



XVIIth World Congress of the International Commission of Agricultural and Biosystems Engineering (CIGR)



Hosted by the Canadian Society for Bioengineering (CSBE/SCGAB)
Québec City, Canada June 13-17, 2010

TOWARDS A FRAMEWORK FOR PLANNING AND DESIGNING OF RURAL KNOWLEDGE CENTRES

GUNTUKU DILEEPKUMAR¹, SANJAY CHAUDHARY², KUNA ARUNA SAI³,
V BALAJI⁴

¹ Guntuku Dileepkumar 1 Dhirubhai Ambani Institute of Information and Communication Technology (DAIICT), Gandhinagar, India, dileep_kumar@daiict.ac.in

² Sanjay Chaudhary 2 DAIICT, Gandhinagar, India, sanjay_chaudhary@daiict.ac.in

³ Kuna Aruna Sai 3 AGEDS, Iowa State University, USA, askuna@iastate.edu

⁴ V Balaji 4 KMS, International Crops Research Institute for the Semi Arid Tropics (ICRISAT), Patancheru, India, v.balaji@cgiar.org

CSBE101196 – Presented at 8th World Congress on Computers in Agriculture (WCCA) symposium

ABSTRACT Exponential growth in Information and Communication Technologies (ICTs) and establishment of Rural Knowledge Centres (RKC)s have been fast spreading across the globe. In the continuous process, there are tens of thousands of RKC)s that are being established by various agencies, to provide shared public access to ICTs for meeting educational, social, personal, economic, and entertainment needs of the rural community. As most of these initiatives are relatively new, there are mixed opinions on the social and economic impacts of RKC)s. There is also lack of good understanding on the conceptual and theoretical framework for planning and designing of RKC)s. This study seeks to fill this information gap by assessing selected ICT for development (ICT4D) project sites in rural India. Through the systemic analysis of the data and continuous interpretation of the observations, the study proposes a framework for planning and designing of RKC)s.

Keywords: Rural Knowledge Centers, ICT, ICT for Development, framework

INTRODUCTION Exponential growth in Information and Communication Technologies (ICTs) [1] and establishment of telecenters have been fast spreading across the globe [2]. Telecenters equipped with ICTs have become new ways of reaching the people and delivering services in the developing countries [3]. In the continuous process, these centers have been acknowledged as new institutions in the global rural milieu, to empower the rural communities by bringing the benefits of contemporary ICTs in their reach such as e-governance, telemedicine, digital literacy, e-agriculture. The last decade many organizations have launched such initiatives, known as ICT for Development (ICT4D) projects, in the rural areas of developing countries, with an aim to bridge the digital divide by providing access to information and technologies; and also for poverty alleviation, policy advocacy, local governance, and educational development [4]. Today there are tens of thousands of telecenters throughout the world [5]. These are the places or centers that provide shared public access to information and communication

technologies for meeting the educational, social, personal, economic, and entertainment needs of the community [3], [6], [7], [8].

As most of these initiatives are relatively new, there are mixed opinions available from the literature on their social and economic impacts in the communities where they are situated. For instance, the United Nations Commission on Science and Technology for Development (UNCSTD) reported, there are many instances where the use of ICTs is bringing widespread social and economic benefits, and also there are as many instances where ICTs are making no difference to the lives of people in developing countries (or even having harmful effects” [9]. Furthermore, emerging studies have shown many of the claims being made about the potential of ICTs for development are not supported, and point to possible counter-productive effects [3]. There is also lack of good understanding about a sound conceptual and theoretical framework for planning and designing telecenters. This study seeks to fill this information gap by assessing the selected telecenters project sites in rural India to understand various dimensions and dynamics involved in planning and designing of telecenters.

ASSESSMENT OF TELECENTRE PROJECTS Most of the evaluation studies of telecenters till date have focused more on their operational aspects, such as technical, financial, managerial performances and sustainability aspects [6], [10], [11], [12], [13], [14], and few discussed on possible frameworks and approaches [7], [3], [10], [15]. Some studies reported on the role of telecenters in e-governance applications [14], [16]. There are no (or) very few evaluation studies focused on understanding various dimensions and dynamics involved in planning and designing of telecenters. In this particular study an attempt has been made to conduct an assessment study by physically visiting selected telecenter project sites – Rural e-seva, E-seva, Rajiv Internet Villages, Saukaryam, Bhoomi, MSSRF IVRP, ITC e-choupals, Aaqua, and Kisan Call Centres; and understood many other projects from the literature and also interviewing the primary researchers and project personnel of the sites includes – Akshaya, WARANA, Drishtee, EID Parry, Kisan Kerala and E-Sagu. Multiple case study methodology was followed to understand various dimensions and dynamics of these projects.

