

# **A Knowledge Management Based Idea Generation Method to Handle Complexity of Organizations**

## **Abstract**

In this paper, as an attempt for creating added-value knowledge, we discuss the applicability of an approach called concept composition as a potential concept for manipulating the existing frameworks for idea generation in complex organizations. In this scope, the existing frameworks are represented in terms of appropriate frames, and the process of composition is performed in an iterative manner to produce a final idea that can support the current decision situation.

**Key Words:** Knowledge management, knowledge creation, decision support, handling complexity, frame, concept composition.

## 1. Introduction

“Knowledge” in (Oxford Dictionary, 2008) is defined as “sum of what is known”. In the past few years concept of the knowledge has been focused by researchers who work on organizational sciences. They define knowledge as “justified belief that increases an entity’s capacity for effective actions” (Huber, 1991),(Nanoka, 1994),(Alavi, 2001). Some authors, especially I.T. researchers believe that data, information and knowledge are different concepts. They think that if we can not distinguish between them; there is nothing new in knowledge (Alavi, 2001). Knowledge is neither data nor information, though it is related to both (Davenport, Prusak, 2000). In this way, (Machlup, 1980) and (Vance, 1998) propose a hierarchy that says data is raw numbers of facts, information is processed data and knowledge is authenticated information. But (Tuomi, 1999) makes inverse hierarchy so he believes that raw data doesn’t exist and it has been already influenced by information and knowledge (Alavi, 2001). Knowledge Management (KM) is a potential gateway to creation of the knowledge with added value, in organizations, teams and research activities (Kothuri, 2002). Knowledge based perspective in organizations has been used by strategic planning researchers to extends the resource based theory (Nanoka, Takeuchi 1995), (Alavi, 2001). This idea initialized by (Penrose, 1959) and expanded by (Barney, 1991), (Conner, 1991) and (Wernerfelt, 1984).

The concept of organizational complexity has been defined in various ways by different authors but (Luhmann, 1995) states “we will call an interconnected collection of elements complex when, because of imminent constraints in the elements’ connective capacity, it is no longer possible at any moment to connect every element with every other element...Complexity in this sense means being forced to select; being forced to select means contingency; and contingency means risk.”. Therefore, complexity in an organization, addresses “connectivity” of different units. In this perspective, (Dooley, 2002) defines organizational complexity as “the amount of differentiation that exists within different elements constituting the organization.” Research results demonstrate that

complexity is positively associated by innovation (Ettlie, 1984), (Damanpour, 1996). In this article, when we point to innovation we focus on organizational level, where innovation is defined by (Daft, 1978), (Damanpour, 1987) as “adoption of an idea or behavior new to the adopting organization.” We expected ideas about work, or “work motifs” to play a prominent role in an organization. Any organization has multiple objectives that reflect the values and interests of profession (Blau, McKinley, 1979). As these values are different so it leads to organizational complexity. But, behind of each innovation there are one or more ideas. (McElroy 2000) states that knowledge management can be used as a tool to manage the organizational complexity.

It is quite clear that all the frameworks for extracting knowledge or those for categorizing, summarizing and mining information as well as frameworks for idea generation can be equally regarded as approaches to KM. Because, as we discussed (Tuomi, 1999) believes all kinds of information or data are related to knowledge. Out of the issues discussed above, idea generation has particular significance for roles in innovation and frameworks to support high-quality organizational decisions.

In this paper, we demonstrate how a previously-proposed approach called “concept composition” can act as a potential approach complex organizational decisions. The proposed frameworks are represented in terms of appropriate frames and process of composition to support the related decisions. To obtain the framework that should be fit to the current decision support situation. Regarding (Pelz, 1983) that says innovation should be incremental the process of concept composition should be performed incrementally to reach the final framework.

## **2. Some Existing Standpoints in Knowledge Creation**

Approaches to knowledge creation from idea generation are in a constant oscillation between knowledge creation, knowledge testing and knowledge destruction (Monthoux, 2004), (Henningsson, 2004), (Haggqvist, 2004). Regarding to knowledge creation, survey on researches directed us to categorize them in following groups:

- *Aesthetics*- the hermeneutics of action (Monthoux, 2004) is a field of new emerging alternative approaches for knowledge creation. Having an aesthetic perspective implies to put fragmented knowledge together that gives meaning, which is a process closed to hermeneutics. In other words, aesthetics is creating meaning in a mass of unrelated data through a subjective experience leading to an objectively shared understanding of connection. The word connection reminds us the definition of organizational complexity. In this sense, aesthetics urges issues such as blending or composition to generate meaningful contents in complex situations.

