A Knowledge Management Framework for Sustainable Rural Development: The case of Gilgit-Baltistan, Pakistan

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Abstract: Some 50% of the people in the world live in rural areas, often under harsh conditions and in poverty. The need for knowledge of how to improve living conditions is well documented. In response to this need, new knowledge of how to improve living conditions in rural areas and elsewhere is continuously being developed by researchers and practitioners around the world. People in rural areas, in particular, would certainly benefit from being able to share relevant knowledge with each other, as well as with stakeholders (e.g. researchers) and other organizations (e.g. NGOs). Central to knowledge management is the idea of knowledge sharing. This study is based on the assumption that knowledge management can support sustainable development in rural and remote regions. It aims to present a framework for knowledge management in sustainable rural development, and an inventory of existing frameworks for that. The study is interpretive, with interviews as the primary source for the inventory of stakeholders, knowledge categories and Information and Communications Technology (ICT) infrastructure. For the inventory of frameworks, a literature study was carried out. The result is a categorization of the stakeholders who act as producers and beneficiaries of explicit and indigenous development knowledge. Stakeholders are local government, local population, academia, NGOs, civil society and donor agencies. Furthermore, the study presents a categorization of the development knowledge produced by the stakeholders together with specifications for the existing ICT infrastructure. Rural development categories found are research, funding, agriculture, ICT, gender, institutional development, local infrastructure development, and marketing & enterprise. Finally, a compiled framework is presented, and it is based on ten existing frameworks for rural development that were found in the literature study, and the empirical findings of the Gilgit-Baltistan case. Our proposed framework is divided in four levels where level one consists of the identified stakeholders, level two consists of rural development categories, level three of the knowledge management system and level four of sustainable rural development based on the levels below. In the proposed framework we claim that the sustainability of rural development can be achieved through a knowledge society in which knowledge of the rural development process is shared among all relevant stakeholders.

Keywords: sustainability, rural development; remote regions; framework; stakeholder, indigenous knowledge, requirement analysis, knowledge society

1. Introduction

Some 50% of the people in the world live in rural areas, often under harsh conditions and in poverty (World Bank, 2013). The need for knowledge of how to improve living conditions is well documented (UNDP, 2013). In response to this need, new knowledge of how to improve living conditions in rural areas and elsewhere is continuously being developed by researchers and practitioners around the world. People in rural areas, in particular, would certainly benefit from being able to share relevant knowledge with each other, as well as with stakeholders (e.g. researchers) and other organizations (e.g. NGOs). Central to knowledge management (KM) is the idea of knowledge sharing. The significance of KM in sustainable development has been described by several researchers. According to Wong (2010), KM provides a good foundation for sustainable development. KM is also critical for innovation, prioritization and the efficient use of resources (Mohamed et al, 2009). Lwoga et al. (2010) recommended the application of KM approaches for the management of indigenous knowledge and its integration with other knowledge systems for agricultural development in developing countries.

In this paper we discuss how to apply a KM approach in order to take advantage of knowledge, experiences and good examples of sustainable rural development to improve life for the people of remote rural regions. We perceive *knowledge management* as the process of "continually managing knowledge of all kinds to meet existing and emerging needs, to identify and exploit existing and acquired knowledge assets and to develop new opportunities." (Quintas et al., 1997) This definition is well in line with *sustainable development* as it is defined by the Brundtland commission: "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (UN, 1987). When we use the term development we refer to human development. "Human development is about … creating an environment in which people can develop their full potential and lead productive, creative lives in accord with their needs and interest" (UNDP, 2007, p. 19). From our perspective in this context of rural development, sustainability implies the use of methods, systems and materials that will not deplete resources or harm natural cycles (Rosenbaum, 1993).

The process of rural development involves a participatory set of activities that includes local people, the natural environment, outside development practitioners, and other stakeholders, including development agencies (Chambers and Conway, 1991). This process evolves through a multidisciplinary set of practices over a period of time. During this process, these sets of practices generate different forms of knowledge. This composition of knowledge is formed by combining indigenous knowledge in rural areas with outside world knowledge that is brought to these areas by the development actors (Agarwal, 2002; Hess, 2006). Relevant knowledge can deal with health care, education, agriculture and more. A knowledge repository of development activities is vital for the sustainability of a development process and is a source for creating KM activities within and across an organization.

Several attempts have been made to use knowledge-based approaches for *rural development*. In the rural area of the Sichuan province in Western China, the farmers were at a geographical disadvantage because of their isolation from both the market and government. A knowledge platform was developed to share knowledge about ecological rabbit breeding (Rabbit King). The objective was to integrate resources and provide a knowledge platform to connect farmers, government and the market. (Liu and Makoto, 2010). Another example is a knowledge platform for the promotion of modern rural energy services in the Association of Southeast Asian Nations (ASEAN) countries (Payakpate, 2004). A third example is a study aimed at establishing an integrated traditional and scientific knowledge base to address a priority issue in terms of sustainable socio-economic development and poverty alleviation in Laos (Rahman, 2000). The studies mentioned above, and most other published studies within the domain of sustainable rural development, focus on a specific view, such as gender (Sati and Juyal, 2008), agriculture (Galindo, 2007), social media (Voccia, 2011), and specific projects (Pade-Khene et al., 2011). This study fills a gap in the research field. In particular, it provides a unique case study-based, holistic view, which covers rural development, stakeholder requirements, sustainability and knowledge management.

Thus, we hypothesize that the use of KM to discover, capture, share, and apply knowledge about rural development activities can support sustainable development. A knowledge-based society and knowledge-sharing environment can make the development process sustainable and the goals of that development process achievable. The long-term goal is to contribute to a better life for vulnerable and exposed people in rural areas.

This study examines the case of the region of Gilgit-Baltistan in Pakistan in order to develop a framework for knowledge sharing for sustainable rural development. It does so by studying the knowledge creation process in rural development and the requirements to manage this knowledge by utilizing contemporary ICT tools and methods in rural development. The research question for this paper is: *How can knowledge management contribute to sustainable rural development?* In addition, the specific objectives are to:
- specify the knowledge needs of a repository for sustainable rural development
- describe conditions for knowledge sharing in rural development, and
- develop a framework for sharing knowledge of sustainable rural development.

