Overview of an efficient knowledge management model for improving the role of agriculture educational system in the process of developing a knowledge-based agriculture: the case of Iran

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Abstract

Agriculture is an important aspect of Iranians economy and life. While there are great opportunities for excellent agricultural activities, the rate of development in agriculture has not been satisfactory yet. A reason for this dissatisfaction is that the moving toward a knowledge-based agriculture, which is the origin of the accelerated economic development in modern world, has been retarded in Iran. Based on a model proposed by USAID and in accordance with the conditions of Agriculture Education in Iran, a model has been suggested. The Knowledge Management Model for Agriculture Educational system consists of organizations and relationships between them that aim toward empowering the focal point of any agriculture production system which is agriculture household. A key entity in the model is knowledge centre that is very much similar to a library but with more varied resources, more sophisticated technologies, wider scope of activities and a more competent manager who is called a CKO.

Analysing the model according to a standard measure like SWOT shows that there are many points that must be considered before the implementation of the model. Among the strengths, the systems approach is very important while in its weaknesses the opinions of the managers and the unstablished structure of the organizations seems to be critical. On the other hand there are opportunities like TAKFA-the Farsi word for the plan of development and usage of IT- that has a large amount of money available for suchlike plans. At last the most important threat is the changes in the managerial teams.

Key words: knowledge management, knowledge centre, Iran, ITVHE, agricultural education

1 Introduction

Iran is located in the middle of a vast plateau in south west of Asia. The country is naturally arid with less than 300 mm annual rainfall. Thanks to the geomorphologic conditions of the plateau, however, some microclimates developed in different parts of Iran amongst which Northern provinces, Mazandaran and Gilan, are the most significant examples. This caused good agricultural opportunities like a powerful sun ray in many parts, more than 50 million hectares of arable lands and plenty of natural resources to be available to farmers from very old times.

Agriculture has been the main job of Iranians from ancient times and for many centuries people have depended on land for their life. Sir Arthur Keith believes that the plateau of Iran has been among the first parts of the world whose people started to practice farming and animal husbandry (Iranshahr, 1963). This long historical background and harsh weather has caused a large amount of indigenous knowledge with many variations to develop all over the country and conveyed through time from fathers to children. In the peaks of their civilization, Iranians introduced so many great ideas and inventions to the world like...
networks of irrigation canals and Ghannats. In this respect Henri Cgoblot, a French hydrologist and
historian claimed that “… the first Ghнат were developed in the cultural borders of Iran”. In
communication technology one can name Chapars as an elementary system for conveying messages
between far cities in ancient Iran. Chapar was a network of horse riders whose duty were to convey the
instant messages of governors to various parts of Iran.

From the beginning, agricultural activities were accompanied with using information and knowledge for
different levels of decision making. The questions like how, when and where to plant a tree required the
usage of know-how, know-when and know-where. Therefore using information in agriculture is not a
new matter and has been around for thousand of years, but the new agenda is the role of information and
knowledge as the fourth resource of production in agriculture.

For perceiving a better view of knowledge it is better to compare it to information and data. Data is
observed and measured by human’s senses or different types of measuring devices that doesn’t convey a
specific meaning to the observer’s mind. Davenport (1998) believes that the meaning of “information” in
English is to shape the insight and vision of the receiver of the information. In other words, as Drucker
puts it, information has goal and relevance. Data can be transformed to information during a process,
which may be complex or simple. Generally the processing of data and transformation of it to information
is more timely and laborious than complex. Therefore it is not unexpected that the long arrays of GIS data
are transformed to information using a computer.

Knowledge, however, as is conceived by many people intuitively has a rather more complicated nature
than data and information. Knowledge is the production of a more sophisticated engine called “human
brain” in comparison to the most advanced super computers. There are many different viewpoints
regarding the real origin of knowledge. While Sveiby(2001) believes that knowledge is only produced in
human’s brain and when it is expressed by any means is transformed to information, Natarajan (2000)
states that knowledge that is in the context of the human mind is called tacit knowledge and when it is
expressed in any form is called explicit knowledge. On the other hand Giere (1984) using cognitive
psychology defines knowledge as justified true belief (JTB). Schmoldt (1996) with reference to Giere’s
definition describes the transformation of information to knowledge as “information is converted to
knowledge when we develop a justified belief in its truth value”.

Natarajan (2000) recommends a practical knowledge solution model which consists of two components.
First is the “transformation of information to knowledge”, which can be achieved through writing an
essay or article by a researcher. Second is “independent knowledge solution model” that does not need a
transformation process. As an example, Natarajan (2000) explains the case of British Petroleum using
video conferencing technology for repairing damaged parts of oil platforms in the sea with the help of an
expert while he is sitting in his office in Aberdeen.