- *Introspection*- is the most subjective method that is used experiences and emotions in a self-observing process (Henningsson, 2004). Introspection can be used by the organization itself, to investigate its own experiences in relation to a particular phenomenon, and it can be also used as a data collection method among respondents.

- *Transparency*- documentation (Henningsson, 2004), distance and knowledge should to be considered in introspection. In this sense, all the approaches for experience management can be considered as some sort of introspection.

- *Thought experiment* (Haggqvist, 2004) means using experiments in organization. A thought experiment with methodological ambitions is more than a fictitious, like science fiction or fantasy or pedagogical illustration. It can be used in several areas like future planning and scenario planning.

### **3. Proposed Approach: Using Knowledge Creation for Concept Composition**

Some approaches for creating knowledge in organizations can be categorized into two groups: (i) Those handling creation rather from human or manual perspective and (ii) Those treat creation as a process of discovering knowledge on the basis of some sort of information mining from a data / knowledge base.

A basic point behind both approaches is that a sort of correlations and structures, either at knowledge representation or inference level, can help the creation or discovery of knowledge in an

effective way. For instance, in the case of knowledge discovery, concept lattice which is a structured graph for representing knowledge can help to provide a productive framework for a variety of problems related to data-bases (Nguifo, et al., 2003).

Generally, both network and structured approaches to knowledge representation lead to development of the schemes such as semantic net, frame and script (Schank, Abelson, 1977),(Quillian, 1968). They potentially can provide correlations and structures, which are essential to computational knowledge creation/discovery in an environment.

In concept composition, we simply make use of frames to represent the knowledge of the concepts in a structural style. In the meantime, it makes values for attributes each in frame, which are strongly linked. That shows a sort of correlation that occurs at inference level.

The basic idea behind concept composition is to link the contents of the frames for two concepts, using some conjunction structures. It should preferably has compound nature (Mahmoudi, Badie, 2004),(Badie, Mahmoudi 2004),(Badie, Mahmoudi, 2005). The content that comes out through this linking would then be capable to explain Why, How, Where and When the linked concepts are beneficial. Based on this idea, concept composition can help to enhance the capabilities of a methodology as well as a theory, at complex situation. In the meantime, we demonstrate that concept composition can be potentially used for anticipating the prospects / impacts of observing a certain concept within the realm of another concept.

To link the contents of concept frames, it is necessary to link the values of the related attributes, using appropriate conjunction structures. The significant attributes for each frame were realized to be Goal (which is for explaining “Why” a concept is used), Basics (which is for explaining “How” a concept is used), Advantages and Disadvantages (which are for explaining “Where and When” or “Where not and When not”).

For any new idea, it is crucial to figure out how it can be realized in practice. Hence, conjunction of the values for Basics (as a significant attribute in the frame) is an important issue in

concept composition. We want to see how the conjunction of the values for Basics in the two concepts can systematically direct the user to the point where the generated idea can be realized practically. It calls a hierarchical framing and linking of the related contents, up to a stage where the user can get the feeling of having access to an appropriate realization. Therefore, the value of Basics in each frame is described in terms of some appropriate stages together with the related models or functions that are essential to realizing them. The problem of conjunction for the values of Basics in the two frames will be mapped into conjunction of the contents of their related stages, which calls the conjunction of their models or their functions. Respecting the conjunction of two functions (or models), each function (or model) itself is described in terms of an appropriate frame, as discussed above the pervious process of concept composition will then be repeated for the related frames. Such a hierarchical process will enable the user to think in details about the possibility of a meaningful conjunction for the values of Basics in the two frames. Due to the multiplicity of the stages in the content of Basics as well as the multiplicity of the functions (or models) for each stage, various alternatives may exist for the final conjunction. Since the process of idea generation must be divergent in nature, this is quite directive to be able to produce new alternatives to select one that is the most compatible with his/her requirements.

### **3.1. Extension of Concept Composition to Creating New Frameworks for Treating Organizational Knowledge**

Regarding the points discussed above, it is quite clear that concept composition can be used as an effective approach to create new ideas in the situations where individual concepts can not be adequate for handling problematic situations in an organization. Let say, composition of concepts makes them capable to treat for more complex situations that have not originally been observed within its framework. Such an issue may eventually direct us to the point that the frameworks to enhance the organizational support and productivity can be composed with each other in some ways to create a new framework. The new framework will be capable enough to response to a more

complex situation in the organization. This can include all the stages with respect for decision support, such as resource selection, resource utilization, product assessment, quality control and assurance.