The Gilgit-Baltistan region of Pakistan is a typical rural region eligible for rural development. It has low population density; people live mainly on farms and country sides and also far from cities. Geographically the region is situated in the north of Pakistan (approximately 35-36° North and 74-75° East) and surrounded by the world's greatest and highest mountain ranges: the Himalayas, Karakorum, and the Hindu Kush. The population of this area endures harsh terrain and climatic condition and is scattered over far-flung valleys within different remote and rural areas. Economically, this area is poor and this region has been the subject of a rural development process by numerous NGOs, international development agencies, and the local government of Gilgit-Baltistan in Pakistan. For the last twenty years, the AKRSP (Aga Khan Rural Support Program) has also sought to contribute to the reduction of poverty in the region (Wood et al., 1997). Nevertheless, in the mountain region of this area, poverty continues to blight the prospect of sustainable livelihoods. This mountainous region presents a series of special challenges, both to the people who live here and to the agencies that try to support sustainable development livelihoods (Wood et al., 2007). Therefore, our case is specifically suitable since many of the challenges of rural areas are drawn to its extreme here.

2. Knowledge Management in Sustainable Rural Development

Knowledge management systems (KMS) refer to a class of information systems that is applied to managing organizational knowledge (Alavi and Leidner, 2001). Organizational knowledge consists of information about activities and best practices. Fernandez et al. (2004) defined KMS as the integration of technologies and mechanisms that are developed to support KM processes. In rural areas, and elsewhere, knowledge is a crucial resource for preserving

valuable heritage, learning new things, solving problems, creating core competences, and initiating new situations for individual and organizations, both now and in the future (Liao, 2003). KM includes activities and processes that are intended to discover, capture, share, and apply knowledge (Fernandez et al., 2004). A common distinction, highly relevant in KM, is made between tacit and explicit knowledge (Polanyi, 1966). Tacit knowledge is non-formalized and exists only in the human mind, whereas explicit knowledge is formalized and represented by, for example, text or figures on such media as paper or hard disks. Explicit knowledge is normally easier to share between people. A large extent of human knowledge is tacit; one such example is craftsmanship (Nonaka, 1991). Since the aim of KM is to share knowledge between people, the sharing of tacit knowledge offers some challenges. In the case of rural development tacit knowledge often exists in the form of indigenous knowledge.

Bruckmeier and Tovey (2008) stated that rural areas have a specific significance for future human survival. Rural societies reproduce actors, practices and knowledge that have an intimate bearing on the continuous availability, use or conservation of resources. These sets of knowledge bases are important for the sustainability of the rural development process and are therefore a relevant target for a KM approach. In order for ICT-related projects to succeed, it is also important to address existing social constraints that might occur in rural regions (Ashraf and Malik, 2011).

The concept of sustainability has been used in a variety of contexts arising from social, economic and environmental development. Sustainability is a term that has been taken to describe biological resource use, sustainable agriculture and carrying capital. A social development definition of sustainability includes the continued provision of basic human needs, food, water, shelter, as well as high-level social and cultural necessities such as security freedom, education, empowerment and recreation (Brown et al., 1987).

3. Knowledge society and knowledge economy

A *knowledge society* has been defined by Afgan and Carvalho (2010) as "a human structured organization that is based on contemporary developed knowledge and representing new quality of life support system". Knowledge is obviously the central pillar of a knowledge society that has access to worldly information and the ability to process that information and transform it into useful knowledge for the improvement of its citizens' lives. An information society represents the building blocks of a knowledge society (Abdul, 2005). The rapid growth of ICT, including the increasing number of mobile subscriptions (ITU, 2012), has further changed the shape of the knowledge society, which is composed of different dimensions (social, cultural, economic, political and institutional) that are specific to its own culture and environment. Today, a knowledge society is a source of human and sustainable development (UN, 2010); thus, it is beginning to play a fundamental role in building sustainable societies. Afgan and Carvalho (2010) have stated that the concept of a knowledge society represents a new paradigm for future development, which is strongly correlated with sustainable development. UNESCO (2005) suggested that by giving knowledge to a society, it can foster the development of a participatory set of development activities, freedom of expression, education and the rights of citizens in the decision-making process in public policies. In turn, this can further strengthen the development process.

The concept of a *knowledge economy* has emerged in recent years as the backbone of a future economy that will rely heavily on a knowledge-based set of activities. Economists have concluded that knowledge is an important driver of the economy (Mansell, 2009). A knowledge economy is a knowledge-driven stage of capitalist development, based on knowledge, and succeeding a phase market with the accumulation of physical capital. Knowledge takes the place of the workforce; thus, without knowledge resources, it would not be possible to progress toward economic growth, social development, and the protection of the environment (UNESCO, 2005). The inception of a knowledge economy also affects the rural economy in developing countries. A knowledge economy has the potential to facilitate new opportunities for learning and knowledge accumulation (Mansell, 2009). In this regard, a heavy reliance on ICT creates opportunities both for rural and urban areas. Rural communities in third world countries can also participate in some knowledge-based sets of activities by linking them to the world of knowledge economy without the need to experience an industrial shift. Whilst the limitation of industrial resources in rural areas is a given, the rapid growth of modern ICT and its use in the rural communities can help such areas to participate in knowledge-based sets of activities, such as the outsourcing of IT to remote areas, e-commerce, tele-health/e-health and ecotourism.

4. Knowledge management frameworks for rural development

A number of *knowledge management development frameworks* exist. In his study, Heisig (2009) found 160 frameworks. In this paper, we present 10 selected frameworks that are specifically related to rural development. Different components of the framework have been selected in order to put forward one specific framework that is appropriate for rural contexts such as Gilgit-Baltistan. Below we present the ten frameworks.

