World Academy of Science, Engineering and Technology
International Journal of Industrial and Manufacturing Engineering
Vol:7, No:11, 2013

Supporting Technology Transfer with Communities and Social Software Solutions

G. Schuh, S. Aghassi

***Abstract*—**In order to bridge the gap between research and industry, promoting technology and knowledge transfer becomes increasingly important. Especially small- and medium-sized enterprises, having only little R&D resources themselves, depend on external technology development activities for remaining innovative. Academia research on the other hand needs potential industrial partners, who are capable and willing to commercialize their technologies as most public funding programs require some sort of technology transfer or dissemination activities. Modern web technologies offer more and more "social" functionalities and open up new ways of user interaction. In the past years several technology transfer platforms were developed, making use of modern web technologies in order to enable and support technology transfer. In this paper we report on the results of a state-of-the art analyses of existing technology transfer platforms, point out their advantages and deficits and give a perspective to the development of an improved technology transfer platform.

***Keywords*—**Knowledge transfer, social software, technology management, technology transfer.

I. Introduction

TECHNOLOGIES have a decisive impact on the competitiveness of industrial companies. New and emerging technologies on the one hand depict strategic business resources with great potential for the future development of an enterprise. On the other hand, emerging technologies are also one of the key threats to enterprises that established their market position resting on outdated technologies [1]. Technology management thus gained increasing attention and importance during the past years. The relevance of a structured management of technologies and technological know-how is amplified through the so called »knowledge explosion«. Technological knowledge increases exponentially and is no longer limited to high-wage countries but is increasingly generated in emerging countries as well. Due to growing digitalization and intensified networking technological knowledge becomes widely accessible. Combined with a decreasing half-life of technological knowledge, companies face the challenge to monitor their technological environment and its players continuously in order to identify threats and opportunities at an early stage and get prepared to act appropriately.

G. Schuh is withFraunhofer-Institute of Production Technology and Laboratory for Machine Tools and Production Engineering (WZL) of RWTH Aachen University, Manfred-Weck-Building, Steinbachstraße 19, 52074 Aachen, Germany (phone: +49 241 80-27404, fax: +49 241 80 22293, e-mail: g.schuh@wzl.rwth-aachen.de)

S. Aghassi is with Fraunhofer-Institute of Production Technology, Department Technology Management, Steinbachstraße 17, 52074 Aachen, Germany (e-mail:susanne.aghassi@ipt.fraunhofer.de).

The rising complexity of technologies furthermore leads to the fact, that technology development can often not be managed by one organization on its own. Especially small and medium sized enterprises, having only little R&D resources themselves, depend on external technology development activities for being innovative [2]. The development of new technologies as well as the build-up of new technological knowledge within an enterprise is therefore increasingly dependent on external sources [3]. Academia research on the other hand needs potential industrial partners, who are capable and willing to commercialize their technologies which is even fostered as most public funding programs require some sort of technology transfer or dissemination activities. Thus, technology transfer - as a part of technology management - gains more and more importance.

Modern web technologies offer more and more "social" functionalities and open up new ways of user interaction. Web Technologies and especially Social Media offer a great potential for supporting technology transfer [4], [5]. In the past years already a number of web platforms for supporting technology transfer have been established that make more or less intensive use of the described community approach. In this research paper we want to accomplish an inventory and first analysis to identify successful practices and point out the deficits of existing platforms. Based on these investigations we will elaborate a conceptual model of an enhanced technology transfer platform which will be implemented in the Aachen Cluster of Excellence. This paper of ongoing research is structured as follows. After having introduced the field of technology transfer and the followed research approach, we give an overview about the state of the art on existing technology transfer platforms and modern Web 2.0 technologies. The second part of this paper deals with a first concept of a "social" technology transfer platform that will be developed in the cause of this research project. Finally we draw a conclusion and give an outlook on further research, planned within this project.

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 [6]. The technology platforms of the CoE integrate product-related, manufacturing-related, material-related, processing-related as well as management-related topics. The starting configuration of the technology platforms in the Aachen Cluster of Excellence includes seven technology platforms, such as "Integrated Computational Material and Production Engineering", "Integrative Light Weight Engineering" or "Photonics Production". The technology platforms consolidate both, unique technological and application know-how as well as the corresponding experts and thus depict an excellent development surrounding 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.

