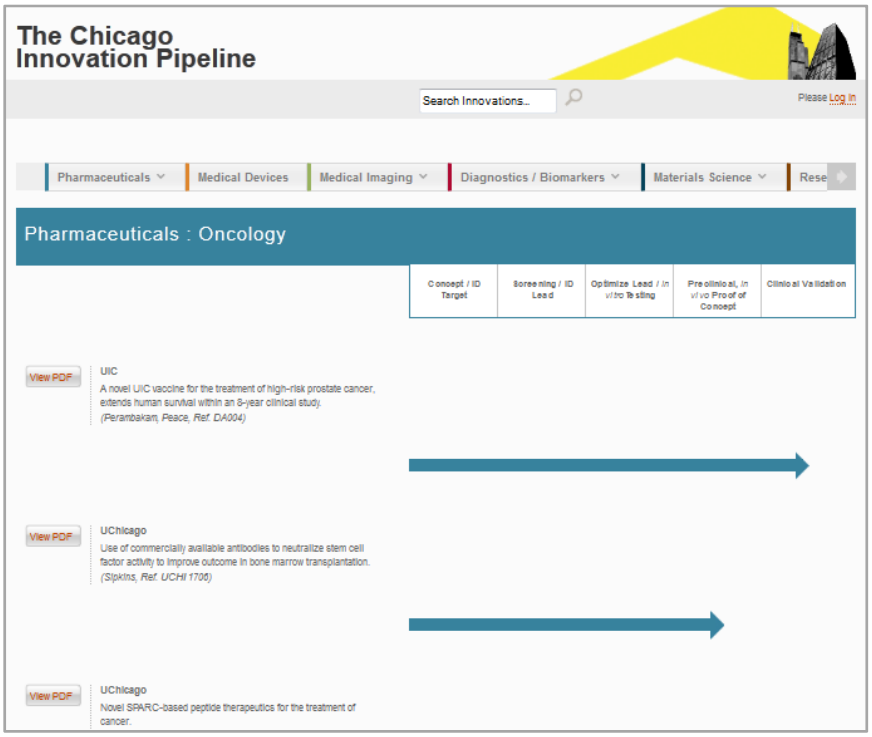

Figure 4 The Chicago Innovation Pipeline – Overview of technological offerings [9]

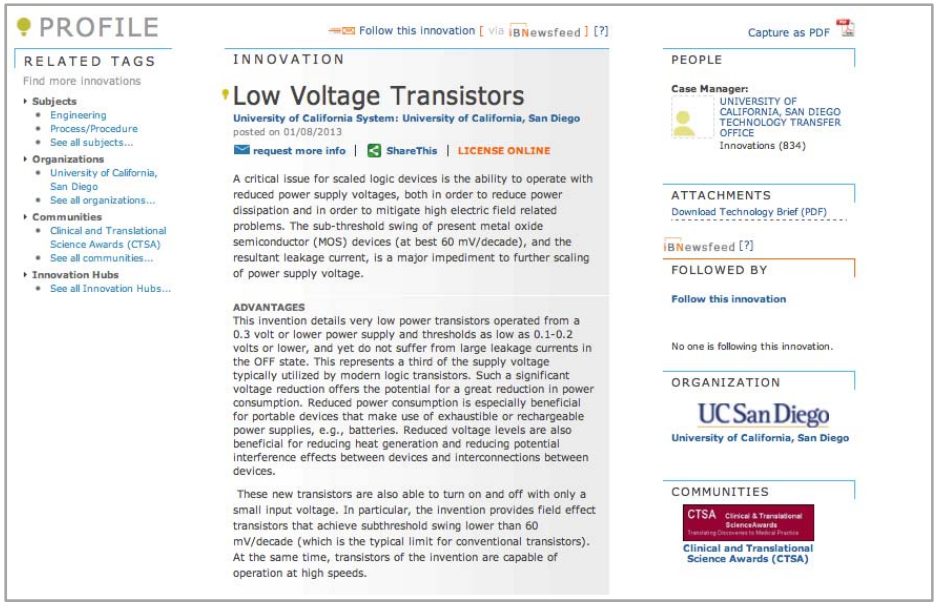

Figure 5: Fact sheet – iBridge Network [11]

The fact sheet at iBridge includes a detailed description of the technology, its background, suggested fields of usage as well as its advantages. All information can also be captured in a pdf-file besides the online-format.