Type of Projects The selected telecenter projects are different with each other, as per the public ICT access, varying in the clientele they serve, the services they provide, as well as their business or organizational model. These centres are being run by Government agencies / NGOs / Corporates /CBOs / Educational institutions etc. Each centre has its own advantages and disadvantages, as the way they link communities with ICTs and to bridge the digital divide.

METHODOLOGY The aim of this study is to develop a framework for setting up of RKC's in developing countries. Since the focus of the research is in building a context aware framework which is synonymous with the theory building which [17] argue could be best approached with inductive qualitative research rather than through continual hypothesis testing. Therefore it was decided to use the qualitative research method, and identified case study method is much more suitable for this kind of study [18], [19].

Data Collection Methods The study used several methods of data gathering; semi-structured interviews were complemented with short time on-site observations and surveys with quantified responses.

Data Analysis of qualitative data depends on the capability of the researcher to integrate evidence from multiple sources [20]. The analysis may not be as mechanical as the analysis of quantitative data [21], [22] but the conclusions from these analyses are reliable.

Important ideas were immediately taken down in the field notes, while all the recorded tapes were later transcribed. The transcribed data was thoroughly read and particular attention was paid to discussions about issues that concerned the planning and designing of RKC's. Further meaning was ascribed to the salient points that emerged from these analysis based on the insight from the observation. After reporting the first series of findings, the study proposes a framework based on a discovery from the systemic analysis of the data and the continuous interpretation of the observations through the pre-knowledge of the phenomenon.

LEARNINGS FROM THE ICT4D PROJECTS Despite good intentions and financial support, the effectiveness of ICT enabled RKC's is uncertain; and analytical understanding of the relationship between the enhanced deployment of ICTs and development outcomes is unclear or ambiguous. The inferences from the assessment of the ICT4D project sites are

- There is prevalence of top-down approaches with few attempts to reflect the end users preferences and needs.
- Production advisory services and market information access do not go together in all such efforts.
- In almost all the projects, the participation of agricultural education and research institutions appears to be marginal.
- In almost all the projects, the efforts taken for addressing the climate change issues appears to be marginal.
- Localization and customizability of content are still not practiced on a significant scale.

The study further states that ICT and techno-infrastructure should consider as judicious blend of traditional and modern technologies depending on what would works best in a given kind of situation. The efforts should be made to develop medium to high level of farmer's faith in ICT enabled services. It is also suggested that Participatory Rural Appraisals and Rapid Rural Appraisals should be carried out to know about information needs of the farmers, and also to know about the social acceptance of the technology. Identification of the typical community problems would be the first step to start any kind of ICT mediated innovation (or) application. Emphasis should be given to define methodologies for transforming generic datasets into locale specific information for their effective use.

Based on these findings a framework was proposed to set up ICT enabled RKC's and recommendations were made for their effective use.

EVOLUTION OF RURAL KNOWLEDGE CENTRES Setting up of a computer centre in a village does not constitute a knowledge centre. The translation of a rural computer centre into a knowledge centre requires an intensive social process. A rural telecenter evolves into a knowledge centre only when modern ICT facilitates transfer of information into knowledge. A telecenter providing market price is an information centre. A telecenter, which enables the rural community to understand the differential mechanisms through which prices are influenced and determined, is a knowledge centre.

Most of the rural ICT projects focus on providing information services, rather than looking at the knowledge management strategies. In agriculture and rural development, the importance of uneven distribution of knowledge in explaining variations in Total Factor Productivity (TFP) is being increasingly recognized [23]. This was also reported by National Knowledge Commission of India in 2004. Mere information in the form of flow of messages may not be able to address the problem. Knowledge as the creative result of a flow of messages anchored on the commitment and beliefs of the actors involved in the process and resulting in human action is needed. Environment in which knowledge is built; capacity building and empowerment processes, social mobilization and organization are the important factors which have to be taken into consideration while transforming a telecenter into a knowledge centre. Freire [24] argued in the case of the pedagogy of oppressed vis-à-vis literacy programs, the need for dialogues and discourses among learners to understand the world instead of mere understanding of words. Similarly in the process of knowledge management, dialogues and discourses of among the rural community are essential. Modern ICT, if properly defined can help to broaden the canvass for dialogues and discourses among the rural community.