Liu and Makoto (2010) presented a knowledge-sharing platform framework for the integration of various types of resources to help farmers connect with the market. Rahman (2000) also presented the integration of regional and scientific knowledge to sustain socio-economic development and poverty alleviation in a developing country context, which is closely related to the case of Gilgit-Baltistan region.

Hess (2006) proposed a four-knowledge network group in rural development, which shows the ways that knowledge is shared. Hess went onto arguing that knowledge networks cooperate across different organizations, a system that is effective if these organizations function well and share their interests in an open way. The four groups are: Global Donor platform for rural development; Swiss Center for Agriculture Extension and Rural Development, African Forum on Rural Development, and the African Knowledge Network, which provides a platform for farmers, practitioners, researchers and donor agencies to share their experiences and knowledge. Kurlavicius (2006) promotes a management model integrating economic, ecological, socio-cultural feedback. A knowledge-based decision support system for farmers is proposed by Kurlavicius (2009b). The system focuses increase of efficiency of conforming to environmental constraints.

Technology plays a significant role in knowledge management. Different types of technologies have been used within certain frameworks in order to capture and share knowledge. In rural development, technologies can be selected from frameworks put forward by Hess (2006), Hu, Liu, and Li (2009), Kurlavicius (2006 and 2009a), and Shakeel and Best (2002). They include communication tools for sharing knowledge in rural areas, such as mobile phones, emails, radio, video, and wireless. Different database management systems (Miah et al., 2008), knowledge repositories or knowledge bases can be used as tools for storing information (Payakpate et al. 2004; Rahman, 2000).

Rahman (2000) applied four approaches: advocacy, social mobilization and program communication for shared dialog and partnership building for political leadership supports and local community participation in a program. He proposed the application of Rapid Rural Appraisal and Participatory Rural Appraisal to collect traditional knowledge from local communities.

Payakpate et al. (2004) proposed the design and development of a knowledge management platform for the promotion of the Modern Rural Energy Service (MRES) in ASEAN countries. The proposed platform employs web service technologies for the enhancement, distribution and utilization of rural energy services. The platform helps the stakeholders to extract and exchange meaningful knowledge related to the design and use of MRES.

Shakeel and Best (2002) studied a community knowledge-sharing centre in the Dominican Republic and found a platform that allowed community members to use and benefit from the computer network regardless of their abilities. Community knowledge sharing introduced an interface usable across a range of literacy levels. The system supported four basic functions: logging in, navigating the bulletin board, reviewing content, and entering content. They pointed out that one of the main barriers to widespread computer use in rural communities is the low level of literacy that often exists. They argued that the use of technology in the literacy research community can remove this barrier.

The selection of frameworks from the literature study is presented in Table 1, below.

Table 1 Selected frameworks.

Frameworks	Purpose/Objective	Type of Knowledge	Technology used	Knowledge beneficiary
Liu, & Makoto (2010)	Integrating resources to help farmers connecting with market by providing knowledge and building a knowledge platform	Agriculture and market development. From poverty alleviation research centre, Rabbit research centre.	Research and training	Local community, researchers
Rahman (2000)	Integrated traditional and scientific knowledge to sustain socio economic development and poverty alleviation in a developing country context	Traditional & scientific, tacit & explicit, knowledge of experience and rationality, simultaneous and sequential knowledge	World digital graphic mental, information portal website, GPS, digitization, DBMS, graphics, intranet, internet	Local community, researchers
Hess (2006)	Study of four different knowledge networks	Formal, local, implicit, explicit	Mobile phone, email, radio, video	Local/ rural community, donor agencies
Kurlavicius (2006)	The dimensions, aims and management areas of sustainable rural development	Economical, ecological, socio-culture and institutional knowledge	Knowledge base	National, regional, local communities
Kurlavicius (2009b)	The architecture of farm management knowledge-based DSS	Agriculture based	Data base, knowledge base	Farmers
Hu, Liu & Li (2009)	Rural education resource, regional service platform	Rural education, rural community training and vocational	IP network, satellite network, wireless network	Rural community members, farmers, teachers, students
Kurlavicius (2009a)	Regional viable system for sustainable agriculture and rural development	Agriculture and rural development	Databases, knowledge pools	Rural community, business, public organizations
Payakpate et al. (2004)	Design and development of a knowledge management platform for promotion of MRES in ASEAN countries	Rural energy service	Relational database, search algorithm, web browsers, knowledge servers, knowledge modelling query	ASEAN countries,
Shakeel & Best (2002)	Community knowledge sharing centre in Dominican republic	Community knowledge	Email, digital identities	Local community
Miah et al. (2008).	Rural business decision support system	Live stock based rural knowledge	Knowledge base-, expert system- and problem ontology modules	Farmers

The framework inventory mainly contributes by offering techniques and strategies that allow rural development knowledge to be shared. It also verifies the categorization of the beneficiaries and of rural development knowledge.

5. Methodology

This work is an interpretive qualitative study (Walsham, 1995) that focuses on how to use KM for sustainable rural development. After an initial literature review the study was carried out in two phases. One phase consisted of an empirical study to specify stakeholders, knowledge resources and needs, and technical conditions and other ICT

aspects related to knowledge about rural development in the Gilgit-Baltistan region. The other phase consisted of a selection of relevant frameworks and concepts carried out in order to find a relevant KM approach to realize a KMS to support rural development in Gilgit-Baltistan. Phase one takes aspects from requirements analysis as point of departure, while phase two searches for KM approaches that claims to contribute to rural development. The main activities of the study are depicted in Figure 1.
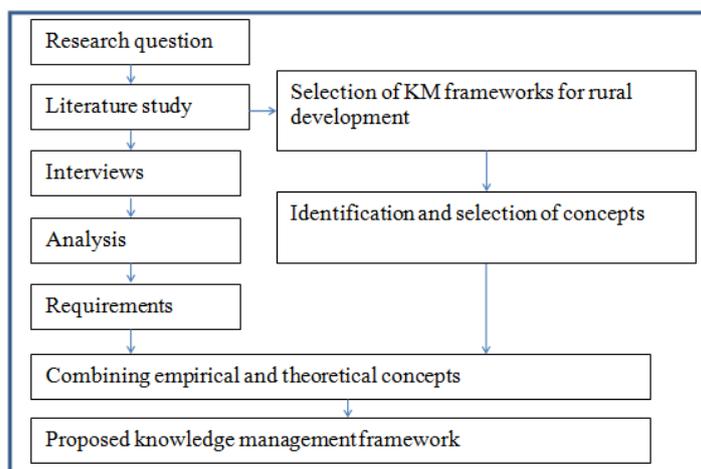
Figure 1 Overview of methodology.

