Supporting Sustainable Development in Rural Areas by Encouraging Local Cooperation and Neighborhood Effects using ICT

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Abstract

The following paper presents an approach how information and communication technology (ICT) can be used to support local cooperation and neighborhood effects. The presented approach maps typical real-world processes in the area of local cooperation between stakeholders from schools, universities and companies to an Internet platform with the motivation to support the communication between the aforementioned audiences and thereby reduces demographic problems in the model area in a sustainable, long-time perspective. The paper describes the process from the conceptual application of the idea as well as the prototypical realization of the technical prototype *vitaminBIR*. This encompasses, from the conceptual perspective, the definition of the main goals of the platform supported by a survey collecting needs and preferences of all addressed audiences and the conceptual phase of the platform itself. Furthermore, from the implementation perspective, the prototypical implementation supported by different software libraries, a concept for data self-management, and an iterative usability study to also check against the prior evaluated needs and preferences of the audiences, is addressed.

1. Demographic Problems in Rural Areas in Europe

The emigration of young people to the bigger cities and the brain drain related with this fact [1], [2] as well as the general aging of the society [3], are big demographic problems especially in rural areas in Germany, and in other European countries, nowadays [4]. Companies observe a shift from a “buyer’s market” to a “seller’s market” regarding employees for open position [5]. Local authorities need to handle the population loss on several levels, e.g. spatial development [6], cultural development [4], or tourism and leisure activities [7]. For these reasons, it is apparent that strategies for the sustainable development, especially for rural areas, need to be found. An important aspect hereby is to show up young people the potentials of their hometown and region [8] and related with this, the possibilities for qualifications and jobs. As job search and recruiting is usually intrinsically motivated by people and companies, we want to present a community-based approach to encourage all persons involved to cooperate in that matter with an intended advantage for both parties.

2. Supporting Local Cooperation and Neighborhood Effects using ICT

The approach presented in this paper mainly focuses on the idea to support local cooperation and neighborhood effects by information and communication technology (ICT), in particular by providing an interactive Internet platform. In detail, our goal is to map typical real-world processes of local cooperation and neighborhood effects, i.e. interactions between people from different involved audiences, e.g. schools, companies etc., to an ICT system. Therefore, we focus on (1) an easy understandable transfer of the real-world processes to the navigation structure of the system to achieve a good ease of use, (2) a screen and information design that is attractive for all involved audiences, (3) a high level of information quality that ideally exceeds the expectations of the user,

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and (4) a mainly self-managing system to reduce runtime service costs. All information provided in the system is, by concept, restricted to information that follows the guideline to work against the aforementioned demographic problems, e.g. job offers only from companies inside the specific local area, educational events provided by the local university, etc.

2.1. Conceptual Application

As part of the pilot project *LandZukunft* we apply the described approach on the cooperation processes of audiences in the District of Birkenfeld in Germany. The pilot project *LandZukunft*, which is funded by the German *Federal Ministry of Food and Agriculture*, focuses on the sustainable support of rural areas during their endeavor to develop regional value chains and protect local jobs. While applying the presented approach, we focus on the processes of cooperation of schools, universities and companies on the organizational side, as well as the neighborhood effects between pupils, students and human resources departments of local companies on the social side. By supporting these audiences and the restriction of the information on the platform to a specific local area, we specifically follow the concept to reduce emigration of young people as well as the mentioned brain drain. When we are successful in this, we expect to have positive impact on the sustainable development of the appropriate local area. With the application described in the following, we furthermore plan to create a solution that can be transferred to other rural regions with similar problems, after a successful prove of our approach in the District of Birkenfeld. Since *LandZukunft* is a pilot project, this transfer of knowledge and technology is also one of the main concepts of the funding.

It is proofed that peer networking has (1) a high impact on the job search or recruiting and its factor of success for students as well as for companies and that (2) these neighborhood effects can be supported by ICT [9]–[11]. Therefore we decided to design an Internet platform, which supports these peer networking aspects with the goal to help pupils and students to find good apprenticeships and jobs in companies near their hometown as well as companies to find appropriate job candidates. To round out the general idea, the platform also encourages offering and searching for side jobs between pupils and students among themselves, e.g. private tutoring. On a higher organizational level, the platform motivates company leaders and human resources authorities as well as headmasters of schools to find and agree to long-term partnerships. Long-term partnerships in this context can be partnerships between schools and companies with periodic practical events, workshops as preparation for apprenticeships, or appointments for networking between pupils and companies. Also practical events or job fairs organized by a university in collaboration with companies etc. belong to this category. Summarized, we offer a platform to encourage different audiences to long-term cooperation between each other. We expect that these changes lead to positive demographic effects and with this a reduction of brain drain to bigger cities as well as to positive effects regarding the other connected aspects already mentioned, e.g., spatial development, cultural development etc.