There is yet another way of categorizing knowledge by studying the origin of it. There are many facts that
have been examined by our ancestors in the laboratory of nature during time and reached to us. This kind
of knowledge is called indigenous knowledge and is plentiful especially in developing countries. World
Bank has plans for discovering and management of this kind of knowledge.

Another kind of knowledge has come to existence by science. Despite the indigenous knowledge, this is
a product of scientific thinking and analogy. Thus science-based knowledge, be tacit or indigenous, is
produced mainly by a scientist or a technologist and the justification is done in a laboratory, in field or
with references to previous experiences recorded in articles, books etc.

With a bit of pondering in the meaning of knowledge in above paragraphs, the different types of
knowledge can be put into a 2*2 matrix. As it is obvious in fig1 there are four different variations for
knowledge representation. Knowledge matrix represents the different types of knowledge and the
interactions between them. In fig1, I, S, E and T consequently mean indigenous, science-based, explicit
and tacit. The interaction between the headlines of the cells, which actually occurs in real world, causes
four variations namely EI, ES, TI and TS. A rare commodity in under developed and developing countries
is the knowledge that is expressed in any means like papers, books, documents, films etc. For indigenous
knowledge this is more critical because the owners of the knowledge are the persons who have not the
ability to write it down and unfortunately the conditions for recording the knowledge by organizations
and experts is not prepared too. ES which stands for explicit science-based knowledge is the most
prominent knowledge in contemporary world of science, technology and trade. Tacit indigenous knowledge is the knowledge trapped in the minds of so many elderly farmers and practitioners in that can be transformed to explicit knowledge or not depending on the situation of them. The rate of the transformation of TI to EI in the developing countries is very low. Tacit science based knowledge is the production of the mental activities of the scientists and can be transformed to ES by recording.

In real situations, there are counterparts for each cell of the knowledge matrix and the interactions between them. For instance, the transformation of TS to ES requires a scientist to publish an article in a journal. There are also other organizations like agriculture library, technical and vocational schools, universities etc. Based on the knowledge matrix, a model can be constructed that relates the organizations which are responsible for different levels of knowledge management to each other so that the concluded system is most efficient in knowledge creation, organization, storage and dissemination. USAID (2003) has devised a model called Agriculture Knowledge System which consists of “organizations, knowledge sources, methods of communication and behaviours surrounding an agricultural process”. Regarding the communications, USAID suggests a two-level ICT-based model that is divided into digital and non-digital ICT. Conceptually the AKS is based on four key assumptions:

1. knowledge is an increasingly significant factor of productions,
2. all actors in the agricultural sector are part of an evolving agricultural knowledge system(AKS)
3. ICTs accelerate agricultural development by facilitating knowledge management for AKS members,
4. ICTs are essential coordinating mechanisms in global trade.

2 Analysing the present situation

Agriculture education in Iran is being delivered in four sections. First, there are agricultural faculties that are affiliated to the ministry of science, research and technology and whose duty is to train agricultural experts with strong theoretical bases. Second, there are other faculties with the same line of duty but different affiliation, i.e. to Azad University. On the third level, are situated the Agricultural Educational Complexes that are affiliated to the Ministry of Jihad-e-Agriculture. Despite the first one, the complexes’ main duty is to train agricultural technicians with strong practical bases. The forth section is the Agricultural education in high school level which is divided into two ministries, i.e. ministry of Education and Ministry of Jihad-e-Agriculture.

While the Agricultural Education complexes have fewer students than the faculties, they own larger fields, more educational centres and closeness to the environment of agriculture. In the present, there are 50 educational centres and 8 high school organized in 28 educational complexes.

For a better understanding, we have to analyse the structure and functions of an agricultural complex. Most of the complexes consist of three different educational departments, as related to this model: Technical and Vocational Higher Education (formerly were centres themselves, called T&V Higher Education Centre), farmers’ education and high school. TVHE students are selected by a national contest.
Their training is coordinated by headquarter called ITVHE, located in capital. The students of high school have two choices: they can either enter the agriculture high school affiliated to the Ministry of Jihad-e-Agriculture or enter the courses that are under supervision of the Ministry of Education. In both cases they are obliged to pass some courses in Agriculture Complexes and work on farms, green houses etc. Geographically, the complexes are situated in the country side except an administrative office which is located in cities. From this aspect, the complexes are much different from the Agricultural faculties that are located in cities.