Phase one started with a field study in the region of Gilgit-Baltistan in Pakistan. The field study was carried out over a period of 21 days, during which interviews were conducted in this specific region. The study was designed using a traditional method of stakeholder-driven requirement elicitation put forward by Lamsweerde (2009). Lamsweerde (2009) described stakeholders as playing an important role in the requirement specification process. They can include strategic decision makers, managers of operational units, and end users. The interviews were designed to explore the concepts of knowledge requirements and development activity information from the stakeholders' point of view. In order to find out what is relevant for inclusion in a KMS repository we applied an agile requirements approach (Eberlein and Leite, 2002). At the most general level, knowledge requirements are related to goals, the relevant stakeholders, their perceived knowledge resources and needs, and any relevant conditions (Van Lamsweerde, 2009). In this study, the goal was to design a KMS that supports sustainable rural development. In this case, the stakeholders are actors that can provide or need knowledge for sustainable rural development; requirements are what stakeholders need or are able to provide. In the context of a rural society, therefore, an awareness of technical, and other opportunities and restrictions is essential for fulfilling knowledge management goals.

The selection of interviewees was carried out on the basis of their respective roles, and the type of knowledge they can contribute (Van Lamsweerde 2009). The purpose was to identify knowledge providers and knowledge consumers. To obtain adequate knowledge requirement for the KMS in the context of Gilgit-Baltistan, we selected organizations that play an active role in the development of the region: Gilgit-Baltistan Planning and Development Department, Gilgit-Baltistan Legislative Assembly, Karakoram International University (KIU), Professional Development Center North (PDCN), Aga Khan Rural Support Program Gilgit Pakistan (AKRSP), Aga Khan Planning and Building Service Pakistan (AKPBSP), Aga Khan Culture Service Pakistan (AKCSP), Karakoram Area Development Organization (KADO), Local Support Organization Hyderabad (LSO), Local Support Organization Network Hatoon (LSO), Local Support Organization Danyore (LSO), and Press Club Gilgit.

These stakeholders were identified according to criteria related to their organizational role. The local government of Gilgit-Baltistan is involved in both the administrative and the development processes of the region. Local support organizations (LSOs) are newly formed semi-structured private organizations that operate at a grass-root level and contribute to the development process of the region. The Aga Khan Rural Support Program (AKRSP) has vast experience in the rural development of the region.

Heads and relevant personnel within the organizations were selected for the interviews. A digital recorder was used to record the information, which was later transcribed. Altogether, we carried out 12 interview sessions.

Interviews were designed from a knowledge requirement point of view. They aimed to collect information about 1) initial knowledge needs from the stakeholders, 2) information about the work of stakeholders' organizations in terms

of their different development activities, 3) the current communication infrastructure in the region and the ICT use of the organizations, and 4) the digitization process and the required online resources for the repositories.

The collected information was analysed on the basis of the stakeholders' resources and needs with the potential to contribute to sustainable development. For this purpose the transcribed interviews were coded and organized in tables with respect to who was the provider and who was the beneficiary.

In parallel with the requirement analysis we carried out an inventory of relevant approaches to the design of knowledge management frameworks. Data bases used were: ACM Digital Library, Elin@orebro, and Google Scholar. Search words were "knowledge management system", "rural development", "sustainable development", "development", and "framework", in different combinations. A review of abstracts and conclusions elicited ten articles on the design of frameworks in knowledge management connected to rural development. The articles were selected due to their close connection to knowledge management and rural development. The three main elements, that were considered when selecting frameworks, were the same as we used as for the empirical study.

1. Stakeholder. Stakeholders are here defined as any group of people or members in any organization or external organizations that can act as producer or receiver of knowledge in a rural sustainability context.
1. Technology. The framework must include an ICT/KM tool used to construct the framework(s).
2. Rural/development sector. The tasks or work area must be related to development or specifically rural development.

A data matrix was used for analysing the concepts of the selected frameworks (Webster and Watson, 2002). As noted by Levy and Ellis (2006), the use of ideas in the literature is to justify the particular approach to the topic. Ten frameworks were selected, see section 4.

Empirical information was gathered in line with initial information requirements for knowledge management. This was then related to the selected frameworks outlined in the literature study and described in the sections that follow.

6. Results

In this section we present the findings from the empirical study. The framework inventory is presented in section 4. Finally, we present the developed framework for knowledge sharing for sustainable rural development.

6.1 Stakeholders

The interviewed organizations were categorized into four main stakeholder groups and analysed with regards to the knowledge beneficiaries. Table 2 shows that the knowledge producers produce knowledge targeting the beneficiaries. Note that the same stakeholder can be knowledge producer of certain knowledge and beneficiary of some other specific knowledge.

Table 2 Stakeholders and knowledge beneficiaries.