In order to identify the processes that should be supported by the platform as well as the information required by the audiences for the same, we conducted a paper and web based survey before we started into the conception phase. The survey (survey data: n=304, 138 pupils (μ=16.64 years), 150 students (μ=26.23 years), 16 company representatives) was, in the beginning, prepared as one generic questionnaire for all audiences and afterwards elaborated as three different versions for the specific audiences. That way, we were able to create questionnaires optimized for each audience on the one hand regarding language, e.g., youth or business language, and question selection, e.g., by adding additional questions for specific audiences. On the other hand it enabled us, to relate the answers on specific question between the audiences, e.g., regarding expectations of responsibilities or preferences of specific audiences on the same topic. The survey results enabled

us to gain an objective perspective on the steps that are seen as most relevant to be supported by such a platform, to be able to give them a higher importance in the platform concept, e.g., the expectations of all audiences from which side a communication regarding an open job position should start[2]. With these results we can especially support the preferred steps on the platform. Beyond this, we determined the information that is required and expected by the users of the platform to support the aforementioned steps, e.g., which information companies expect from applicants when applying for an open position[3]. Additionally, we identified some technical preferences by the survey, e.g., if the users want to use existing or separately created user accounts to access the personalized or private sections of the platform[4].

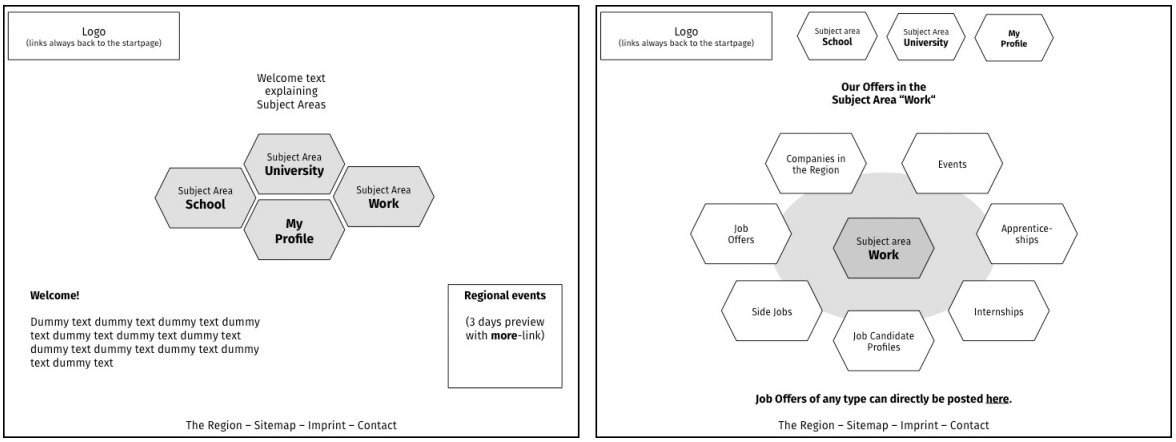

Figure 1: Concept draft of the Homepage and the Subject Area "Work" of the Internet platform. (Translated from German.)

Based on these survey results, we elaborated the first concept for the Internet platform, which can be seen as first screen design concept above (see Figure 1). The concept follows a combination of a target group and intention based navigation approach. That way, the information a user is searching for on the platform, can be found in not more than two mouse clicks. If possible, the user can also find the information without giving any personal information in advance, i.e., it is not necessary to request user information to provide the information. Summarized, users from all audiences can come to a page containing the relevant information with only two clicks and will, if is is appropriate for the particular information, be able to filter the given information to find the best-fitting results afterwards. An additional top menu supports direct navigation over all pages for returning, experienced users who want to skip the two-step process. The screen design concept drafts showing the exemplary results page of a two-step process of a student searching for a side job offer as well as the top menu can be seen in the following (see Figure 2). By focusing on the aforementioned two-step process while developing the concept, we hope to reduce the bounce rate[5] to a minimum.

[2] The majority of the participants over all audiences expect the applicant to contact the company, not vice versa. Survey result excerpt: Students: 54,4%: applicant contacts company, 36,2%: no preference; pupils: 6,2% applicant contacts company, 68,2%: no preference; companies: 68,8%: applicant contacts company, 25,0%: no preference

[3] Most relevant information from company perspective as evaluated by the survey: Name, residence, age, motivational letter, employment type, branch, earliest starting date, language knowledge, photo

[4] Survey results: All audiences prefer the creation of own accounts instead of reusing existing Facebook, Twitter, Google, Microsoft or XING accounts.