With a closer examination of the fact sheet, the social functions directly become obvious. Within technology profile, different "social features" can be found. Users can "follow" a technology or technology field via newsfeed and see, how many other users do so. Technology profiles can be shared between users and users can assemble in technology specific communities. (Figure 5)

The preceding analysis revealed several technology transfer platforms that have been established in the past years. Although they seem similar in the first place, the analysed platforms show some major differences, especially regarding their degree of openness and social media integration. Hypothetically, the considered platforms can be improved by increasing their level of social media integration, thus profiting from the benefits of an expert community. Through the investigation of the existing platforms it could be concluded, that there is no standard way of presenting technologies on web-based platforms. Although all presented platforms use fact sheets for presenting technologies, these contain different kind of information and also differ in their level of detail. The way technological offerings are presented seems to be one of the crucial aspects in supporting technology transfer via web-based platforms and should be object to further investigations in the future.

C. *Social Software Solutions*

A prominent challenge in the context of technology transfer is the selection of appropriate transfer respectively cooperation partners. To meet this challenge, social networks and communities offer a great potential. They can contribute to transparency about technologies and technological experts making them accessible via a web-based social platform. With the development of Web 2.0 technologies and especially social software the way of sharing knowledge took a revolutionary step forward. It changed the methods of interaction, styles of development and sources of contents [13]. Furthermore it offers the possibility to gather information in real time form different sources and assemble it in a single Webpage [13]. These technologies paved the way for today's social web applications. Popular networks and communities (e.g. Facebook, Flickr, Twitter, etc.) nowadays are entering the market and are well established applications with a huge and still increasing number of users. Studies show that most of all home Internet users are registered and active on social networks [15] [3]. These social networks allow new ways to communicate and to exchange ones knowledge with another. However, beyond the private use, companies recognize the value of this form of knowledge exchange and start using it for their own aims. The previously referenced study reported the growing interest: Approximately 70% of all questioned companies use social media [15]. Of this, 90% state that they had reached a significant success through integrating and using social media [15]. In the context of technology transfer however, only little and singular attempts were made, to integrate social functions in technology transfer platforms.

D. *Interim conclusion*

The state-of-the-art analysis revealed several technology transfer platforms that have been established in the past years. Although they seem very similar in the first place, the analysed platforms show some major differences, especially regarding their degree of social media integration. Hypothetically, the considered platforms can be improved by

increasing their level of social media integration, thus profiting from the benefits of an expert community. Modern Web 2.0 technologies and community approaches already offer a far more complex functional portfolio than existing transfer platforms use today. Our hypotheses is that social software functions and communities can make a significant contribution in supporting inter-organizational technology transfer.

At this place it must be noted that the state of the art analyses focusses on academically driven technology transfer platforms and has to be extended to commercial ones in the future (e.g. Yet2com). Furthermore it should be extended to related social web-based portals, such as scientific network sites (e.g. ResearchGate) and open innovation platforms (e.g. NineSigma, Innocentive) in order to identify their potential for a support of technology transfer and include these in the analyses.

IV. CONCEPT DEVELOPMENT

A. *Draft concept of a social technology transfer platform*

In order to drive the existing concepts of technology transfer platforms forward, within this research project a holistic technology transfer platform should be developed. Making use of modern social software features the platform should enable social interaction between its users and simplify technology transfer. The platform to be developed should serve as a transfer portal as well as an expert community ensuring transparency about the technologies and corresponding experts within the Aachen CoE.

The platform should bundle technological information in a network/user group specific technology field structure (Figure 6).

Within the platform concept different users with various roles are considered. Providers can meet and exchange their technologies, know-how and ideas with potential consumers. Moderators coordinate discussions in a technology-specific structure, a community manager is put into place in order to stimulate and supervise the platform activities and also to store the knowledge in an accessible way on the platform. The actual transfer can take place through the platform or through a direct contact between technology provider and consumer. The platform offers the possibility to present technologies and technological expertise which can be challenged and discussed among other users. The community manager furthermore gives initial input in order to ensure a critical mass of information at the beginning and takes care that the code of conduct is being followed.

