Experience Management Framework for Managing Innovation in Post-Harvest Resource Management

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***Abstract*- People who struggle financially are often some of the most discriminating consumers; value for money takes on more urgency when resources are limited. This scarcity also leads to innovative solutions to everyday problems which can be leveraged by supporting them through use of ICT to create sustainable services/products. This research paper is set within the background of management of natural resources and their related environments in Rural India. It proposes a framework to support the emergence of a Knowledge Infrastructure that allows for creation of localized products/services. The infrastructure would model and document processes mapping the bricoleur approach to resource management prevalent in India to structured grids of information. With this objective, we provide for knowledge to be managed in ways that enable the benefits from bottom-up, and allow for geographically dispersed, incrementalist teams. The paper makes an attempt to look at existing structures, open-source methodologies and organizations that support rural innovation. It comments on how these can be leveraged using an Experience Management Framework to create more opportunities for innovation. The central lessons is that the mutual dependencies between different layers in the distributed team of the Enterprise involving farmers, technical experts, management, etc. enable continuous innovation in methods involved in any process. In conclusion, the paper objectifies the context of these innovations and attempts to emphasize the need for effective translation of methods from bricoleur tacit knowledge to a documented method for innovation.**

I. Introduction

With accelerating pace of environmental, technological and social change, traditional transfer-of-technology approaches to product/services development can no longer keep pace with the complex, and risk-prone circumstances of the actors involved. An organization aiming to interact with complexity of varied locations and documenting processes to create culturally-sensitive products and services needs a Knowledge Framework that allows for maturation of lessons learned. Product development involves a process of trial and error in which relatively few development paths achieve their intended goals. The paper aims to create an intuitive model for organizational learning by proposing a meta-methodology for knowledge acquisition and maturity.

This paper highlights the four challenges that such organizations may face to interact and respond with appropriate products/services for a specific culture or locality. The first challenge raises questions relating to the creation of the knowledge within the system, about actors' competence in bringing about system-wide change and how the organization might support competence development. The second deals with the dissemination of knowledge which relates to the facilitation of transformation among actors across different social, administrative and cultural domains. The third challenge is the classification of knowledge created and description of the role of actors within the paradigm of management of knowledge. Lastly, there is the challenge of correct interpretation of the context of knowledge generated. It explores the organization's ability to understand change of context and map the applicability of the knowledge created in one location to another location with a different context. The discussion of the four challenges draws on the constructs of systems thinking, open source methodologies, communities of practice, and the process of localization, while focusing on the implications of the facilitators' practice in relation to system-wide transformation.

II. Case Study

Pointing at research and field experience, the paper would be specifically focused on organizations working in the Post-Harvest sector. Given that the focus of the Framework is development of culture evolving with an increasing set of use cases at hand, the Post-Harvest sector provides an optimum choice of a research area which cuts across many scientific disciplines spanning engineering, food science, pathology, and market systems economics [1]. Since the sector does not fit into the neat categorization of research-extension-farmer, it provides the scope to explore the relationships between producers and consumers, and links betweens rural and urban areas, with markets playing a large role in mediating these relationships. The sector includes technology clients and intermediary organizations from both public and private sectors and is shaped by a diverse set of stakeholder agendas and interests that range from profit to social welfare. Given the wide variety of actors and an extensible scope of interactions between them, Post-Harvest technology applications are frequently embedded in a wide set of relationships and contexts.

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III. First Challenge: Creating a Knowledge Base

Alice: Which direction should I take?
The Cat: It all depends where you want to go.
Alice: But, I don't know…
The Cat: Then, you'll have to walk a long time."
(Lewis Carroll, Alice in Wonderland)

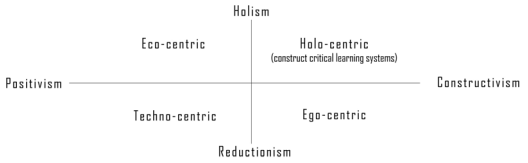
A. Identification of Actors

In creation of a knowledge base, the initiation step is identification of stakeholders in relation to the activities. Then the problem can be viewed as a film script with stakeholders being the actors that have a role to play.