[5] The bounce rate is the number of users leaving a platform directly after the first page view.

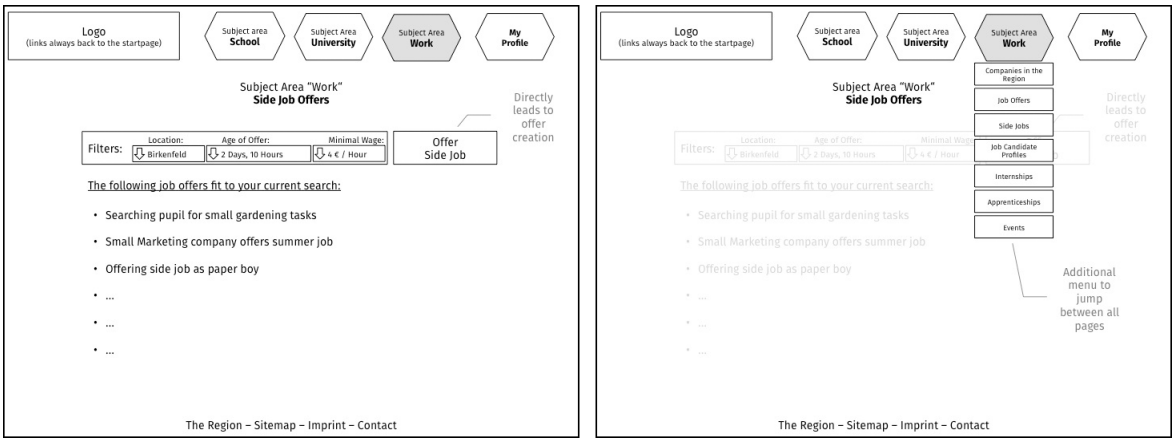

Figure 2: Concept draft of a results page with filter and the additional top menu on the platform. (Translated from German.)

2.2. Prototypical Implementation

Our prototype, *vitaminBIR* (www.vitamin-bir.de), is developed as interactive Internet platform based on the content management system *TYPO3* for easy content management and own extensions to provide specific interactive components on the platform, which directly support the use cases addressed. On the one hand, when designing *vitaminBIR* a major aspect of our technical concept was also a self-managing design, to reduce management effort for the developed platform to a minimum. On the other hand, we always focused on simplicity and low entry barriers for all involved audiences to motivate the users to use the cooperation features provided by the platform. This process is also supported by an iterative usability and adaption cycle before the release of the Internet platform. Both aspects will be elaborated a bit more in the following paragraphs.

Data Self-Management

When delivering a service like the aforementioned Internet platform, one of the major problems is the data management, in specific the effort to keep the collected information correct and up to date. To provide such a huge amount of different types of information about schools, companies, jobs, apprenticeships, job candidate profiles etc. in a high information quality, it is necessary to automatize most of the data management steps to keep the effort on a minimum. An approved approach to solve this problem when delivering a service is, to involve the user into these processes and to reduce the administrational effort for the service provider hereby as much as possible [12]. Thus, the effort of data management is almost completely shifted from the platform provider to the user. When designing and implementing *vitaminBIR* we followed this approach in many ways:

1) The management of all personal and institutional account data is completely outsourced to the user, while the system validates the input when the user tries to store the same to only allow consistent data states to be saved. The validation of the data is done by a combination of the internal validation capabilities provided by the *TYPO3 Extbase* technology and program logic implemented in PHP. The required data model and controller classes are realized as standardized *TYPO3 vitaminBIR Model* extension. An example for the internal *TYPO3 Extbase* validation of an email address can be seen in the following source code snippet:

```
/*
 * @var string
 * @validate NotEmpty, EmailAddress
 */
protected $email = '';
```

2) All data-based lists on the platform, e.g. job position listings, school listings, company listings, events etc., are also managed by the responsible person directly on the platform. Using the *TYPO3 Fluid* template technology these listings are automatically created from the data objects. The conditional functionalities of *TYPO3 Fluid* hereby help to be able to deal with optional fields and empty field values in a professional way. The templates are also part of the aforementioned *TYPO3 vitaminBIR Model* extension. An example for a *TYPO3 Fluid* condition to show the application deadline of a job offer on the platform can be seen in the following source code snippet:

```
<f:if condition="{jobOffer.applicationDeadline}">
    <f:then>
        <f:format.date format="d.m.Y">
            {jobOffer.applicationDeadline }
        </f:format.date>
    </f:then>
    <f:else>
        not provided
    </f:else>
</f:if>
```