B. *Elements of the platform concept*

For the development of the transfer platform, the constituting elements must be conceptually detailed. The developed draft concept of the platform comprises eight elements: transfer objects, users and roles, services and technical functions, financing and incentive system and the code of conduct. The characterization of the *transfer objects* should include answers to the question of how technologies should be clustered and presented on the platform. Within the element *users and roles* it must be defined, what kind of users should be allowed to use the platform, how the user profiles should look like, and what roles with what permissions these users can take on the platform during their life cycle. Concerning the *services and technical functions* it must be specified, which products and services the platform should offer to its users and with what technical functions these can be realized. A *financing and incentive system* must be set up in order to ensure sustainable operation of the platform and to motivate users to actively participate in the platform. Finally, a *code of conduct* must be developed to ensure the basic rules of usage and build trust among users. Matching the users need for an established etiquette, is a core requirement of acceptance of social software in a work environment [4].

In order to detail the above mentioned elements of the platform concept, a detailed requirements analysis must be conducted. Platform requirements will be derived through

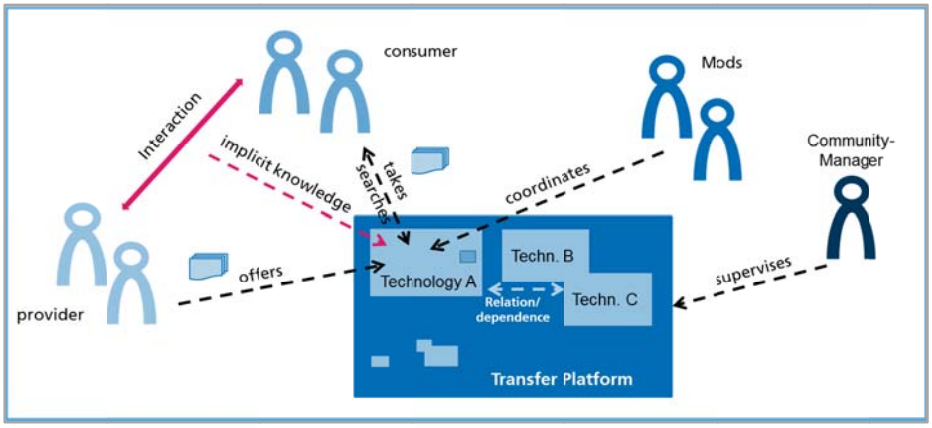

Figure 6: Draft concept of the technology transfer platform

interviews with potential future users from an academic and industrial point of view. Furthermore corresponding models must be developed characterizing the specific transfer situation so that the platform concept provides flexible support in different transfer situations.

C. *Vision of the technology transfer platform*

The support of technology transfer depicts only a first step in this field of research. Visionary, a technology transfer platform could lead to a new way of conducting technology management in a broader sense. For instance semi-automated technology monitoring can be mentioned with the aim to notify subscribed users who are interested in certain technology fields. User-specific alert criteria can be defined (e.g. the performance parameter of a specified technology), which trigger a notification if the users alert criteria threshold has been met (e.g. significant increase of the performance of the specified technology) (

Figure **7**).

Transparence of technologies and technological expertise is a key enabler of technology transfer, especially in its early phases. Techniques of network visualization enable a quick overview about relevant fields of technology and experts working on it and thus can pave the way for technology transfer to take place [5].

V. CONCLUSION AND FUTURE RESEARCH

In this paper of ongoing research, the concept of web-based platforms supporting technology transfer was introduced. Several existing platforms were identified and analyzed and three exemplary platforms – the KIT Technology Market, the Chicago Innovation Pipeline and the iBridge Network – were demonstrated. Special focus was put on the way, technological innovations are presented on these platforms. Having learnt from this analysis as well as from the theoretical literature perspective on technology transfer, a draft concept of a technology transfer platform to be developed within the Aachen CoE was presented, providing social interaction functions to its users.