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 analyzed 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 analyzed 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

Our research on supporting technology transfer via web-based platforms has to be approached from two directions: first of all, on the basis of technology and knowledge transfer insights, existing technology transfer platforms have to be identified, clustered and analyzed in order to reveal their advantages and deficits. These analyses should also be extended to other web-based portals, such as scientific network sites, open innovation portals etc. in the future. In order to get an overview about the technical possibilities of modern web technologies these should also be looked at from a generic perspective to open up the full range of possible social software technologies that might be adequate for supporting technology transfer.

A. Technology and Knowledge Transfer

The common understanding of technology transfer underwent significant changes in the past years. Starting from linear models focusing on the transfer of technologies that are produced by academia and consumed by industrial companies it was extended with an additional aspect of knowledge. At the same time the linear process model gave way in favor of a bidirectional process [3], [7]. The basis for the linear model in the past is built on the assumption that the main hindrance for innovation lies in a dissymmetry of knowledge and information between academia and industry. In order to bridge this gab, various technology transfer establishments were initiated. However, their effectiveness is still subject to ongoing discussions [3].

In literature there exist several definitions of technology transfer. GESCHKA defines technology transfer as "… the transfer and application of technological knowledge and know-how from one field of application to another" [3], [7].

CORSTEN defines technology transfer as " a planned, timely limited and voluntary process of transferring a technology inter- as well as intrasystematic …" and additionally points out, that technology transfer is only sensible when the actual degree of usage of a technology is smaller than its potential degree of usage (NGeff<NGpot), which makes technology transfer a means to an end [8]. However, this disparity in the degrees of usage has to be made visible in the first place.

In order to enable and support the inter-organizational transfer of technologies and technological knowledge, the specific transfer situation has to be analyzed. For a detailed characterization of the technology transfer situation the following elements have to be defined:

- Which phase of the technology transfer process is currently in focus?
- What is the object that should be transferred?
- Who are the involved parties in technology transfer?

In the following paragraphs, these elements will be shortly introduced. For a detailed description of the constituting elements characterizing the specific transfer situation reference may be made to [3], [6], [8].

1. Technology Transfer Process

The process of technology transfer aims at transferring a technology or technological knowledge from a technology provider to a technology consumer in a focused and planned manner. The process of technology transfer can be divided into distinct phases of which you find various definitions in literature. CORSTEN uses a linear model consisting of four sequential phases to describe the process of technology transfer [8]:

- The *searching phase*, starting with the general decision in favor of technology transfer and ending with contacting a certain transfer partner. Main task of the technology provider in the searching phase is to find an adequate technology consumer. The consumer on the other hand has to pre-select the available technologies and find an appropriate technology provider.
- The *negotiation phase*, starting after the searching phase with an established contact between the technology provider and consumer and ending with the successful completion of the contract negotiations.

- The *realization phase*, starting after successful contract negotiations and ending with the implementation of the technology at the technology consumer.
- The *utilization phase,* comprising the continuous use and marketing of the transferred technology.

HOFSTETTER in his phase model further differentiates the searching phase into the two phases of transfer planning and the selection of the transfer partners [9].

Most process phase definitions that can be found in literature have in common, that the process of technology transfer needs some sort of a preparation phase which is mainly characterized by getting transparency of possible transfer partners and objects. In the second phase, when partners and transfer objects have been identified, the preparation and negotiations of technology transfer take place. Having found an agreement, the realization and after-treatment phase follows. These generic phases also correspond to KERN, whose three phases of technology transfer (search phase, transfer phase and market phase) make up the basis for the following phase model descriptions of technology transfer [8], [10].

Although most of the phase models describe linear process steps, the technology transfer process is a bidirectional process. Producers of technological knowledge more and more realize the necessity to become learning organizations and start implementing this in their organizational structure and management [3]. In this research project we focus on the early phases of technology transfer as a bidirectional process, as these show the highest potential for a benefit of web-based technology transfer platforms.

2. Transfer Partners

Technology transfer is carried out from the technology provider or producer to the technology consumer. Sometimes there are also transfer mediators involved that support the transfer process especially in the early phases. Technology producers are public research institutes and universities, private research institutions and industrial companies [3].

Technology consumers are mainly existing or new industrial companies that exploit the technologies in existing or emerging business sectors. Research institutes can also be technology consumers, e.g. in order to drive the further development of a technology from fundamental research to the next development stages [3].

In the past years, more and more technology transfer establishments were initiated, mainly driven by the national governments or universities. These technology transfer organizations often take the role of a transfer mediator and support the technology provider and consumer in the different phases of the technology transfer process.