Within the context of an Organization facilitating Post-Harvest sector in Rural India, there are various actors playing different roles right from the grassroots up to policy levels. In general, we can divide such a spread of actors based on their geographical distribution. At the very grassroots level, we have an agro-ecosystem which involves farmers, local project staff, representatives of local NGOs and local traders. Local policy makers and support systems that involve the Organization in its larger context are NGOs, the market, farmer community, research Organizations and the local government. Also policy actors at the enterprise level, have the same amount of impact since the policies made by the Enterprise are the framework that set the conditions within which the concerned agro-ecosystem evolves and learns.

B. Knowledge Paradigms

If knowledge created is used to visualize the preferred or applied collective learning pathways of farmers and scientists, it may also be useful to visualize the changing paradigm of scientific society, as studied under Niels Roling. This paradigm change in scientific society is reflective of an equivalent paradigm shift in the type of knowledge that is created out of the system when the roles of the above-mentioned actors evolve into a collective knowledge base. The basis of this evolution is a proposed learning path which every single actor has to undertake whereby they learn to look beyond their personal world-views and take a systems view to problem solving.



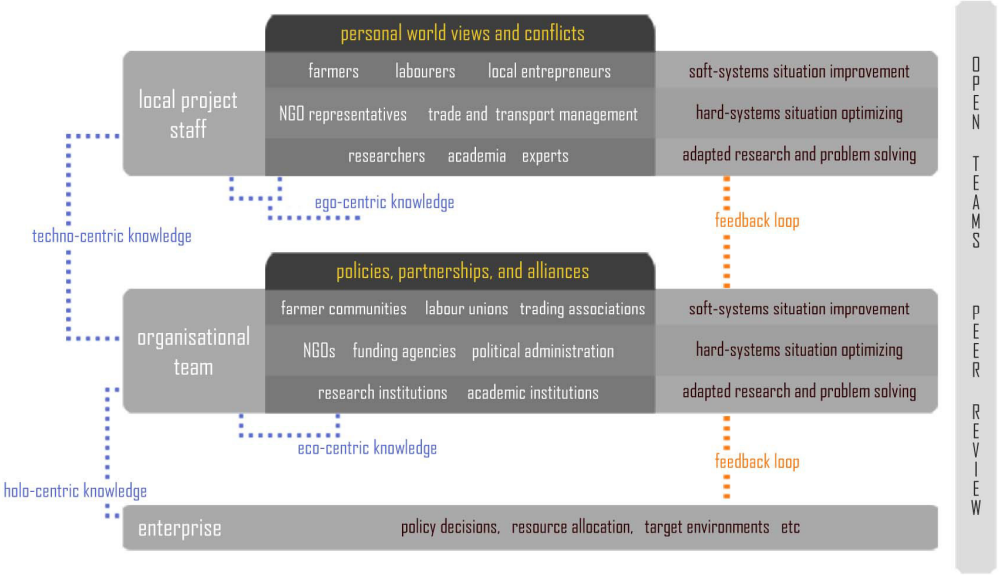
Development of Scientific Paradigms (Roling, 2000)

The above paradigms can provide us with varied methodologies for evaluating the content of knowledge that is created in an evolving system. In the initial stages several actors present their view-points to work out solutions for any given problem at hand. They carry with them divergent worldviews, learning pathways and therefore different sets of solutions. While most of the knowledge is ego-centric, the usual movement of the knowledge paradigm is towards techno-centric knowledge. Various actors get together to identify methodologies of problem solving enabling them to identify the required techniques for the same. The collective learning path now moves towards minimizing risk and increasing sustainability which finds its basis in the Eco-centric paradigm. The Holo-centric paradigm accepts all kinds of paradigm knowledge that may be a relevant starting point to contribute to different parts of solutions [2].

The knowledge base so created could possibly explain the movement of the Organization through the above-mentioned paradigms and its evolution from an ego-centric entity with a singular world-view to a holo-centric institution with accumulated knowledge sets relating to each paradigm.