Information Vs. Knowledge The differences between information and knowledge are being spelt out in many books and papers in recent times. Many authors have described the progressive processes from data to information to knowledge to wisdom in terms of purposes and contexts. *Data refers to raw materials such as facts and figures that could be collected by an information system. Information refers to analyzed data often presented in a form that is specifically designed for a given decision-making task, and transmitted to/received by decision makers. Knowledge refers to subsequent absorption, assimilation, understanding and appreciation of that information* [23]. Pomeroll and Brezillon [25] quoting Newell and Simon [26] argue that *knowledge is information incorporated in an agent's reasoning and made ready either for active use within a decision process or for action. It is the output of a learning process. Thus the roles of knowledge are to: (1) transform data into information, (2) derive new information from existing ones, and (3) acquire new knowledge pieces.* Wisdom is considered as meta-knowledge, knowledge mobilized to acquire new knowledge and update it. From a philosophical angle wisdom refers to the evaluation of knowledge vis-à-vis the norms, values and morality [25]. Knowledge management focuses on definition of the context and validation of the information. It also increases the *connections among people (who have knowledge) that would likely not occur without the help of a knowledge management system* [27]. The process of searching answers for the following questions characterizes the dimensions of knowledge management;

Who created the information?

What is the background of the creators of information?

Where and when was it created?
How long will the information be relevant, valid and accurate?
Who validated the information?
Who else might be interested or has similar knowledge?
Where was it applied or proved to be useful?
What other sources of information are closely related?
How to test and validate some of the concepts?

In the context of rural community, the presence of traditional knowledge is another important dimension of knowledge management. The social construction of traditional knowledge and the blending of the new knowledge with traditional knowledge are the components of knowledge management. Thus knowledge management necessitates a participatory management in which the rural community plays a crucial role of absorption, validation, critical evaluation, assimilation, understanding and appreciation of information. A paradigm shift in the concept and practices of extension will occur only when the community develops its own framework for knowledge management.

According to Marwick (2001:815) knowledge management takes place at four levels: *Socialization* in which exchange of tacit knowledge taking place within a community; *Externalization* in which a set of tacit knowledge is converted into explicit knowledge; when the explicit knowledge are shared, the process of *combination* takes place; and finally *internalization* in which socialization, externalization and combination lead to further set of new tacit knowledge. Through such a process the community plays a crucial role in converting a generic information and knowledge into locale specific knowledge. Such a system requires both vertical (between macro and meso organization and villager) and horizontal transfer of knowledge (between villager to villager) in which the knowledge creators at the macro and meso level interact with the community and through an interactive learning process both the stakeholders define the roadmap for knowledge management. The ICT enabled RKC's enhance the socialization process through broadening the horizontal transfer of knowledge. The creation of databases based on local knowledge and traditional knowledge represents the process of externalization in which the tacit knowledge is converted into explicit knowledge. ICT also facilitates the exchange of explicit knowledge within the communities and between the communities leading to a process of combination. Finally internalization of explicit knowledge into tacit knowledge represents the framework of knowledge management. *Thus in a knowledge centre villagers are not mere consumers of information but partners in knowledge management.*

The various dimensions of Rural knowledge centers vis-à-vis knowledge management are

Centers of human resource management
Centers of Information such as weather, trade, market, transport etc
Centers of governance for delivering development with least social and economic transaction cost.
Centers blending traditional wisdom with frontier sciences

The community ownership is crucial. The various sections of the community (vis-à-vis caste, class, gender, age, religion and region) should be involved in the entire process of

developing the programs, content, delivery methodologies, learning processes, and assessment, and in the use of innovative technologies. Such a participatory approach is necessary for ensuring the relevance of contents and technologies within the social context in which the knowledge centre is operating.

According to Roling, Neils, (1988), the evolution of rural knowledge centre is a function of 7 C s, i.e., Connectivity, Content (Static and Dynamic), Context, Cash, Culture, Community and Communication. Ensuring the 7 Cs requires a process of Mobilization, Organization, Capacity Building, Technology Incubation, Technical Support, and System Management. Though Neils analyzed these aspects well, he forgotten to include the factors influences the process. In the proposed framework, we made an attempt to distinguish between processes, functions and influencing factors, and discussed in details how these relate with each other during the evolution of rural knowledge centers.