Poorahmad (2004) has done a thorough survey of the library and information services of the Agricultural Complexes for ITVHE. The research shows that while there has been some coordination for the development of the library and information services but the lack of a comprehensive plan or architecture is obvious. The same conclusion is true for the Agricultural faculties that are scattered in different cities. Regarding the internet connection of the complexes Poorahmand (2003) finds out that from 30 TVHE centres only two have wireless devices, four have leased lines and the others have dial up connections.

3 problems observed

The statistics published by Iranian Statistical Centre (2004) shows that the rate of growth in training the highly educated experts and training the farmers are uncoordinated. On one hand there are about 45% illiterate farmers and on the other hand there are so many students graduating from higher education centres that are either unemployed or employed in non agriculture sector. It seems that there have to be a straight relationship between the low rate of literacy and the productivity of agriculture being as low as about 50%.

The agricultural organizations in Iran are not designed to be components of a dynamic agriculture system. Thus each of them plays its role without considering the others’. Even inside an Agricultural Education Complex the relationship between training of farmers, TVHE students and Agricultural high school students is not designed systematically. By the same token, the faculties of agriculture have not any defined relationship with other organizations in agriculture sector being public, government or private affiliated. Therefore there is not any chance for the owners of indigenous and science-based knowledge to interact in the agriculture system of Iran. A brief observation shows that there are plenty of unused and unknown knowledge all over the country inside the brains of so many scholarly people, students who have great ideas, intelligent and hard working librarians, experienced elderly and young farmers and so many books, journals and documents scattered all over the organizations. Mokhtari (2004) during a feasibility study in ITVHE concludes that “at the present, there are masses of documents such as annual reports, laws and regulations, financial and credential documents etc. in the form of reports or loose leaf and plenty of file cabinets all over the Institute” that are organized properly.

On the other hand, the end user of the agriculture system of Iran has been lost in the middle of the bureaucracy of large and heavy bodies of government organizations which use most of their energy for managing themselves. The ultimate purpose of the agriculture system in any country should be maximizing the sustainable production of agriculture. Thus the farmers must be the focal point of the agriculture system.

Not having a coordinator, agricultural organizations like faculties, complexes and schools used different and sometimes incompatible standards in their software, hardware and networks development. As a distinctive example, library software used in agriculture educational complexes and research centres are incompatible.

While there are so many unfulfilled missions for librarians in agricultural educational organizations, they devoted their time and energy only to collecting, organizing and disseminating books and journals. The potential mission which have not been considered seriously yet are managing so many digital and non digital documents, content management, promoting dissemination of knowledge through web pages and internet, collaborating in making new ideas for organization of knowledge, acting as a knowledge broker for the organization and so many other jobs.

Developed and many of developing countries have come to the conclusion that knowledge is the fourth element of production and ICT plays as an enabler for accelerating the movement towards a knowledge based agriculture. For the same reason the organizational structure of the organizations that are engaged
in agricultural activities, a new position has been created called CIO or CKO. A good example of the CIO is in USDA. In Iran, especially in agriculture sector, not only the position has not been designed but also the belief in ICT as being the enabler and accelerator of movement towards a knowledge-based agriculture has not been established yet.

4 Suggested Model

figure 2 Knowledge Management model for agriculture educational sector of Iran, in which the abbreviations are as below: MA ministry of agriculture, NKC National knowledge center, KC knowledge centre, RC research center, RS research station, AH agriculture high school, FE farmers education, LEC local extention services, LSP local service providers, and NGO non-governmental organization.
Based on the problems of the present situation and requirements of the new system a model can be proposed. The proposed model is shown in fig2 schematically. As it is obvious, there are three levels of knowledge in the model which are from top down consequently global knowledge, national knowledge and local knowledge. The global and national knowledge are, according to the knowledge matrix, equivalent to science-based knowledge while local knowledge is the same as indigenous knowledge. Global knowledge consists of the information and knowledge that is published by universities, research centers, journals and so many other scientific and technical organizations. Among them, there are best practices kept in the databases like that of the world bank.

The components of the model as shown in fig 2 are the agricultural household which is the focal point of the model, intermediate organization that are in the local level and in the context of the agriculture household, the more scientific bodies like agricultural faculties and research centers, knowledge centers in two levels and national organizations like national library and Ministry of Jihad-e-Agriculture. As it was mentioned before the main goal of the knowledge management model is to increase the agricultural production in a sustainable manner and that knowledge is a very significant factor in increasing the production. The drawings of the two persons inside the oval are representative of a young and an elderly farmer. Interrelationship between the two shows the exchange of tacit knowledge in both forms of indigenous and science-based. The young farmer have a relationship with Agricultura Highschool in which she or he can grasp scientific knowledge. One of the most important roles of the high school in this model is to prepare an environment for recording the indigenous knowledge of the young farmers and transmitting the scientific knowledge to elderly farmers. There should be a regulation for the students to write papers and lab reports, present seminars, taking part in discussions, using internet for their assignments etc. -which in the present is not persuaded actively.