While presenting a first approach in this paper, there is a clear need for further research. As related fields such as open innovation and scientific network sites address similar topics, the analysis of existing technology platforms should be enlarged. The emphasis of the first conducted interviews for requirements analysis relied on an academic point of view, and should be supplemented with the industry perspective. Therefore, interviews with potential platform users from industry and further interviews from academia side should be conducted in a next step. On the basis of a more detailed state of the art and requirements analysis, the concept of a social technology transfer platform in the CoE will be further elaborated and defined in more detail. A software prototype will be implemented supporting a continuous, bi-directional and technology-based exchange between research and industry. For motivating users to participate in the platform a critical mass of information must be secured from the beginning. For that reason further external data sources might be connected to the software platform to enlarge the initial knowledge reservoir. An efficient search function must be developed to allow internal and external users to navigate and grant fast access to their specific fields of interest. Ensuring

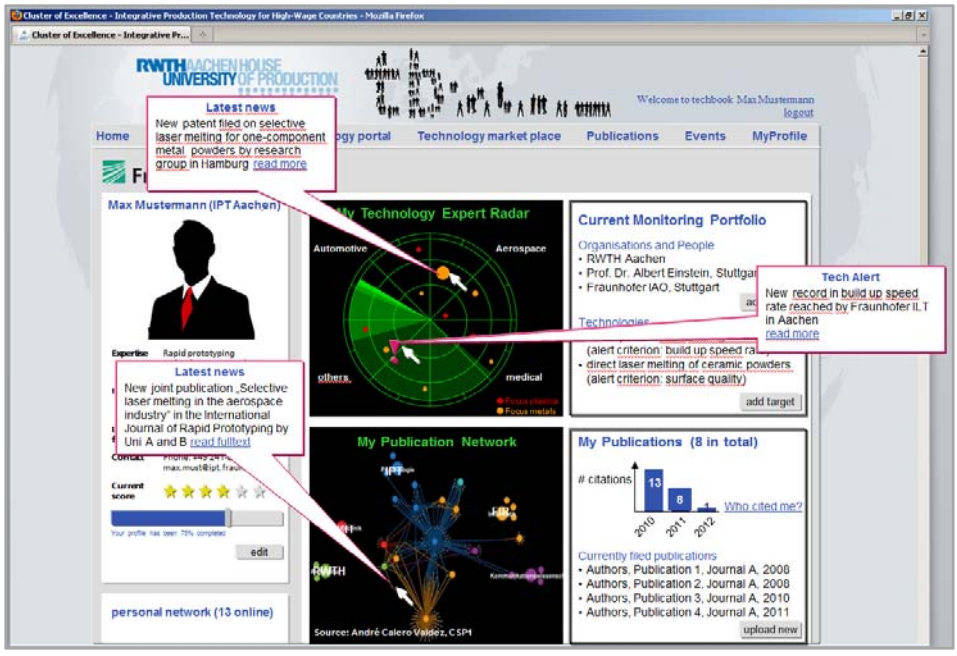

Figure 7 Vision of the social technology transfer platform

future usability of the platform depicts one of the key targets and challenges within this research project. Software development will therefore be performed in a user-centred approach. Each function should be tested by real users at an early stage of development to ensure future acceptance and ease of use. Scenario-based testing has been used as an effective way of determining non-functional requirements (e.g. data-security, code of conduct, attractive design) for social software to ensure acceptance [17]. As test cases within the cluster of excellence, serve the technology platforms, each representing an existing network of experts with a set of application and industry focused technology activities. These technology platforms bundle technologies and know-how in industry-faced platforms and serve as ideal test cases of the technology transfer platforms. Future research should also deal with a wider use of such platforms, for example to support technology monitoring activities within technology intelligence or technology evaluation through expert feedback. Furthermore integrating the monitoring activities of industrial or academic interest could support steering or performance measurement of the research cluster itself [12]. Technology transfer platforms can be regarded as a first approach to support technology management and potentially lead to semi-automated ways of conducting it.

ACKNOWLEDGMENT

The authors would like to thank the German Research Foundation DFG for the support of the depicted research within the Cluster of Excellence »Integrative Production Technology for High-Wage Countries«.