FRAMEWORK FOR RURAL KNOWLEDGE CENTRES

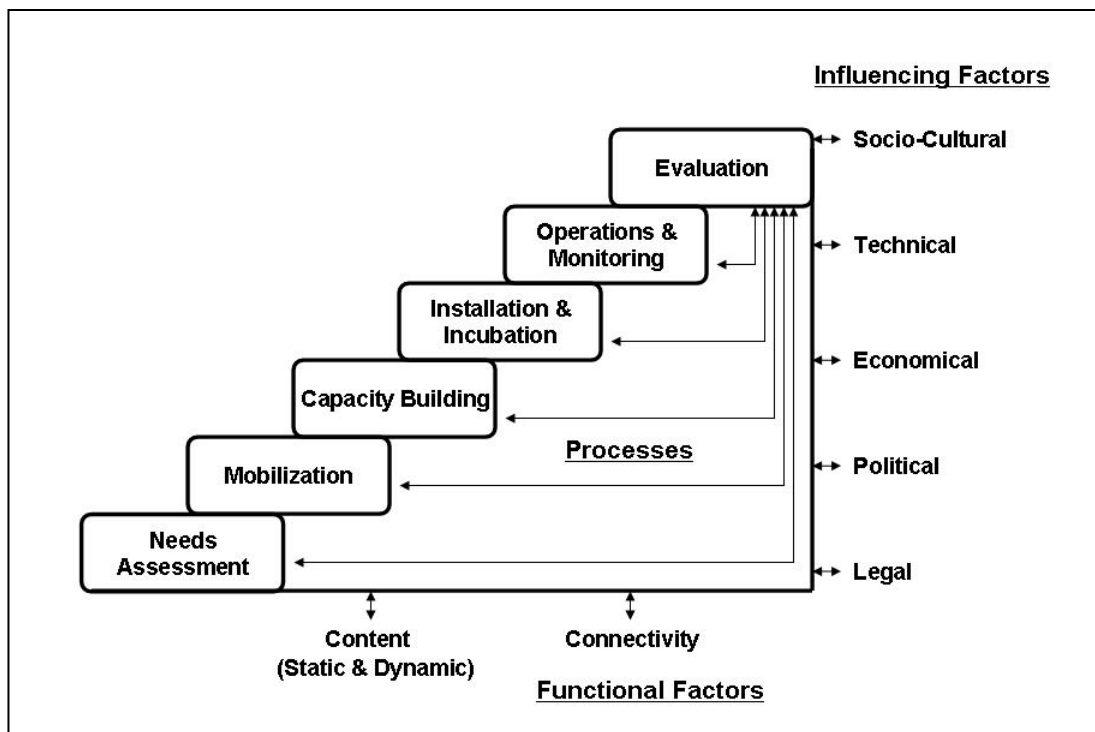


Figure 1. Functional Framework for Rural Knowledge Centres

Process in evolution of a Rural Knowledge Centres (RKC)

Needs Assessment Rural communities have own social dynamics, and wide diversity of interests. The solutions to their problems will be highly local and highly specific. So identification of their needs, problems and technology preferences is a first step to start RKC in any location. After identification, analysis is required to provide relevant information resources through user preferred communication techniques for satisfying their information needs.

In most of the government projects, Rural E Seve, Eseva, Rajiv Internet Villages, Drishtee, the government officials assumed that they know what is needed at the grassroots, and established the infrastructure for starting the activities without making any committed involvement of the local communities. That's why most of the projects even kick started the activities very well but in the long run they lost that tempo, and resulted failure in achieving the long-term sustainability. In the case of ITC e-choupals, though the project personnel made efforts in identifying the needs of users, they didn't consider the user preferences in technology identification. This resulted to look for alternative mode of communication in the case of coffee and Aqua choupals. This was discussed in detail in influencing factors (technology) section. From this it clearly emerges, instead of following top-down approach, RKC project should follow combination of bottom-up and top-down approaches with community mobilization to ensure the long-term sustainability of the project.