Regarding the above approach to creating new frameworks for organizational support, the following points should be considered:

(i) Representation of frameworks in terms of appropriate frames with the attributes such as goal, basics, advantages and disadvantages totally shows that how and for which purpose, the framework can be used, and what are the advantages and disadvantages behind using it. The values of these attributes should also depend on the experimental results of using the related framework in practice as follows:

(ii) Existence of an expert user in the organization to help the process of concept composition proceeds in a interesting direction.

(iii) Development of a systematic method to find out that which concepts should be composed to create a new framework for handling current situation.

Out of the points discussed above, the latter is particularly significant. Because, both issues of selecting the appropriate concepts and determining the sequence in composition have strong affects on the quality of the final framework.

#### **4. Example**

Many frameworks have been proposed for enhancing organizational support and productivity in Information System, Business Process Reengineering (BPR) (Johansson, 1993), Total Quality Management (TQM) (Hackman, Wageman, 1995), and Knowledge Management (Haykin, 1999),( Mansour, Juang, 1989) . The idea behind development of each framework is to provide a systematized forum to support organizational certain complexities. Although these frameworks are successful in handling certain complexities, but each framework faces to certain drawbacks (or disadvantages) that can presents a complex problem for the organization. Therefore, it is interesting

to employ frameworks collaboratively in a way that the advantages of some frameworks can cover out the disadvantages of the others.

Here, we will demonstrate that a sequenced composition of these frameworks (as independent concepts), can eventually lead decision makers to some new ideas through a reasonable organizational support that can be appeared with a reasonable amount of complexity and disadvantage.

In our example, an organization has decided to operationalize the framework of BPR (Business Process Reengineering) (Johansson, 1993). Normally, one of the important disadvantages of BPR is “risk” in selection of the correct and efficient items. Therefore, we want to see how TQM (Total Quality Management) (Hackman, Wageman, 1995) handles this drawback.

One of important advantages for TQM is ability to improve performance of organizational teams. Therefore, we select this technique to handle risks. Figure 1.a and 1.b show frames for TQM and BPR. In order to link the values of Basics in these two frames, the following points should be considered:

(i) Finding which stage(s) in Basics of BPR is (are) remarkably responsible for “risk” as a disadvantage. Then, we will consider to these stages for linking.

(ii) Finding which stage(s) in Basics of TQM is (are) able to handle “risk”.

Hence, considering the Basics of TQM and BPR, “Testing the samples” and “Initialization” are the related stages. Figures 1.a and 1.b show that these stages correspond respectively to “failure detector”, and the set of “benchmarking”. Then, “cost-benefit analyzer” is an alternatives for functions. Here, using “based on” as the conjunction structure, the following contents has been announced as the alternatives for a new idea.

(i) “Initiation” (in BPR) based on “Testing the Samples” (in TQM)

(ii) “Initiation” (in BPR) based on “Failure Detector” (in TQM)

(iii) “Benchmarking” (in BPR) based on “Testing the Samples” (in TQM)

- (iv) “Benchmarking” (in BPR) based on “Failure Detector” (in TQM)
- (v) “Cost-Benefit Analyzer” (in BPR) based on “Testing the Samples” (in TQM)
- (vi) “Cost-Benefit Analyzer” (in BPR) based on “Failure Detector” (in TQM)

The user due to any independent reason gets the feeling that the content addressed by (iv) holds some message for him / her, but he/she still needs to expand it in details. At this stage, “Failure Detector” itself propounds in terms of a frame, within “isolating failure causes” that is a stage in Basics with “Error Detector” as the related function.

The following content is announced to the user: “Benchmarking” (in BPR) based on “Error Detector” (in TQM).

In this step, the user gets the feeling that he/she has produced a useful idea as follows:

**Idea 1:** The risk in BPR may possibly be because of the error in benchmarking. In this way, many benchmarks can be considered as the alternatives for sample testing in BPR, and an error detector activates to pick out the benchmarks. They are fit to the present situation for initiation in BPR. In this way, one may eventually expect for the situation for applying BPR. In this situation, risk will be decreased. It could be possible that, the user may reach another idea through the content of <<“Cost-Benefit Analyser” based on “Error-Detector”>> as follows:

**Idea 2:**The risk in BPR may possibly be due to the error in cost benefit analyzer. In this respect, an error detector can help to detect the possible errors in the related processes, and in this way, one may eventually expect for decreasing the risk of BPR.