REFERENCES

[1] Abfalter, D. et. al. (2011). *Relevanz und Messung von Sense of Community im virtuellen Kontext*. Institut für Strategisches Management, Marketing und Tourismus, Universität Innsbruck. Institut für Betriebswirtschaft, Lehrstuhl für Unternehmensführung, Martin-Luther-Universität. Halle-Wittenberg

[2] Billinger, S. ; Fleisch, E. ; Friedli, T. ; Rathje, M. (2004): Combining Action Research, Grounded Theory and Case Study Research within Long-term Research Projects. Submitted at Management Decision (Special Issue on Qualitative Research Methodology)

[3] Calero Valdez, A., Schaar, A. K. & Ziefle, M. (2012). State of the (Net)work Address Developing criteria for applying social networking. Work: A Journal of Prevention, Assessment and Rehabilitation, 41, 3459-3467. ISSN: 1051-9815. IOS Press

[4] Calero Valdez, A., Schaar, A.K., Ziefle, M.: (2013) Personality influences etiquette requirements for social media - Understanding user-specific preferences for practiced etiquette and its influence on the attitude towards different social media applications in the work context. (in press). In: LNCS Springer

[5] Calero Valdez, A., Schaar, A.K., Ziefle,M., Holzinger,A., Jeschke,S., Brecher,C.: (2012) Using mixed node publication network graphs for analyzing success in interdisciplinary teams. In: AMT. pp606–617

[6] Corsten, H. (1982). *Der nationale Technologietransfer: Formen – Elemente – Gestaltungsmöglichkeiten – Probleme.* Berlin: E. Schmid

[7] Friar, J and M Horwitch (1985). The emergence of technology strategy: A new dimension of strategic management. *Technology in Society*, 7(2-3), 143-178

[8] Geschka, H. (1996). *Technologietransfer*. In: Kern, W. (ed.): Handbuch der Produktionswirtschaft. Band 7. 2. Aufl. Stuttgart: Schäffer-Poeschel

[9] http://chicagoinnovationpipeline.org [as of January 31st 2013]

[10] http://techtransfer.ima.kit.edu/ResearchToBusiness [as of January 31st 2013]

[11] http://www.ibridgenetwork.org [as of January 31st 2013]

[12] Jooss,C. et al. (2012). Scientific cooperation engineering in the cluster of excellence integrative Production Technology for High-wage Countries at RWTH Aachen University. ICERI2012 Proceedings of the 5th International Conference of Education, Research and Innovations (pp. 3842-3846). Madrid: Spain. ISBN: 978-84-616-0763-1

[13] Lewis, D. (2006). *What is Web 2.0?*, Vol.13, pp. 23-26. The ACM student Journal Crossroads. New York, USA.

[14] Liao, S (2005): Technology management methodologies and applications: A literature review from 1995 to 2003. *Technovation*, 25(4), 381-393.

[15] McKinsey (2012): *The social economy: Unlocking value and productivity through social technologies*. McKinsey Global Institute. McKinsey & Company 2012.

[16] Meißner, D. (2001). *Wissens- und Technologietransfer in nationalen Innovationssystemen.* Doctoral dissertation TU Dresden

[17] Schaar, A.K.; Calero Valdez, A. & Ziefle, M. (2012) Social media for the ehealth context. In V. Duffy (Ed.). Advances in Human Aspects of Healthcare. Section II. Communications, Systems Support and Healthcare Informatics. Boca Raton: CRC Press

[18] Schmoch, U.; Licht, G.; Reinhardt, M. (1999): Wissens- und Technologietransfer in Deutschland. Thesenpapier, Karlsruhe, Mannheim, München

[19] Schuh, G and C Haag (2006). Erfolgsfaktor Technologiemanagement. Ausgangspunkt für nachhaltigen Unternehmenserfolg. KGK Kautschuk Gummi Kunststoffe, 59(10-6), 526-529

[20] Schuh, G.; Drescher, T.; Aghassi, S. (2012). Commercialize Technology Assets Comprehensively - A Case Study for Automated Tissue Engineering. *International Journal of Science and Engineering Investigations*, 1 (10), pp. 36-48

[21] Schuh, G.; Klappert, S (eds.) (2011). *Technologiemanagement*. (series in production and management 2). Heidelberg: Springer [Available: http://dx.doi.org/10.1007/978-3-642-12530-0]