3) The service provider can define self-management rules in the backend of the platform to motivate the users to keep their information up to date and to automatize the process of checking and updating information using email, i.e. a user can be asked by email, when a data object has not been changed for a while, if the information is still correct. The user can confirm that the information is correct or adjust it on the platform by using direct links also provided in the email. An exemplary rule-based self-management flow can be seen below (see Figure 3). The service provider has only to act, if the user does not react at all. To provide such functionality another own *TYPO3 vitaminBIR Maintenance* backend extension has been developed.

By combining these approaches we hope to minimize the effort of data management on the platform by still having a high level of information quality. Especially for the last mentioned approach of self-management (3) a wide-ranging document is currently in development, which will be the basis for the setup of the rules in the backend of the platform before the official release.

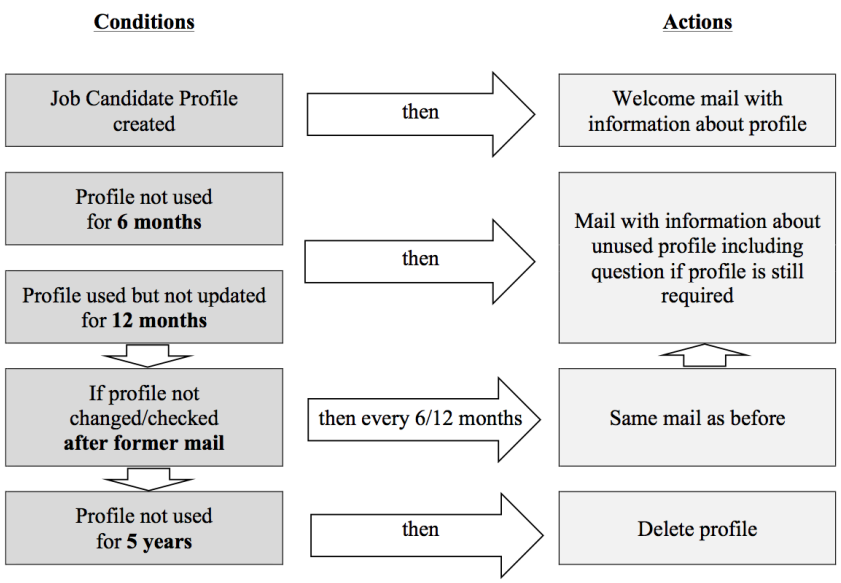

Figure 3: Exemplary rule-based self-management flow for job candidate profiles.

Usability and Adaption Cycle

Another problem when developing a service for such a broad variety of users and processes is the potential loss of the formerly aimed simplicity as well as the potential fail of providing not the processes that were expected by users. Therefore we conducted an iterative usability study with adaption cycles to keep on track regarding the former problems. The study was split into three usability tests with about five participants from each user group, i.e., three appointments for tests with five pupils, five students, and five employees from human resources departments of companies in the District of Birkenfeld. The first test took place using an early Alpha Version, the second test some weeks later using a revised Beta Version and the last test will take place in the near future using the revised Release Candidate Version. Between these tests the time was used to adjust the platform based on the feedback from the former tests. The tests were conducted as qualitative usability tests with *Concurrent Probing*[13], which means that the participants follow some tasks they have to do on the prototype platform while the supervisor analyses the behaviour and interrupts in case of unexpected behaviour of the user. The tasks given to the participants were typical tasks for the appropriate audience, i.e., creating a job candidate profile for a holiday job for pupils or finding a nearby company for an internship for students. About half of the participants in the second and third iteration are participants who already participated in the former test/tests to be able to not only get feedback on the current version, but also on the realized changes. Due to the fact that the usability tests were not the main focus of the project, they were conducted in the described, simple form, but as systematic continuation of the web and paper based survey in the beginning of the conceptual process. Like the survey at the beginning of the conceptual process, the usability tests supported the development process to keep the whole project on track regarding the needs and expectations of the future audiences of the platform.

Beside all the former mentioned approaches to ensure a good information quality and to provide a platform, which specifically fits the needs of the appropriate audiences, we are also collecting and analysing classical usage data on the platform using the open-source software *Piwik*[6]. By doing so, we will try to evaluate the most used features on the platform and navigation problems of the users to be able to further improve the platform also after the release date.