Main Stakeholder	Knowledge producers	Knowledge beneficiaries
Local government	Planning & development department	Local population., LSO, Donor agency, AKRSP
Local population	Local population	AKRSP, LSO, Local government
Academia	Karakuram International University, Professional Development Center North	Local government, Local population, NGO's, Civil society & Donor Agencies
NGO's, Civil society & Donor agencies	AKRSP, AKPBSP, AKCSP, KADO	LSO, Donor agency, Local government, Local population
	LSO Danyore, LSO Hatoon, LSO Haiderabad	Local population, AKRSP
	Donor Agencies	AKRSP, Civil society, LSO

The **local government of Gilgit-Baltistan** has several departments, including those that deal with health, education and administration. We chose to study the planning and development department because many of its services are closely related to rural development activities in the region. The department receives funding and advice from central government and international donor agencies, such as the World Bank, United Nations Development Program (UNDP), USAID, DFID and the EU. Together with funding, the international donor agencies also provide policies and guidance on where and how to utilize these funds. Guidance, policies and research work carried out by the donor agencies contribute to knowledge of rural development activities, as well as their sustainability. Donor agencies also offer seminars and training programs that are aimed at the local population and relate to development work. Thus, a multi-way contribution of knowledge is made between the stakeholders, from donor agencies to the local government department and from the local government department to the local population. In return, the donor agencies, local government department and NGOs acquire knowledge from the local population during their research work and through interviews.

Local population: For many years, the region of Gilgit-Baltistan has been extremely isolated; indeed, many parts of the region are still quite isolated. Here, isolation means an absence of outside world knowledge and an absence of physical accessibility. Over the past three decades, the situation has changed. Road infrastructure has been developed, and modern technology and telecommunication systems introduced. In the meantime, however, the local populations have developed their own way of living in a region that has been isolated from the outside world for such a long time. Such indigenous knowledge (World Bank, 1998) includes development work and activities in farming, agriculture and business. The local NGOs, local government department and donor agencies also rely on indigenous knowledge to carry out their development activities in the region. In this way, the local population is the knowledge producer, whilst the donor agencies, NGOs and local government department are all knowledge beneficiaries.

Academia: In terms of education and research, the region has one university and a professional development centre. The university arranges annual national and international conferences and seminars on rural development. The local government, donor agencies, local population, NGOs and civil society organizations participate in these conferences and seminars. In this way, the university is the knowledge producer and the other participants are the knowledge beneficiaries. Professional Development Center North (PDCN) is a place where rural development training is carried out. The participants include members of the local government, civil society organizations and NGOs, as well as the local population. In this case, PDCN is the knowledge producer and the other participants are the knowledge beneficiaries.

NGOs, civil society and donor agencies fall into the same category because of the nature of their work and their contribution to rural development. Their main goal is to carry out development work without making a profit.

NGOs play a key role in development by working closely with the local population. They serve as a bridge between the local population and international donor agencies. The donor agencies grant money through these NGOs and the local government department uses this money to target the local population. Due to a lack of good governance, the donor agencies mainly rely on NGOs when working on rural development projects. The NGOs produce knowledge when working with the donor agencies, civil societies and local population. Their knowledge is very useful, because they can closely observe the rural development process and interact with the local population on the ground. The NGOs employ educated people to record best practices and success stories. These can be utilized in another village or area of the region. Their knowledge is also used by donor agencies in further research work; for example, for analysing development activities and writing reports. The NGOs go on to train the area's civil society, which further utilizes their knowledge. In this case, NGOs, civil society organizations and donor agencies are all knowledge producers and the local population is the beneficiary.

Civil society is a new concept in the region. Civil society is made up of a network of groups of people, organizations and voluntarily institutions, whose main task is to help people in every aspect of their lives. In recent years an NGO known as the AKRSP (Aga khan Rural Support Program) has, with the help of the local population of Gilgit-Baltistan, established a number of Local Support Organizations (LSO) using the concept of civil society. The main goal of the LSOs is to introduce good governance at a grassroots level and to work in such areas as health, education and infrastructure development. Since the only civil society interaction is between the NGOs and local population, their knowledge is used by both these groups. In this way, the civil society or LSO becomes the knowledge producer and the NGOs and local population become the beneficiaries.

The **donor agencies** are important stakeholders in the rural development process because of their financial support and research work. Donor agencies pass on their knowledge to the local population, as well as to NGOs, such as the AKRSP, and the civil society or LSOs. In this case, they become the knowledge producers and other NGOs, the civil society or LSOs, and the local population become the beneficiaries.

The overall transfer of knowledge between these stakeholders is a multi-way process. Stakeholders rely on each other's knowledge; thus, they are dependent on each other.

6.2 Knowledge on development activities

In order to develop a knowledge repository, the primary requirement is to acquire knowledge from stakeholders. Initially, information about development activities in the region was collected and categorized. The interviewed stakeholders had specific knowledge with respect to their development practices. Their practices concerned animal husbandry, social welfare, safe drinking water, sewerage systems, housing construction, road-, bridge- and tunnel construction, agriculture, marketing and enterprise development, civil society building, environment protection, tree planting, glacier protection, wildlife preservation, building health care units, school building, teacher training, culture preservation, tourism promotion, building ICT centres, gender development, and more. Table 3 below shows the generated knowledge domains for the stakeholders' development activities. Knowledge was categorized on the basis of stakeholders' knowledge resources and needs relevant for rural development, which is presented below.

Table 3 Development activity knowledge ("E" = Explicit, "T" = Tacit, "-" = N/A) .

Stakeholders	Rural development knowledge in the Giligt-Baltistan Region							
	Research	Funding	Agriculture	ICT	Gender	Institutional development	Local infrastructure development	Marketing & enterprise section
Local gov	E	E	E	E	E	-	E	-
Local pop	-	-	T	-	-	-	-	-
Academia	E	-	-	E	-	-	-	-
NGO's, Civil Soc & Donor Agencies	E	-	E	E	E	E	E	E

The knowledge depicted in Table 3 is available in different forms. The local government's planning and development department has, for example, knowledge on funding and infrastructural development of the region in paper format. The department has not yet established any kind of computer network for official use. The LSO and local population have information on the agriculture sector; this is also the main target for AKRSP and other NGOs. AKRSP has 25-years' worth of development records, kept both in paper and digital formats.

6.3 Technical conditions and ICT infrastructure

In this section we present the ICT infrastructure and existing initiatives in the region of Gilgit-Baltistan. The infrastructure represents the conditions for any ICT-based initiative such as a KMS. The initiatives are candidates for incorporation in the KMS and they demonstrate that ICT based knowledge exists even in remote rural regions.