C. Multiple Nested Subsystems

To understand the knowledge flow within these subsystems a soft systems approach taking up the teams with a holistic perspective and evaluating their roles has been used. The system is required to support open teams originating at any level or out of any dependency to interact and generate relevant knowledge and contexts. The figure [3] kept below is self-explanatory.



Systems Framework to Support Enterprise Innovation in Post-Harvest Resource Management

IV. Second Challenge: supporting learning among actors

Talking to his teacher Calvin says: "You can present the material, Mrs. Wormwood, but you can't make me care."

A. Types of Knowledge

There are two type of knowledge[1] namely *explicit knowledge*, which is stored in a mechanical or technological device, such as documents or databases. *Tacit knowledge*, which is obtained by internal individual processes and stored in human beings. Such knowledge is sometimes described as Experience, Reflection or Individual Talent. The assumption here is that the explicit part of the knowledge in the system is well documented, and the objective is to understand and implement ways of leveraging the tacit knowledge among actors via peer review and feedback loops. As a final outcome the support system should be able to document the inherent bricoleur approach towards problem solving into well defined, structured processes with secondary tasks and data attached to each process.

B. Development of Critical Learning System

For innovation to be driven from the grassroots level, it is imperative that open dynamic teams be inherently supported across systems in the organization.

Open methodologies founded in the fertile pasture which is the internet make the process of evolution quicker, and by creating new forms of power assignments they make social interaction explicit.

Open source methodologies combine some properties of markets (strong incentives for improvement) with essential properties of communities (non-monetary exchange, gift relationships and reward through recognition). Inclusion of these will aid knowledge networks to flourish - with zero marginal cost, non-rivalry and value that grows with number of users. The Knowledge aggregation system and team structures in an enterprise environment should support the following shared attributes found in open source projects [4]:

Transparency
Vetting of participants only after they get involved
Peer review and feedback loops
Incrementalist teams
Powerful non-monetary incentives

The knowledge base should not hinder disruptive innovation and open dialogue across traditional hierarchies. Traditional organizations erect sophisticated barriers to involvement; systems of recruitment, appraisal and promotion are designed to ensure that only people with adequate qualifications and experience get to work on important projects, or to exercise power. In an adaptive organization projects should be open for everyone to get involved in; this does not mean that there is a substantial vetting of inputs once submitted. Project leaders and experienced members can guide the vetting process to create a community where quality of input is directly correlated to power and respect. It should also be noted that small and specific contributions by participants in any project be considered a valuable to represent accurately the complexity of the grassroots level and so rich images are available when translating knowledge towards a holo-centric paradigm.

Peer review and feedback loops that allow local response to decisions taken by organizational groups help maintain context in innovation. Also different perspectives on a situation are known to enable germination of exciting new solutions by supporting lateral thinking at an enterprise level.

Such Open Teams [4] should be organized with certain limitations of open methods in perspective. Development in an open system is better suited to incremental improvement than to pure creativity; thus radical ideas should be given a limited time in isolation for them to be able to thrive in an open environment. Also an organization may have limitations concerning publication of certain ideas or projects, this requires that open methodologies be supported at various levels to allow collaboration as Open Teams or constrain decision making and create space for Open Conversations. It is rewarding to encourage external participants to discuss and reflect upon areas of interest of the organization. This demands creation of interfaces for interaction and generation of knowledge from outside the organization, allowing it to connect to research institutions, academia and experts globally.

C. Conflict Resolution

'No change or development without conflict'; and, 'No change or development with too much conflict' are the somewhat simplified versions of the main common findings of studies in cognitive psychology [5].