3. Summary and Outlook

As presented above, the elaborated steps to support sustainable development in rural areas by encouraging local cooperation and neighborhood effects can be transferred into an ICT system. The advantages of ICT systems for this matter are evident: ICT systems, in our case the Internet platform, are available for a large number of people, without time restrictions and hold only a very low entry barrier. Compared to short-time collaboration projects, such a system can also consist for several years with a relatively low managing effort, to sustainably support development of a specific region, not only during the runtime of the current funding or developing project.

Summarized, with *vitaminBIR* we try to provide an ICT system that helps the District of Birkenfeld, as well as other regions in the future by transferring the concept and the software, to reduce the previously mentioned demographic problems, by efficiently supporting real-life processes which reduce the influencing factors of emigration of young people from rural areas. During the whole conception and realization process of *vitaminBIR* it was always important to continuously check the developed platform against the needs and expectations of the audiences, to ensure that the platform can really have a sustainable and positive supporting effect for the model region.

[6] http://piwik.org/

Beside the development of the Internet platform, our team is already in the process of promoting the platform. We thereby directly address our main user groups, i.e. pupils, students, and human resources departments of companies. The first Release Version of *vitaminBIR* will be published in August/September 2014.

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References

[1] S. Hradil, "Auswirkungen des Demographischen Wandels auf die Gesellschaft," in *Alte Gesellschaft, Neue Gesellschaft?*, S. Hradil and J. Weingarten, Eds. Mainz: Zukunftsinitiative Rheinland-Pfalz (ZIRP), 2010, pp. 15–24.

[2] B. Müller, "Demographischer Wandel und die Folgen für die Städte - Einführung und Übersicht," *Dtsch. Zeitschrift für Kommunalwissenschaften*, vol. 2004/I, pp. 5–13, 2004.

[3] L. Böckmann, T. Kirschey, J. Stoffel, and M. Völker, "Statistische Analysen No. 25 2012, Rheinland-Pfalz 2060." Statistisches Landesamt Rheinland-Pfalz, Bad Ems, 2012.

[4] J. Weingarten and S. Zahn, "Kultur, Wirtschaft und Demographie - Chancen der rheinland-pfälzischen Kultur- und Kreativwirtschaft im gesellschaftlichen Wandel," in *Neue Potentiale für Wirtschaft und Beschäftigung*, J. Rump and J. Weingarten, Eds. Zukunftsinitiative Rheinland-Pfalz (ZIRP), 2010, pp. 77–126.

[5] H. Schwager, "Demographischer Wandel - Risiko und Chance für Unternehmen," in *Neue Potentiale für Wirtschaft und Beschäftigung*, J. Rump and J. Weingarten, Eds. Mainz: Zukunftsinitiative Rheinland-Pfalz (ZIRP), 2010, pp. 15–18.

[6] B. Müller and S. Siedentop, "Wachstum und Schrumpfung in Deutschland - Trends, Perspektiven und Herausforderungen für die räumliche Planung und Entwicklung," *Dtsch. Zeitschrift für Kommunalwissenschaften*, vol. 2004/I, pp. 14–32, 2004.

[7] A. Schloemer, "Tourismus und Freizeit - Herausforderungen und Chancen des demographischen Wandels," in *Neue Potentiale für Wirtschaft und Beschäftigung*, J. Rump and J. Weingarten, Eds. Zukunftsinitiative Rheinland-Pfalz (ZIRP), 2010, pp. 62–68.

[8] A. Baier and V. Bennholdt-Thomsen, "Der 'Stoff', aus dem soziale Nähe ist," in *Aktivierung durch Nähe*, T. Kluge and E. Schramm, Eds. Frankfurt am Main: Institut für sozial-ökologische Forschung (ISOE) GmbH, 2003, pp. 12–21.

[9] M. Pellizzari, "Do Friends and Relatives Really Help in Getting a Good Job?" 2003.

[10] D. Marmaros and B. Sacerdote, "Peer and social networks in job search." 2002.

[11] Y. M. Ioannides and L. D. Loury, "Job information networks, neighborhood effects and inequality," *J. Econ. Lit.*, pp. 1056–1093, 2004.

[12] J. A. Fitzsimmons, "Consumer Participation and Productivity in Service Operations," *Interfaces (Providence).*, vol. 15, pp. 60–67, 1985.

[13] J. R. Bergstrom, "Moderating Usability Tests," 2013. [Online]. Available: http://www.usability.gov/get-involved/blog/2013/04/moderating-usability-tests.html. [Accessed: 10-Jul-2014].