Mobilization Community mobilization and resource mobilization are essential for ensuring the long term sustainability of the RKC project. Involve the communities in each and every evolution process of RKC, includes needs assessment, identification of the user preferred technology, and resource mobilization; and give sense of ownership. Once the communities realize that the RKC project is being operated by them and for their benefit then the operation will go long-way with the faith and motivation of involved communities. During the resource mobilization, make the communities to share the project costs in terms of community buildings, electricity, and human work hours. Motivate them to identify and establishing linkages with local knowledge producing agencies, and their role in RKC operations; and make them to realize the information need and knowledge management process and pattern; and make them to understand structural differences in the community i.e., caste, class, religion, region, gender, and age; and realize them need of allowing users to use facilities of RKC's irrespective of structural differences for achieving the development.

Capacity Building Capacity Building is often defined in the literature as a process to develop a certain skill or competence to enable individuals (or) organizations to perform effectively. In this context capacity building is essential to both the communities (individual level) and RKC (organizational level) for long term execution of activities effectively. Capacity building is continuous long term process as reported by UNDP. It was therefore, since inception of the project continuous capacity building to the communities and RKC's is essential on various areas includes (1) Organization - Capacitate the communities on identification of organization types, build organizations, planning programmes through their organizations, linking the organization with the macro, meso and local organizations for horizontal and vertical transfer of knowledge, facilitating the organizations to define the self-sustainable interventions, developing contractual arrangement between various stakeholders, organization management, and conflict resolution (2) Literacy – The focus of first phase should be on digital literacy includes literacy training on new software and basic trouble shooting, and the focus of second phase is on subject matter literacy training includes use of technical skills for gaining subject matter literacy; and ICT enabled knowledge management includes content creation, consolidation and delivery.

Installation and Incubation After ensuring the communities are mobilized and capacitated, start install services, and introduce them by creating awareness. The period in between installation and implementation is known is incubation period.

Operations and Monitoring *In* the initial stages monitor each and every service, the way it is offering and the way communities are receiving.

Evaluation After certain time period take an evaluation, and well absorb every learning, and fed back into the system to evolve that as a sustainable system.

Functional and Influencing Factors Critically examine the functional and influencing factors while planning and designing rural knowledge centres.

REFERENCES

- [1]. H. Munyua, “Information and Communication Technologies for rural development and food security: Lessons from field experiences in developing countries,” *SD Dimensions*, Sustainable Development Department, Food and Agricultural Organisation of the United Nations, 2000. [Online]. Available: <http://www.fao.org/sd/CDdirect/CDre0055b.htm>.
- [2] R. D. Colle and Y. Liu, “ICT Capacity-building for Development and Poverty Alleviation, Enhancing the Role of Agricultural Universities in China”, *Third Asian Conference for Information Technology in Agriculture, Beijing*, October 26-28, 2002. [Online]. Available: <http://ip.cals.cornell.edu/commdev/documents/ictpaper-china.doc>
- [3] R. Gomez, P. Hunt and E. Lamoreux, *Telecenter Evaluation and Research: a global perspective*, International Development Research Centre (IDRC), Canada, 1999, [Online]. Available: <http://www.idrc.ca/telecentre/evalutioin/html/main.html>
- [4] A. G. Flor, “ICT and Poverty: The Indisputable Link”, *Third Asia Development Forum on “Regional Economic Cooperation in Asia and the Pacific”* organized by the Asian Development Bank, June 2001. [Online] Available: <http://www.worldbank.org/html/extdr/offrep/eap/eapprem/infoalexan.pdf>
- [5] Electronic Journal of Information Systems in Developing Countries (EJISDC) *Special Edition on Telecenters*, Vol. 4, 2001. [Online] Available: <http://www.is.cityu.edu.hk/research/ejisdc/vol4.htm>
- [6] R. P. Fuchs, *Little engines that did, Case Histories From the Global Telecenter Movement*, IDRC, Study/Acacia Initiative, Future works, Inc. http://web.idrc.ca/en/ev-10630-201-1-DO_TOPIC.html , 1998.
- [7] W. H. Roger, *Evaluating Telecenters within National Policies for ICTs in Developing Countries*, International Development Research Centre (IDRC), Canada, 1999. [Online] Available: <http://www.idrc.ca/telecentre/evaluation/nn/main.html> , 1999.