3. Transfer Objects

Transfer object can either be the technology itself (materialized technology) or explicit as well as implicit technological knowledge [3]. Very often technology transfer mainly includes implicit knowledge that cannot be codified which makes it also hard to transfer. One of the main challenges in technology transfer is therefore the overcoming and management of interfaces [3].

The transferability of certain transfer objects does mainly depend on their specific characteristic. These characteristics can either be technology-specific (such as the complexity or communicability of the technology) or situation-specific (such as the compatibility or the relative benefit of the technology) [8]. The particular specifications in these characteristics usually have direct impact on the transferability and mode of presentation of the corresponding transfer object.

B. Communities and Social Networks

A prominent challenge in the context of technology transfer is the selection of appropriate transfer respectively cooperation partners. An innovative approach to supporting technology management and especially the early phases of technology transfer presents the concept of social networks and communities. Existing social networks are hereby enhanced by virtual communities. A community is understood as a group of legally independent participants pursuing a common goal [11]-[14]. Central aspect is the creation and sharing of services through communication and interaction via web 2.0. technologies, such as chats, blogs, alerts, social links and many more. The content and functionality of a community builds trust and thus loyal bonds between its participants and their services. Through the community functions various tasks can be accomplished, such as knowledge exchange, expert access and more.

For several years, especially in the private sector, various forms of social networks and communities are entering the market (e.g. Facebook, Flickr, Twitter etc.). A study by the McKinsey Global Institute from the year 2012 80% of all home Internet users are registered and active on a social network [15]. These social networks promote different ways of communication between their members. Especially young users have a lot of expertise in dealing with these new media, which generally aim at private knowledge sharing with friends or unknown people in the network. This new form of knowledge exchange and dissemination proves to be an effective and efficient tool for innovative cooperation between people, regardless of time or place. Beyond private use, companies have also long recognized the value of social technologies for their own business. The previously referenced study by the McKinsey Global Institute reported approximately 70% of all questioned companies to use social media. Of this, 90% of respondents said they had reached tangible success through the use of social media [15].

The fields of application in an enterprise context are diverse and range from technology and product development to marketing and sales. Besides its use within one organization social networks and communities offer the perspective to enable and deepen inter-organizational cooperation and communication between different companies and organizational units. Especially the support of inter-organizational technology transfer offers a promising hunting field for social networks and communities (see next chapter).

With the increase of users of social technologies and

especially communities, the use of crowdsourcing in the corporate environment also gets more likely. In general, in the concept of crowdsourcing communities serve as a resource and source of information in the business value chain: Papsdorf describes crowd sourcing as a strategy of outsourcing a usually non-gratuitous service provided by an organization or individual by means of an open invitation to a mass of unknown actors [16]. In this context, crowdsourcing can be used as part of technology management and technology transfer in communities in order to get (expert) feedback and information on new technological developments and integrate it into the development process. The network of the community also allows to address a broad audience, so that relevant user groups and potential key markets for emerging technologies can be identified at an early stage. Social networks and communities can therefore contribute to transparency about technologies and technological experts making them accessible via a web-based social platform.

C. Web 2.0 and Social Software

Web 2.0 is a revolutionary step forward, where users can access content from a web site and contribute to it by participating, creating and sharing contents. It changed the methods of interaction, styles of development and sources of contents [17]. With the development of Web 2.0 technologies and especially social software, web applications nowadays offer comparable interactivity to most desktop applications. The speed of interaction and information flow is one of the enablers for dynamic content, which is an "…important force behind Web 2.0. Information can be gathered from multiple sources in real time and assembled on a single Webpage" [17]. Thus, Web 2.0 facilitates and provides flexible web designs with rich and responsive user interfaces.

Central aspect of Web 2.0 is the communication and relationship of users within the network. The term social software in this context comprises web-based applications that support individuals in exchanging information, building relationships and communicating in a social context [18]. According to KAPLAN and HAENLEIN, in digital social networks the term user-generated content is commonly used to reflect the concept of social media or social software as "a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0 and that allow the creation and exchange of user-generated content" [19]. Developers are enabled to create new desktop-like applications by reusing and combining different data on the web or by combining information from different dynamic sources. Thus, creating social networks of people with common interests who might be at different geographical locations through mostly asynchronous contribution channels.