The region has only one Internet operator, Snet, which provides Internet services and landline telephone services in the region. Table 4 shows the Internet connectivity rate available for connected stakeholders. Some of the NGOs have relatively fast Internet connection rates. The two LSOs, Hatoon and Danyore have dial-up Internet connection, whereas Hyderabad LSO has none. Several mobile phone companies offer services in the region.

Table 4 Stakeholders, connectivity and ICT-based initiatives**.**

Stakeholders	Sub organization	Connect. rate	ICT-based initiatives
Local government	Local government planning/ development department	50-250kb/s	Northern Areas Information Resource Centre GIS project of 300 villages in Diamer district
Academia	KIU	1 Mb/s	Karakoram International University Digital Library
	PDCN	1 Mb/s	ICT training of professionals, teachers & students
NGO's, civil society & donor agencies	AKRSP	1 Mb/s	e-Mundi (E-Market) 3D program (Democracy, Dialog & Development) Digital library for NGO use
	AKPBSP	1 Mb/s	KAP (Knowledge, attitude and practice)
	AKCSP	1 Mb/s	Restoration of landmarks, digital images and mapping of Hunza region
	KADO	1 Mb/s	Journal of Karakoram highway Business incubation project for website development E-schooling and e-village concept Concept of e-commerce and Internet Café´s
	LSOs	50-250 kb	Websites Mobile networks

The existing ICT-based initiatives in Table 4 are for example: AKRSP has initiated a project in collaboration with Telenor Pakistan. The project examines e-market access for farmers in the remote valleys. Another recent project is a digital resource centre, which stores the current documentation of organizational activities. AKRSP has also initiated a 3D program (democracy, dialogue and development) to study local governance in terms of the initiation of dialogue culture. AKCSP has initiated a project with support from the Government of Norway to restore and rehabilitate historic landmarks and places. KADO has started a business incubation project for website development for small entrepreneurs. An e-schooling concept has been introduced and four Internet cafés have been established. The main requirement for the knowledge repository is to utilize all these kinds of resources offered by individual organizations.

From the interviews with AKRSP representatives, we found that some digital resources relate to development activities that already exist. This information can be included in the knowledge repository right from the start. AKRSP can provide the following resources to show its yearly best rural development practices in the region.

1. Monitoring and evaluation research reports
2. Outcomes of the workshops and conferences, and village case studies
3. Activities, records, and reports regarding gender, early childhood, and institutional and social development
4. Natural resource management data
5. Training modules and manuals, and information on ICT centres
6. International development and donor agency contributions

7. Proposed framework for knowledge sharing of sustainable rural development activities

In this section, we present a framework for knowledge management in rural development based on our literature study and the empirical findings of the Gilgit-Baltistan study, see Figure 2. The description of the KMS is compiled from

selected frameworks for rural development. The stakeholder categorization and knowledge content are both derived from the empirical study.
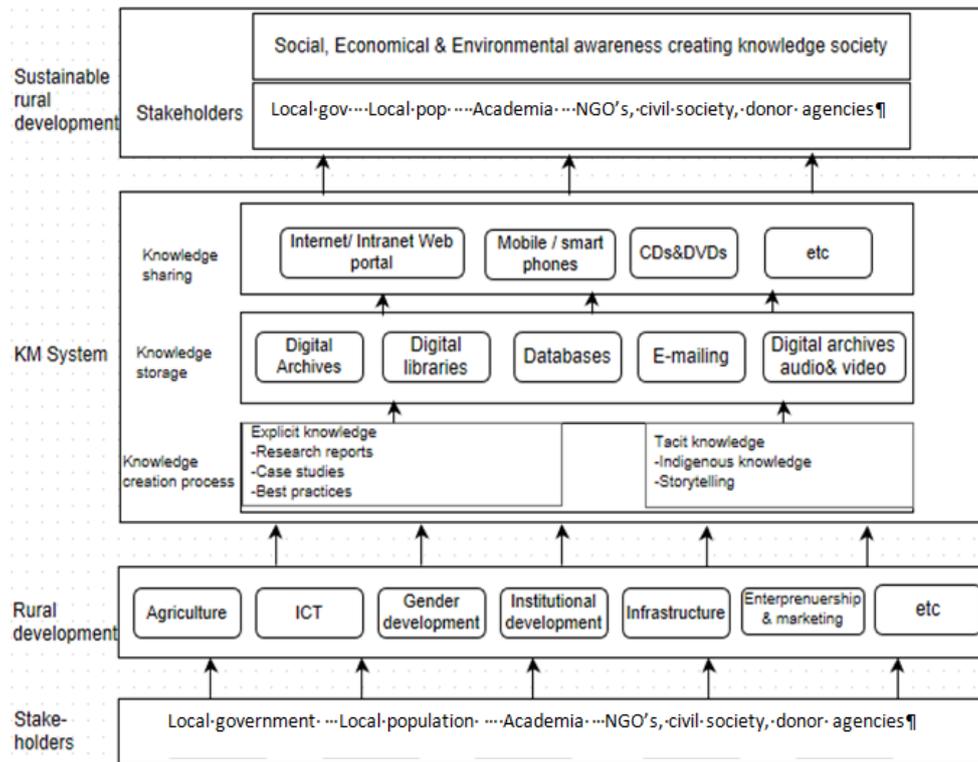
Figure 2 KMS framework for sustainable rural development

In this section, we introduce the notion of "knowledge society". A knowledge society generates, processes, shares and makes available to all members of the society the knowledge that may be used to improve the human condition (Wikipedia). Afgan and Carvalho (2010) claimed that a knowledge society is a human-structured organization based on contemporary knowledge and representing new quality of life support systems. The availability of information to the rural communities and their ability to transform that information into useful knowledge and further by enhancing their capacities to use that knowledge for the improvement of their lives is a major step toward the sustainability of the rural development process.