- [8] F. J. Proenza, "Telecenter Sustainability: Myths and Opportunities," in *The Journal of Development Communication*, 12/2, pp. 94-109, 2001. [Online] Available: http://www.developmentgateway.org/download/111602/Telecener_Sustainability_Myths_and_Opportunities-Proenza0102.pdf .
- [9] R. Mansell and U. When, *Knowledge Societies: Information Technology for Sustainable Development*, Oxford University Press, UK, 1998. [Online]. Available: <http://www.sussex.ac.uk/spru/ink/knowledge.html>.
- [10] A. Whyte, *Assessing Community Telecenters, Guidelines for Researchers*, IDRC, 2000. [Online]. Available: http://web.idrc.ca/en/ev-28301-201-1-DO_Topic.html.
- [11] Y. Judy, R. Gail and R. Jeff, "A preliminary Evaluation of Online Access Centres: Promoting Micro E-Business Activity in Small, Isolated Communities," *The Electronic Journal on Information Systems in Developing countries (EJISDC)*, 4, 1, 1-17, 2001. [Online]. Available: <http://www.is.cityu.edu.hk/research/ejisdc/vol4/v4r1.pdf>, 2001.
- [12] L. Colin and W. David. *Perspectives on Distance Education, Telecenters: Case studies and key issues, Management Operations, Applications, Evaluation*, The Commonwealth of Learning, 2001. [Online]. Available: <http://www.col.org/telecentres>.
- [13] E. E. Florence and S. P. Wamahiu, "Information and Communication Technologies for Development in Africa," *The Experience with community telecenters*, CODESRIA/IDRC, Vol (2), 2003. [Online]. Available: http://web.idrc.ca/en/ev33001-201-1-DO_TOPIC.html.
- [14] P. Balaji, P. Aswin, G. R. Kiran, G. Dileep Kumar, S. Janaki and R. Kumar, *Information and Communications Technologies for Development: A Comparative Analysis of Impacts and Costs from India*, Project Report, Department of Information Technology, Ministry of Communications and Information Technology, Government of India, 2005.
- [15] K. Reilly and R. Gomez, Comparing Approaches: telecenter Evaluation Experiences in Asia and Latin America, *Electronic Journal of Information Systems in Developing Countries*, 4, 3, 1-17, 2001. [Online]. Available: <http://www.is.cityu.edu.hk/research/ejisdc/vol4/v4r3.pdf>.
- [16] M. Shirin and G. R. Kiran, *Information Technology for Citizen Government Interface: A Study of Friends Project in Kerala*, 2001. [Online]. Available: <http://www1.worldbank.org/publicsector/bnpp/part1.pdf>, 2001.
- [17] B. Glaser and A. Strauss, *The Discovery of Grounded Theory*, Chicago: Aldine, 1967.
- [18] M. Alavi and P. Carlson, "A Review of MIS Research and Disciplinary Development," *Journal of Management Information Systems*, Vol. 8 No 4, pp. 45-62, 1992.

- [19] W. Orlikowski, "Knowing in Practice: Enacting A Collective Capability in Distributed Organising," *Organization Science*, Vol. 13 No 3, pp. 249-273, 2002.
- [20] I. Benbasat, D. Goldstein and M. Mead, "The Case Research Strategy in Studies of Information Systems," *MIS Quarterly*, Vol. 11 No 3, pp. 369-386, 1987.
- [21] M. Patton, M. *Qualitative Evaluation and Research Methods*. Beverly Hills: Sage, 1990.
- [22] M. Miles, "Qualitative Data as an Attractive Nuisance: The Problem of Analysis," In *Van Maanen, J. (Ed.), Qualitative Methodology*. Beverly Hills, CA: Sage, 1983.
- [23] R. Chapman and Tom Slaymaker, *ICTs and Rural Development: Review of the Literature, Current Interventions and Opportunities for Action* ODI Working Paper 192, 2002.
- [24] P. Freire, *Pedagogy of the Oppressed*, Harmondsworth: Penguin, 1972.
- [25] J. Ch. Pomerol and P. Brézillon, *About some relationships between Knowledge and Context*, 2001. [Online]. Available: <http://www-poleia.lip6.fr/~brezil/Pages2/Publications/CXT01/JCP-PB.pdf>
- [26] A. Newell and H. Simon, *Human Problem Solving*, Prentice-Hall, Englewood Cliff, 1972.
- [27] J. C. Terra and T. Angeloni, *Understanding the difference between Information Management and Knowledge Management*, 2002. www.kmadvantage.com/docs/km_articles/Understanding_the_Difference_Between_IM_and_KM.pdf