Besides its ideological perspective, Web 2.0 stands for a bundle of technologies which cannot all be named in this place. As a prominent example, AJAX facilitates and enriches the user interface, making it highly interactive and more responsive by "exchanging small amounts of data with the server so that the entire Webpage doesn't have to be reloaded each time the user requests a change which would increase and improve the overall Web page's interactivity, speed, and usability, making it easier to deploy rich client Web applications" [20].

D. Technology Transfer Platforms

1. Overview and Development

In the past years, modern web technologies and social software opened up new possibilities to support the inter-organizational transfer of technologies via web-based transfer platforms. A number of sites have been established since. Fig. 1 shows a selection of existing platforms together with some of their key figures.

Type	Name	Year of foundation	Operator	Number of technologies
Cluster I	iBridge Network[1]	approx. 2005	Kauffmann Innovation Network, Inc.	18,296
	flintbox[2]	approx. 2003	Wellspring Worldwide Inc.	14,902
Cluster II	Easy Access IP[3]	2011	Kings College London	31
	Enterprise Europe Network[4]	2008	European Commission	12,269
	Swiss Technology Transfer Association[5]	2003	Bridge Plus AG	147
	Chicago Innovation Pipeline[6]	2010	University of Chicago	68
	yet2[7]	1999	yet2.com Inc.	4,612
	UMIP[8]	2011	University of Manchester	96
	Tynax[9]	2003	Tynax Inc.	1,257
	University Technology[10]	2004	University Technology consortium	50
	Massachusetts Technology Portal[11]	2003	University of Massachusetts	3,230
Cluster III	KIT Technology-market[12]	2011	Karlsruhe Institute of Technology	65
	Office of Cooperative Research[13]	1982	Yale University	161
	Technology Transfer at Penn State[14]	2011	Pennsylvania State University	224

1: http://www.ibridgenetwork.org
2: http://www.flintbox.com
3: http://www.easyaccessip.org.uk
4: http://portal.enterprise-europe-network.ec.europa.eu
5: http://www.switt.ch
6: http://chicagoinnovationpipeline.org
7: http://marketplace.yet2.com
8: http://umip.com
9: http://www.tynax.com
10: http://www.university-technology.com
11: http://www.masstechportal.org
12: http://techtransfer.ima.kit.edu/ResearchToBusiness/
13: http://www.yale.edu/ocr/searchTechnologies
14: http://www.research.psu.edu/techtransfer

As of January the 19th, 2013

Fig. 1 Overview of existing technology transfer platforms (own collection, January 2013)

Most of the existing technology transfer platforms were established and are run by a university or university network. All platforms comprise of functions, allowing technologies or technological knowledge to be displayed, described and offered to interested consumers respectively potential transfer partners. Most of the investigated platforms provide the contact points to the inventors, technology owners or involved transfer mediators and some even go further and support the actual transfer via predefined licensing forms and workflows. The way in which technologies are presented on the platforms varies from very structured approaches, including a short description, the technology readiness level and possible fields of application to flexible forms, leaving more freedom to the technology provider. Furthermore, the considered platforms show a differing range of application. Whereas some merely focus on technology transfer, others have a wider spectrum, such as the brokering of project partners or funding programs.

2. Classification Scheme

In order to analyze, describe and understand the existing technology transfer platforms, they are evaluated according to two dimensions: their openness to different user types and their level of social media integration. Openness in our context can be described as the level of accessibility. It describes the types of users allowed to make use of the platform as technology provider or consumer. To depict openness, two different extremes can be defined. One is a platform open to any users, private or professional, affiliated to an organization or none. The other extreme depicts a more or less closed platform, that comprises only technologies of the operating organization(s). The second dimension social media integration describes the degree in which social functions such as user profiles, interpersonal communication channels, user-specific newsfeeds, visualization of relationships or communities are integrated into the platform and offered to its users. This allows the grouping of the analyzed platforms into three clusters, out of which we present one representative in more detail (Fig. 2): The ibridge network for an open platform with medium social media integration (cluster III), EasyAccessIP for a more limited platform with low-to-medium social media integration (cluster II) and the KIT Market Place as a representative of closed technology transfer platforms with no social media integration at all (cluster I).