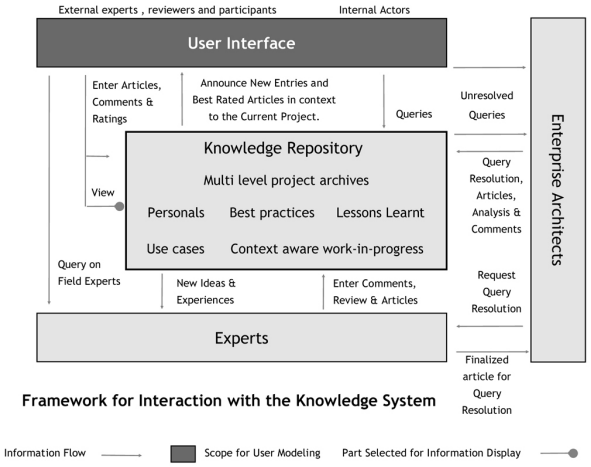
A facilitator in conflict resolution should organize and guide dialogical deconstruction. The process of conflict resolution draws parallels to the process of conducting ethnography. The facilitator must at first build up an environment of trust and confidence by being sensitive to all involved and putting himself into their construction of the world. At the same time, he will need to separate himself from each group to explicate the different assumptions and positions held by those involved in the process. Inevitably the personal perspectives and assumptions of the facilitator also play a part in the process of deconstruction.

Problems aren't just 'out there', but they are construed out of problematic situations. Hence, the facilitators must also make sense if an uncertain situation that initially makes no sense at all. In the process, he must be capable of bracketing his own biases in order to avoid a biased framing of the discussion.

V. Third Challenge: Integrating Knowledge

With proper facilitation in place, one can now move on to identify the knowledge paths within systems. Taking up the analogy of a rubber tree, which has to be cut at the right place to tap its sap, the system structure may be viewed as this tree and the places to tap can be looked upon at the knowledge paths and the knowledge can be looked upon as the sap that needs to be tapped.

1. Ikujiro Nonaka and Hirotaka Takeuchi, Knowledge-Creating Company : How Japanese Companies Create the Dynamics of Innovation, Oxford University Press, 1995



A. *Framework for Interaction with Knowledge System*

Bigg and Matsaert[2] suggest that actor oriented tools applied in development and research help build-up institutional knowledge during projects. Such tools create a purposeful mechanism by which intuitive ad-hoc processes can lead to learning in a system active fashion.

B. *Roles of Elements*

User Interface: It is the view of the system visible to an actor. It

(a) Provides uniform access to the information residing within the Knowledge Repository, and
(b) Adapts and aggregates information within the Knowledge Repository based on the actors role in a system.

It can be envisioned as a personal weblog of actors, which provides the facility to interact and query information in the Knowledge Repository.

Knowledge Repository: It contains explicitly captured and consolidated knowledge of the organization. The categories, which can be observed within it, are personals, Best Practices, Use Cases, Content-aware information about work in progress, and Holo-centric project archives.

Experts: Forum for the members of the organization to discuss current problems, questions, and open issues. Their formation and existence is imperative for query resolution and feedback.

Enterprise Architects: support maintenance and development of the content of the Knowledge Repository. They keep connected the flow of the knowledge system in tandem with organizations goals and expectations.

C. *Workflow Strategy for Interaction with Knowledge System*

With proper identification of knowledge paths as observed with the flow of information, the actors responsible within the system architecture would follow the following steps to integrate the knowledge created into the system [6]:

Collect: To start the actor needs to collect a set of information grids relating to the task at hand.

Analyze: Once a set of information grids is available to an actor, he is responsible for deriving knowledge out of these grids and for identifying the context of its usage.

Filter: The knowledge that is so identified has to be filtered from the context within which it was created to the present context of usage.

Apply: After the transformation of context, the knowledge has to be put into execution in its present form.

Distribute: Finally the transformed knowledge has to be combined with the results of execution and documented with comments relating to the problems identified in relation to transformation and execution.

VI. The Final Challenge: Enabling Context Driven Transformation of Knowledge

Building on biological theories of cognition as well as theories regarding experiential learning, Roling[3] had arrived at the model showing relations between different elements of cognition. In relation to context for any technique relating to a problem solving approach, we have observed that the understanding of such techniques includes 1.) Actors that can perceive the environment or context and therefore have beliefs or theories about it along with emotions that provide criteria for judgment and enable them to take action; 2.) The context: the environment or domain of existence with which the agent is structurally coupled [7].