USAID(2003) recognizes intermediate organizations as the critical knowledge brokers in its model. By the same analogy there are intermediate organizations in our model too. They are as shown in fig 2 Agriculture Education Complex, Local Extension Services, Local Service Providers and NGOs. Four directives that USAID advises the intermediate organizations to do is very helpful for our proposed model. The directives are as follows:

1. Know about and search global knowledge sources and their own experience for answers to pressing farmer needs. This includes searching digital sources via ICTs, but not excluding traditional and non-digital sources.

2. Contextualize global knowledge so that it applies to the realities of the local community. This may involve a translation of material into less technical language, the addition of information about local conditions (e.g., soil types, market conditions)

3. Pro-actively assess and articulate present and future information needs of clients, including feedback on the availability of and usefulness of locally accessible knowledge.

4. Provide objective feedback to national and global knowledge sources, which may include the production of locally developed content on lessons learned, preferably developed through participatory methods”

One important deficit, which has been discussed in the problems observed, is the lack of coordination between different components of the agricultural knowledge management shown in fig 2. For resolving the problem the model should have coordinators that in this case are one National Knowledge Center in the national level and 28 local Knowledge Centers in the provinces.

Knowledge center is originally the same as a library with the difference that the resources, scope of the work, devices and competencies of its librarians are so diverse that the word library can not convey the meaning properly and thoroughly. The resources of a knowledge center cover a vast range from a book or an article to an idea kept in the mind of an expert. In the middle, there are other resources such as documents, contents, records; web pages etc. scope of the work is so diverse that can not be covered by one or two experts properly. For instance Davenport (1998) describes the outcomes of a survey in which the questioned librarians forgot to mention the brokerage of knowledge as the duty of the librarian while it is normally one of the most interesting activities of them. The center uses many technologies like LAN, WAN, INTERANET, DOCUMENT MANAGEMENT, CONTENT MANAGEMENT, PORTAL
TECHNOLOGY and so many others, most of which are just emerging. At last, recently there has been a trend in some of the companies for assigning a new position called CKO that stands for Chief Knowledge Officer and is supposed to be synonymous to CIO or Chief Information Officer. The competencies of a CKO are varied and difficult.

5 Discussion and Conclusions

A model is an image of the real world in one’s mind and is constructed upon some assumptions. Thus in time of implementation of the model, if the assumptions were not realistic, then the model would fail. The same is true for the present model of Knowledge Management. Here will go a SWOT analysis of the model.

5-1 Strengths
- The main strength of the model is using the systems approach for considering the entire players in the agriculture educational system of Iran and their interrelationships.
- having a theoretical basis and good amount of best practices done by major international organizations.

5-2 Weaknesses
- Organizational structures of the components of the model have not been established yet;
- The number of the organizations engaged in the model can be of a possible trouble in coordination;
- The model is not in detail and quantitative yet.

5-3 Opportunities
- The most important opportunity for implementing the model is TAKFA. TAKFA¹, which stands for “the Plan for Development and Application of Communication and Information Technology in Iran”, started in late 2001. It has been one of the most radical plans of president Khatami’s cabinet in ICT domain. A large amount of budget is dedicated to the plan, which consists of subdivisions like Electronic Government or Content Creation (TAKFA, 2001). Furthermore, the new priority of TAKFA will be on creating contents and knowledge.
- During last years much works have been done in equipping the libraries and information services of ITVHE with computers, software, networks, internet, websites and many other technologies providing a backbone for the model.
- Some activities have been done in the Center for Rural Research on indigenous knowledge which can potentially act as the scientific and managerial support for the model
- Recently a rise in the salary of the faculty members in Higher Education Sector by the decree of the Leader has put an extra weight on the importance of knowledge workers

5-4 Threats
- Every now and then the managerial teams change suddenly without prior notification and thus the previous plans will be in danger of failure
- The bureaucracy of administrative phases of accreditation, research and implementation of the model
- The role of knowledge in the development process is not conceived by the managers completely;

¹ TAKFA is a Farsi acronym which stands for Toseeh va Karbarieh Fanavari-e-Ettelaat va Ertebatat.
6 References


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