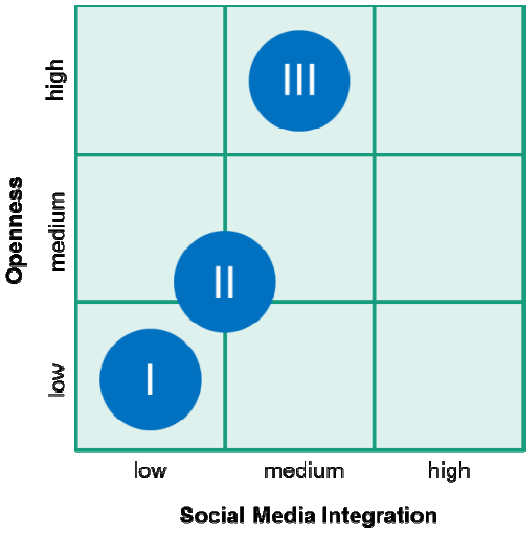


Fig. 2 Classification of technology transfer platforms

In the following paragraph we present three of the analyzed technology transfer platforms in more detail, as they depict representative examples of the different platform types respectively platform clusters.

3. Selected Example Platforms

Representing cluster I (see Fig. 2) the *KIT Technology Market* (Karlsruhe Institute of Technology) will be introduced as an example. The platform was founded in the year 2011 with the aim to simplify partnerships between the KIT with his over 150 institutes and the economy and to accelerate knowledge transfer. The licensee of the platform is the KIT itself. Users of the platform are the institutes of the KIT who appear as the technology providers and economic actors, representing potential technology consumers. The platform comprises several functions simplifying navigation. For example all of the listed technologies are attributed to one of five different technology fields, such as materials and nanomicro or applied life sciences. Furthermore, a specialized search function and a tag cloud eases the access to technological offerings. Every offer is linked to a patent, if existing. Additionally to the free technology transfer functions on the platform, the KIT offers non-gratuitous participation in the business club, representing a communication and networking platform, which provides VIP access to the knowledge and services of the KIT.

As a representative of cluster II (see Fig. 2) Easy Access IP will be exemplified. The main target of Easy Access IP is very similar to the KIT Technology Platform Research to Business: simplifying partnerships between research and business and accelerating the knowledge transfer of the participating research organizations. It differs from representatives of cluster I and III especially by the grade of openness. Licensers of the platform are solely the participating universities and companies. As Easy Access IP is focused on technologies, that are difficult to commercialize through traditional ways, the presented technologies are licensed for free to Easy Access IP partners. The limited functions of the platform itself are

enhanced by the collaboration with the iBridge Network, which is described in the next paragraph.

Representing the last cluster III (Fig. 2), the technology transfer platform iBridge Network is a meta-platform, additionally comprising technologies that were uploaded or offered on other technology transfer platforms. It 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. The provider of iBridge is the Kauffmann Innovation Network, Inc. and the commission for licenses depends on the nationality of the organization. It is free for citizens of the United States and costs a small fee for users from other countries. It supports the possibility to get into direct contact with the offering organization. Main users of the platforms are organization like universities or enterprises, but even individuals can take advantages of participation. An additional characteristic of iBridge Network is the integration of selected social media functions. The user can create a profile with an individual newsfeed, which automatically generates news of subscribed communities, themes or technologies. Also communities can be founded and joined by the participants.

E. 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 analyzed 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 hypothesis 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 focuses on academically driven technology transfer platforms and has to be extended to commercial ones in the future. Furthermore it should be extended to related social web-based portals, such as scientific network sites and open innovation platforms in order to identify their potential for a support of technology transfer and include these in the analyses.

IV. Concept of the Technology Transfer Platform

In the following paragraphs, a draft concept of the technology transfer platform is introduced. The here presented results are not very detailed yet, but give a first impression about how the platform will be developed. Furthermore, the key questions are raised that will have to be answered in the next steps of ongoing research.

A. Requirements for Portal Support

Based on the above described literature analyses on technology transfer the analysis of existing platforms as well as additionally conducted interviews with potential future users, the following functional requirements on an improved platform concept could be identified:

- Presentation of comprehensive information on technologies or technological know how
- Presentation of users and their expertise via profiles
- Efficient search mechanisms for fast access to information
- Semi-automated information retrieval based on user preferences
- Technology- or application specific clustering of information
- Communication via synchronous and asynchronous channels
- Private and public communication channels and spaces
- Formation of interest groups concerning different fields of application or technology
- Rating of users and technologies
- Enhanced (judicial) support of technology transfer process (licensing agreements etc.)
- Visualization of monitored technology fields
- Visualization of user participation and relationships

In the next step these requirements will be detailed, clustered and supported by further interviews with potential users, especially from the industrial point of view. Additionally, nonfunctional requirements have to be analyzed.