A. *Evaluative Frame of Reference: the basis of reasoning about practices*

The functionalities of an Organization depend on: (a) Actors' perceptions of the consequences of certain practices; (b) the perceived likelihood that these consequences will emerge, and (c) their valuation of such consequences vis a vis a set of aspirations. Taken together, we label these components, a social actors' *evaluative frame of reference*, as it relates closely to their knowledge and mode of reasoning about the natural, economic and social world [7].

Perceived consequences

Any particular technique of problem solving has its own technical, economic, organizational and relational consequences. Based on the experiences at hand, any Organization develops an implicit reasoning about these practices based on the consequences resulting out of them. There is also a network of attributes to which the Organization maps the origin of these consequences. Identification of these attributes leads to a better understanding the context of the consequences that originate.

Perceived likelihood of emergence of these consequences

The predictability of occurrence of certain consequences might be a function of the underlying causal attributes. Thus one also needs to take into account the risk originating out of

2. Biggs SD and Matsaert H. "An Actor Oriented Approach for Strengthening Research and Development Capabilities in Natural Resource Systems", Public Administration and Development, 1999

the unpredictability of these consequences and the technical, economic, organizational and relational impact of the same.

Assessment of consequences vis a vis the set of aspirations

In implementation of a certain practice, there is a general sense of expectation relating to its perceived consequences. This sense of expectation leads any actor to possess different kinds of aspirations relating to an implementation. This has an impact on the actor's choice in relation to finding the appropriate solution to a given problem.

B. Dynamics of Translation of Knowledge

Considering the given frame for evaluation, it is more or less a 'photograph' of relevant factors that may shape actors' practices at any given point in time. In everyday life, however, we are dealing with 'moving pictures' and highly dynamic situations rather than with photographs [7]. Moreover, we are interested in *change*, which has not yet been captured in the *evaluative frame of reference*.

Dynamics through time: the importance of feedback and routine

Given a specific timeframe, the reasoning behind the set of aspirations relating to the consequences of implementing any practice is bound to alter based on change within the causal attributes. Thus, it creates a sense of instability within the system such that the actors now move towards alternatives techniques or aspirations so as to achieve the balance between perceived consequences and the expectations out of the system. This change might be initiated via feedback from the social-organizational world or the bio-physical world, wherein the actors move towards a problem-solving approach considering the present methodology of implementation as problematic. As a final outcome of the process, new forms of coordinated action are generated with an expectation of creating new patterns in the problem-solving approach.

Dynamic interrelations between the casual attributes: the social construction of perceptions

The basis of any change that originates from the actors is the way they influence the causal attributes within the system. Based on the perception of the actors there is always an associated reasoning behind the choice of a methodology. An important interrelation to understand here is that the causal attributes not only have an effect on the outcome of the methodology but also indirectly have an impact on *each other*. For example, a new research in the field of packaging may alter the way farmers package their harvest. Thus the attribute of "ease of performance" leads to betterment to the quality of the consequences. This interrelation is a source of change wherein each of the casual attributes exists in a quasi-stable equilibrium with each other. A change in one radically affects the way actors may look upon the resultant consequences at hand. In essence, these attributes represent the social construction of knowledge.

VII. Conclusion

Events, episodes, practices, and related narratives are seldom hosted in the neat representations of systems, data flows. Processes, entities, and relationship; rather made popular by swapping of war stories by practitioners. Activities such as hacking, improvising, tinkering, applying patches, and cutting corners punctuate ubiquitously the everyday life of systems.

The paper has focus on organizations that require a dynamic structure for operation in emerging markets and explains the challenges at hand using Post-harvest resource sector as a case study. The figures have been constructed using the case study as a sample set of emerging markets.

To conclude, we are moving towards a more modern, but not necessarily a more Western society. A world of more modern culture does not necessarily mean a more homogenous world. Cultures will respond differently to the process of modernization and will remain unique. Even the use of identical products in different parts of the world does not indicate a sameness of cultures. Users will continue to be influenced by their unique cultures and thus user behavior will continue to vary cross-culturally [8]. Thus the framework proposed introduces multiple facets of use of ICT in organizations existing simultaneously in multiple cultural-contexts pointing to an alternative center of gravity – *human existence in everyday life.*

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