In the proposed framework we claim that the sustainability of rural development can be achieved through a knowledge society in which knowledge of the rural development process is shared among all relevant stakeholders. Knowledge society and sustainability occur:

- when the main target group of the rural development process, the local population, can independently inform themselves about the rural development process and activities
- when the local population becomes aware of the importance of taking care of their own natural rural environment,
- when the local population becomes economically prosperous by starting to earn money by themselves, and
- when the local population becomes socially harmonious, peaceful and knowledgeable.

When the local population has reached such a state, it can take better care of their own social life, economy and environment. It will certainly become master of its own rural development, leading to the creation of a knowledge society and sustainability.

In the proposed framework, as depicted in Figure 2 above, the process starts with the stakeholders who are featured in the bottom layer of the figure. In the rural development environment the stakeholders are; local government, local population, academia, NGO's, civil society and donor agencies. (See section 6.1.)

The second layer consists of rural development activities. A selection of these is shown in the figure, including agriculture, ICT, gender development, institutional development (grassroots-level civil society organizations) and

infrastructure (building of roads, bridges and canals, providing safe drinking water and sewerage, building houses etc.). These activities are performed by the stakeholders. (See section 6.2.)

The third layer consists of the KM system. This layer has three further sub processes: a) creating/capturing knowledge, b) knowledge storage and c) sharing/application of knowledge. The processes and their components/technology are adapted from the 10 selected frameworks that are relevant to the Gilgit-Baltistan case, based on the available technology and infrastructure. (See section 6.3.)

Rural development practices generate different forms of knowledge (Bouwen and Taillieu, 2004; Tovey and Bruckmeier, 2008). This composition of knowledge is formed by combining indigenous knowledge found in local rural areas with outside world knowledge, which comes through the development actors (Hess, 2006). Thus, we claim that the rural development process and knowledge creation takes place when rural development activities are being performed. The knowledge created is sometimes explicit, in the form of research reports, case studies and best practices. Activities from which lessons have been learned also appear in the form of documentation. Some knowledge is tacit such as local population knowledge, specifically called indigenous knowledge (World Bank, 1998). Some NGOs, like the World Bank, run programs to preserve isolated knowledge that has not been seen by the outside world. Such indigenous knowledge has been practiced by the rural population for centuries, helping them to live in keeping with their rural environment. In our framework, the created knowledge was then captured, converted and stored in different digital formats using the relevant ICT tools and technology. These tools, selected from the 10 frameworks, are digital archives of, for example, documents, digital libraries, databases, emails and blogs. To capture, convert and store tacit knowledge we used digital audio and video formats. After storing the available knowledge, as part of the third sub process of KM system, we shared it with the stakeholders. The framework shows the technologies that can be used to share knowledge; these include the Internet and intranet web portals, as well as mobile and smart phones, and CDs and DVDs. Different communication channels can also be used, such as TV programs, to show documentaries on rural development.

The fourth and final process on the topmost layer of the framework relates to the sustainability of rural development. Our main claim about this process is that when shared knowledge is applied further on in the rural development process, it leads to the sustainability of the whole rural development process. The following key points may come into play.

- Knowledge is important for development (Wong, 2010).
- A sustainable knowledge society is composed of three elements: economic, environmental and social development (Afgan and Carvalho, 2010).
- A knowledge society can make the development process achievable.

8. Conclusion

The research question for this paper is: How can knowledge management contribute to sustainable rural development?

Knowledge is crucial for any kind of development (Bruckmeier and Tovey, 2008). Sustainability is composed of three main areas: social development, economic development and environmental development. Berkes et al. (2003) stated that diverting rural development towards the path of sustainability implies a reliance on knowledge of the natural process, natural resources and the inter-relations between social and ecological systems. A knowledge society can also make the rural development process achievable. In this context, the achievability of the rural development process and its sustainability relies on knowledge. Thus, we designed a knowledge management framework (see section 7) in order that knowledge can be used to develop the sustainability of the rural development process in the case of Gilgit-Baltistan.

References

Abdul, W.K. (2005). UNESCO Assistant Director-General for Communication and Information UNESCOs Basic Text on the Information Society, UNESCO Publishing. Afgan, N. H. & Carvalho, M. G. (2010). The Knowledge Society: A Sustainability Paradigm, *Cadmus*. 1(1), Oct 2010, 28–41.

Agarwal, A. (2002). Indigenous knowledge and politics of classification, *International Social Science Journal*. 54, 277–281.

Alavi, M. & Leidner, D.E. (2001). Knowledge Management and Knowledge Management systems: Conceptualization and research issues, *MIS Quarterly*, 25(1), 107-136.

Ashraf, M.M. & Malik, B.T. (2011) Gonokendra model: a response to "information poverty" in rural areas of Bangladesh. Information Technology for development. 17(2), 153-161.

Brown, B. J., Hanson, M. E., Liverman, D.W. (1987). Global sustainability: Toward definition, *Environmental Management*. 11(6), 713-719.

Bruckmeier, K., & Tovey, H. (2008). Knowledge in Sustainable Rural Development: From Forms of Knowledge to Knowledge Processes. *European Society for Rural Sociology,* Vol. 48, p 313-329.

Chambers, R., & Conway, G. (1991). Sustainable rural livelihoods: practical concepts for the 21st Century. *IDS Discussion paper.* No 296, 1-33.

Fernandez, B., Gonzalez, A., & Sabherwal, R. (2004). Knowledge management: Challenges solutions and technologies. *Pearson Prentice Hall, New Jersey USA*.

Galindo, I.M. (2007) Regional development through knowledge creation in organic agriculture. Journal of Knowledge Management. 11(5), 87-97.

Hess, C.G. (2006). Knowledge Management and Knowledge Systems for Rural Development. *GTZ Knowledge Systems in Rural Areas.* 09/2007, 1-16.