B. Overview of the Platform Concept

A holistic model of a technology transfer platform with the underlying expert communities should be developed, that supports the specific tasks of technology transfer via corresponding platform functions. As an example of these "task-function tuples" one can mention the semi-automated monitoring of future relevant technologies through technology-specific alerts which users can subscribe to. Having defined the user- and technology-specific alert criteria in advance (e.g. the performance parameter of a specified technology), each user will be notified as soon as his alert criteria have been met (e.g. significant increase of the performance of the specified technology).

Transparence as an enabler of technology transfer should be achieved through a technology specific platform structure as well as user profiles indicating each users technological expertise and interests. Modern techniques of network visualization offer the opportunity to get a quick overview about the relevant fields of technology and the experts occupied in this field.

Fig. 3 shows a sketch of the overall platform concept, possible user interactions and roles.

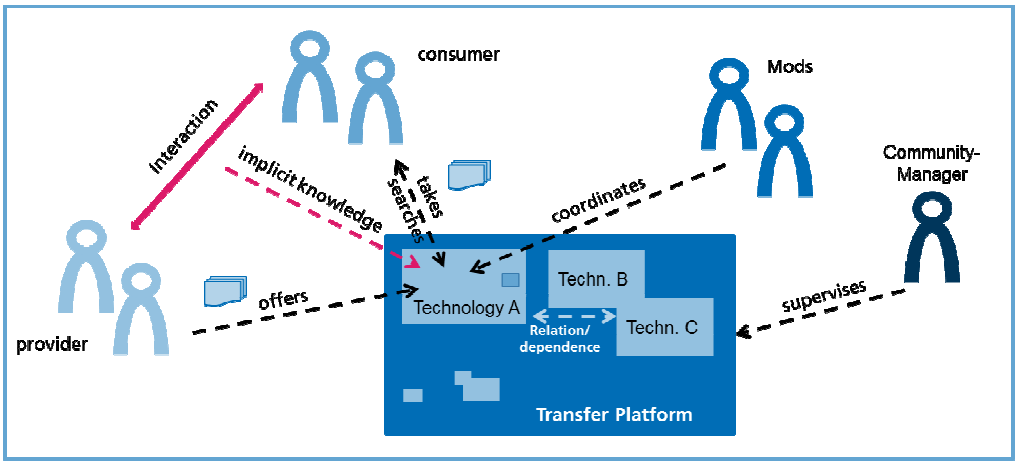


Fig. 3 Draft concept of the technology transfer platform

The technology transfer platform assembles different users who can take various roles. The platform depicts a place where providers and consumers of technologies or technological know-how can meet and exchange their knowledge and ideas. Technologies and technological expertise can be presented via the platform and challenged among the other users. The discussions take place in a technology-specific structure and are coordinated by the moderators, which can be experienced users themselves. In order to stimulate and supervise the platform activities, a community manager must be put into place. Through the technology-focused interaction of the expert users, implicit knowledge will be generated. The community manager should also make sure, that this knowledge is stored in an accessible way on the platform and linked to the corresponding technology.

Referring to the above introduced classification scheme (see Fig. 2) the platform developed within this research project is aimed to be positioned in a fourth cluster of platforms with a medium to high level of openness and a high level of social media integration.

C. Elements of the Platform Concept

For developing the draft concept of the technology transfer platform, the following elements have to be defined and elaborated: Transfer objects, users and roles, services, technical functions, financing and incentive system and the code of conduct.

1. Transfer Objects

Which objects are to be transferred via the platform and how should they be clustered? How should technology transfer objects be presented on the platform? What is the fitting level of detail for presenting technologies on the platform?

2. Users and Roles

Who will be the users of the platform and what roles can they take? What role based permissions should the different user types have? What kind of "user career"-system should be holding by the platform?

3. Services and Technical Functions

Which services is the platform going to offer and with what technological functions can these services be implemented? What is the right balance between offering enough and valuable functions to the users and overloading the platform with superfluous offers?