Hu, M., Liu, Q. & Li, H. (2009) Design and Implementation of Rural Educational Resource Regional Service Platform. *IEEE Computer Society 2009 Second International Symposium on Knowledge Acquisition and Modeling. Pp. 16-19*

ITU (International Telecommunication Union) (2012). *Measuring the Information Society*. ITU Publications: Geneva.

Knowledge Society (2013, 4 November) In Wikipedia. Retrieved 2013-11-27, http://en.wikipedia.org/wiki/Knowledge_society

Kivunike, F.N., Ekenberg, L., Danielsson, M., & Tusubira, F.F. (2011) Perceptions on the role of ICT on quality of life in rural communities in Uganda. *Information Technology for development*. 17(1), 61-80.

Kurlavicius, A. (2009a). A viable systems Approach to sustainable Rural Development: Knowledge-Based Technologies and OR Methodologies for Decisions of Sustainable Development. *5th International Conference,* KORSD. 75-79.

Kurlavicius, A. (2009b). Sustainable agricultural development: knowledge-based decision support. *Technological and economic development of economy.* 15 (2), 294-309.

Kurlavicius, A. (2006). Knowledge based approach to sustainable rural development management. *Biometrics and information technologies in agriculture: Research and development in proceedings of the second International Scientific conference, 24-25 Nov 2006, Academia, Kaunas*, 7-10.

Levy, Y., & Ellis, J. (2006). Towards a Framework of Literature Review Process in Support of Information Systems Research. *Proceedings of the 2006 Informing Science and IT Education Joint Conference.*

Liu, F. & Makoto, H. (2010). Leadership's function in the knowledge management of rural regional development. *IEEE*, 978-1-4244-5326-9/10.

Lwoga, E,T, Ngulube, P. & Stilwell, C. (2010) Managing indigenous knowledge for sustainable agricultural development in developing countries: Knowledge management approaches in the social context. *The International Information & Library Review*, 42(3).

Mansell, R. (2009). Information Societies: Knowledge, Economics and Organization Editor's Introduction to Vol. 2. Routledge, London, UK.

Miah, J.M., Kerr, D., Gammack, J., & Crowan, T. (2008). A generic design environment for the rural industry knowledge acquisition. *Knowledge-Based Systems*. 21 (2008) 892–899.

Mohamed, M., Stankosky, M., & Mohamed, M. (2009) An empirical assessment of knowledge management criticality for sustainable development. *Journal of Knowledge Management*, 13(5), 271 – 286.

Nonaka, I. (1991). The Knowledge Creating Company. *Harvard Business Review*. Nov-Dec 1991.

Pade-Khene, C., Mallison, B., & Sewry, D. (2011) Sustainable rural ICT project management practice for developing countries: investigating the Dwesa and RUMEP projects. *Information Technology for development*. 17(3), 187-212.

Payakpate, J., Fung, C.C., Nathakarankule, S., Cole, P., & Coke.P. (2004). A knowledge management platform for the promotion of modern rural energy services in ASEAN countries. *IEEE Xplore*. 535-538.

Polanyi, M. (1966). *The Tacit Dimension*. Routledge & Kegan Paul, London.

Quintas, P., Lefrere, P. & Jones, G. (1997). Knowledge Management: a Strategic Agenda. *Long Range Planning*. 30(3), 395-391.

Rahman. A. (2000). Development of an Integrated Traditional and Scientific Knowledge Base: A Mechanism for Accessing, Benefit-Sharing and Documenting Traditional Knowledge for Sustainable Socio-Economic Development and Poverty Alleviation. *UNCTAD Expert Meeting on Systems and National Experiences for Protecting Traditional Knowledge, Innovations and Practices*. 20 Oct- 1 Nov 2000.

Rosenbaum, M. (1993). Sustainability definition www.hsewebdepot.org/imstool/GEMI.nsf/WEBDocs/Glossary?OpenDocument

Sati, M.C. & Juyal, R.P. (2008) Gender Approach to Sustainable Rural Development of Mountains. *Mountain Research and development*. 28(1), 8-12.

Shakeel, H., & Best, M. L. (2002). Community knowledge sharing: an Internet application to support communications across literacy levels. *Technology and Society, (ISTAS'02). International Symposium*. 2002, 37- 44.

UN (1987). Report of the World Commission on Environment and Development: Our Common Future. Retrieved 2013-11-27 from http://www.un-documents.net/wced-ocf.htm

UN (2010). *Information Economy Report. ICTs, Enterprises and Poverty Alleviation*. UN: New York & Geneva.

UNESCO (2005). *Toward knowledge Societies*, UNESCO World Report.

UNDP (2007). *The human development concept*. Human Development Reports. Retrieved 2013-11-27 from http://hdr.undp.org/en/humandev/

UNDP (2013) Knowledge Sharing. Retrieved 2013-11-27 from
http://www.undp.org/content/undp/en/home/ourwork/knowledge_exchange/

Van Lamsweerde, A. (2009). *Requirements engineering: from system Goal to UML Models to software specifications.* John Willy & sons Ltd, England.

Voccia, A. (2011) Knowledge Management for sustainable development in the web 2.0 era: the Triangle of Dichotomies. *Knowledge management for Development Journal*, 6(3), 179-193.

Walsham, G. (1995). Interpretive case studies in IS research: nature and method. *European Journal of Information Systems* 1995 4, 74-81.

Webster, J., & Watson, R. T. (2002). Analyzing the past to prepare for the future: Writing a literature review. *MIS Quarterly 26*(2), xiii-xxiii.

Wong, D. M. L. (2010) Knowledge Management Catalyst for Sustainable development. ITSim 2010 (3), 1444-1449.

Wood, G., Malik, A., & Sagheer, S. (2007). *Valleys in Transition, Twenty Years of AKRSP's Experience in the Northern Pakistan.* Oxford University Press.

World Bank (2013). World databank. Retrieved 2013-11-27 from http://www.worldbank.org/

World Bank (1998). Indigenous knowledge for development a framework for action, *Knowledge and Learning Center,* Africa Region. Retrieved 2013-11-27 from http://www.worldbank.org/afr/ik/ikrept.pdf