4. Financing and Incentive System

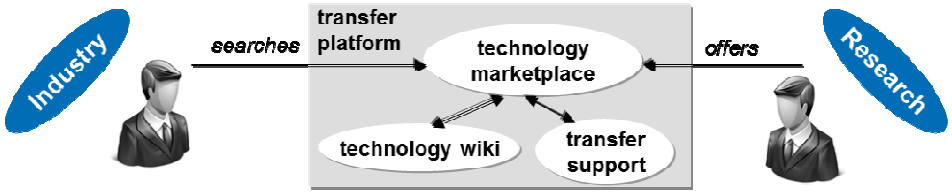
How is the operation and future development of the platform financed? How will the users of the platform (i.e. the technology experts and consumers) be incentivized to take an active part in the platform and to offer their technologies and part of their technological know-how? Corresponding to the above mentioned role system; an incentive system has to be build up that motivates each potential member of the community through the establishment of appropriate added value to activity and involvement in the community.

5. Code of Conduct

What are the basic rules and elementary directives of the platform? What are the "Dos and Don'ts"?

D. Implementation

The next step towards implementation will be the detailed identification and elaboration of user requirements. Based on this requirements analyses the above described draft concept is going to be detailed. The main functions of the platform will be described in detail via generic use cases. Fig. 4 shows an example use case of the technology market place.



User	Technology consumer (e.g. Company)
Initial situation and objective	Company is look ng for technology for n-l censing
Functions	Market place, Technology-Wiki
Alternative path	Patenttraders, Transfer society / company, personal network, trades and faree
Benefit for user	Time saving, proactive search for relevant technologies
Benefit for transfer platform	Gained nformation, commission if transfer successful, user loyalty, expert contact

User	Technology provider (e.g. scientist, research nstitute, University)
Initial situation and objective	Scientist look ng for partner from insdustry for commercializat on of developed technology
Functions	Market place, Technology-Wkl
Alternative path	Patenttraders, Transfer society / company, personal network, trades and fares
Benefit for user	Time saving, extended target group, eff cient and flexible allocat on
Benefit for transfer platform	Gained information, commission f transfer successful, user loyalty, expert contact

Fig. 4 Possible use case of technology transfer platform

With the help of the use cases and prototypes (in the first place non-functional mock-ups, later functional prototypes) future users can get actively involved in the early platform development in order to assure future usability and user acceptance of the platform. The technology experts and scientists from the cluster of excellence as well as external interested partners will serve as test users and will be included into research and development of the platform.

V. Conclusion and Further Research

Within this research paper it could be shown, that there are promising approaches in supporting inter-organizational technology transfer via web based platforms. However, the state-of-the-art analysis of existing platforms revealed room for improvements that could be filled by a higher degree of social media integration. A draft concept of a technology transfer platform was presented, showing the key elements that have to be defined and the key questions that have to be answered in order to develop an improved and user-centered platform.

The presented approach in this paper serves as a first framework for further research. The analysis of existing technology transfer platforms should be widened up to other related fields of research, e.g. open innovation platforms and scientific network sites. These should be analyzed for their analogies and potential support functions of technology transfer. The conducted interviews form a starting point for a detailed identification and analyses of the requirements of future users. As the first part of the interviews mainly concentrated on potential users from an academic point of view, the further requirements analyses should emphasize the industry perspective. Based on this more detailed state of the art and requirements analyses, the draft concept of the technology transfer platform must be further detailed. The elements of the platform should therefore be elaborated on their own as well as their interdependencies. In order to foster technology transfer of the cluster of excellence, a software prototype will be set up, supporting a continuous, bi-directional and technology-based exchange between research and industry. Bundling information and ensuring fast access to this information will be one of the core tasks of the transfer. It will provide a discussion forum and meeting point for technical communities as well as information on the different technology platforms which shall be used for internal and external communication. To enlarge the knowledge reservoir and to link new technological findings of the cluster of excellence with existing knowledge, further external data sources might be connected to the software platform. The transfer function of the platform requires that internal as well as external users can search for technological information passively or can contribute relevant content actively. Ensuring future usability of the platform depicts one of the key targets and challenges within this research project. Software development should therefore be performed in a user-centered approach, such as the DIA cycle. Each function should be tested by real test users as early as possible to ensure future acceptance and use. As test cases within the cluster of excellence, the technology platforms, each representing an existing network of experts with a set of application and industry focused technology activities. These platforms bundle technologies and know-how in industry-faced technology platforms and serve as ideal test cases of the technology transfer platform.

Future research should also focus on the wider use of such platforms, e.g. for supporting technology management.

Technology transfer platforms, comprising top experts in various technology fields depict a promising technology to support technology management, especially technology forecasting, evaluation and exploitation. A community-based approach to technology management should be the vision, to which technology transfer platforms present a first step.

ACKNOWLEDGMENTS

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«. In addition, we would like to thank the research assistants of the technology platforms within the Cluster of Excellence as well as our interview partners from industry for their support of the concept phase in platform development.

REFERENCES

[1] 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]
[2] 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
[3] Meißner, D. (2001). Wissens- und Technologietransfer in nationalen Innovationssystemen. Doctoral dissertation TU Dresden
[4] Leupold, M. (2010) Technologietransfer im Web 2.0 – Wie das Wissen heute in die Welt kommen kann. In: Wissenschaftsmanagement 1, Januar 2010
[5] Czarnitzki, D.; Eckert, T.; Egeln, J.; Elschner, C. (2000): Internetangebote zum Wissens- und Technologietransfer in Deutschland – Bestandsaufnahme, Funktionalität und Alternativen, ZEW Wirtschaftsforschung, Mannheim
[6] Brecher, C. (ed.) (2012). Integrative Production Technology for High-Wage Countries. Berlin, Heidelberg: Springer
[7] Geschka, H. (1996). Technologietransfer. In: Kern, W. (ed.): Handbuch der Produktionswirtschaft. Band 7. 2. Aufl. Stuttgart: Schäffer-Poeschel
[8] Corsten, H. (1982). Der nationale Technologietransfer: Formen – Elemente – Gestaltungsmöglichkeiten – Probleme. Berlin: E. Schmidt
[9] Hofstetter, S. (1990). Technologietransfer als Instrument zur Förderung von Innovationen in technologieorientierten Klein- und Mittelunternehmungen. Doctoral dissertation at University St. Gallen. Bamberg: difo-druck
[10] Kern, W. (1996): Handbuch der Produktionswirtschaft. Band 7. 2. Aufl. Stuttgart: Schäffer-Poeschel
[11] Hartleb, V. (2009). Brand Community Management. 1. Auflage, Wiesbaden: Gabler
[12] Loewenfeld, F., Herrmann, A., Rösger, J., Heitmann, M. (2008): Brand Community – Definition, Theorien und empirische Befunde. In: Bauer, H. H.; Huber, F.; Albrecht, C. (eds.): Erfolgsfaktoren der Markenführung – Know-How aus Forschung und Management. München: Vahlen, S. 97-117
[13] Hagel, J.; Armstrong, H. A. (2006): Net Gain. Heidelberg: Redline GmbH
[14] Abfalter, D. (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
[15] McKinsey (2012): The social economy: Unlocking value and productivity through social technologies. McKinsey Global Institute. McKinsey & Company 2012.
[16] Papsdorf, C. (2009). Wie Surfen zu Arbeit wird: Crowdsourcing im Web 2.0. Campus Verlag.
[17] Lewis, D. (2006). What is Web 2.0?, Vol.13, pp. 23-26. The ACM student Journal Crossroads. New York, USA.
[18] Hippner, H. (2006) Bedeutung, Anwendungen und Einsatzpotenziale von Social Software. HMD 252, 43. Jahrgang, Dezember 2006
[19] Kaplan A. M., Haenlein M. (2010). Users of the world, unite! The challenges and opportunities of social media, Business Horizons, Vol. 53, Issue 1 p. 61
[20] Murugesan, S. (2007). Understanding Web 2.0, Vol.9, IT Pro July/ August pp. 34-41.

Prof. Dr.-Ing. Dipl.-Wirt. Ing. Guenther Schuh studied mechanical engineering and economics at the RWTH Aachen from 1978 until 1985. He received his doctorate in 1988 following his research fellowship at the WZL, where he was also head engineer until 1990, under Professor Eversheim. He lectured manufacturing economics and industrial management at the University of St. Gallen (HSG) from 1990 until becoming Professor for Economic Production Management and co-director of the Institute for Technology Management in 1993. He also founded the GPS Group in Wuerselen, St. Gallen and Atlanta. Professor Schuh succeeded Professor Eversheim in September 2002 as Chair of Production Systems at the RWTH Aachen and as co-director of the WZL and the Fraunhofer IPT in Aachen. Professor Schuh was awarded the Otto-Kienzle Memorial Coin by the Scientific Society for Production Technology in 1991. He has often been commended for his scientific work at the Swiss Technology Competition. His most important research work includes various methods and instruments related to complexity management, resource-oriented process cost calculations, participative change management and the virtual factory concept. Professor Schuh is also a member of several boards of directors and councils and Deputy Headmaster for industry and economics of the RWTH Aachen.