We see that, all the ideas produced through the system’s interaction with the user, are valuable and worth to test so the organization has the opportunity to choose the one which is most compatible to the situation. This enables the organization to have its own solution for handling its complexities.

To continue above example, we suppose that the organization has decided to observe Idea 1, which is concerned with detecting the errors of benchmarking as an approach to reducing the risk of

BPR. We also suppose that, despite reducing risk, the organization has faced a new problem, which is for application of TQM to BPR: “over-consumption of time and cost”. We assume that the organization has decided to make use of Knowledge Management to handle this drawback. The frame for KM is represented in Figure 1.c. as you see that from this frame, the Basics include stages such as “Collection”, “Organizing”, “Retrieving” and etc. Here, using “based on” again as the conjunction structure, a variety of contents can be announced as the alternatives for a new idea. The user again due to any independent reason gets the feeling that the content (“Benchmarking” (BPR) based on “Error Detector” (TQM)) based on “Clustering Tool”(KM)), holds a good idea for him/her.

**Idea 3:** The over-consumption of time and cost may possibly be due to applying TQM to BPR. In this respect, clustering tool can help benchmarks to be clustered according to their similarities. Therefore, the error detector can just be applied to the benchmarks representing the clusters. In this way, the anticipated amount of time and cost for applying TQM would be reduced.

#### **4.1. Investigating the Proposed Approach from Knowledge Creation Perspectives**

As mentioned in section 2, aesthetics, introspection and thought experiment are three major perspectives in knowledge creation. Regarding the proposed approach for creating new frameworks, the contents in the two frames are linked to produce a new content for the user, can be considered as the issue of aesthetics.

In the meantime, some flavors of introspection are sensed in the place where the organization searches for a framework to treat the drawbacks of the previous framework. Also, the fact that concept composition may be used to measure the prospects/impacts of observing a concept within the realm of another concept is considered as thought experiment.

### **5. Conclusion**

The article shows that composing the frameworks for organizational support finally leads to some ideas that help the organization to handle its complexities in reasonable costs. Hierarchical

framing of the stages and functions in the Basics of the two frames was explained as a helpful concept. Regarding the type of complexity of the organization, some different ideas come out through the interaction with the user. It makes concept composition as a potential concept for enhancing organizational support and productivity, based on the intermediate feedbacks from the users. The interaction of the user with the values being generated through composition will direct the system to the point where it can generate the most efficient ideas for handling the ongoing complexities in the organization.

# TQM

Super Class	Frameworks for quality management	
Sub Class	Distributed TQM	
Instance	Special versions of TQM	
Goal	Integrating the business environment	
Basics	Stages	Functions
	Sample selection	Statistical distribution, random selection
	<b>Testing the samples</b>	<b>Failure detector</b>
	...	...
	...	...
Related Non Action Type Noun	Quality	
Related Action Type Noun	Control, estimation, optimization, management	
Advantages	Reducing development cycle time, improving team performance, reducing products & service costs, improving the performance of training for administrative system	
Disadvantages	Time & cost consuming, ignoring some customer requirements, difficulty in controlling the demand flow of manufacturing	

**Failure Detector**

...	
BASICS	
..	...
Insulating failure causes	<b>Error detector</b>
...	...

↓

**Figure 1.a**

...		
Goal	The source which is essential to solving problems or making decisions regarding a system with respect to using policies, strategies, tactics and techniques defined in the realm of managerial science or obtained through one's own experience	
Basics		
	Collection	
	Organizing	<b>Clustering tool</b>
	Retrieving	Retrieving tool
	...	
...		
Advantages	To help problem solving/ decision making process in order to assuring stability in the working environment	
Disadvantages	Loading on the excessive cost in case that it is over considered, loading on a non-creative environment	

**Figure 1.b**

**BPR**

Super Class	Frameworks for business management																
Sub Class	Banking BPR, BPR in heavy Industry																
Instance	Man Tech BPR																
Goal	To bring about dramatic improvements in critical contemporary measures of performance such as cost, quality, redesign, reconstruct and evaluation																
Basics	<table border="1"> <tr> <th>Stages</th> <th>Function</th> </tr> <tr> <td>Envision</td> <td>Engendering support,...</td> </tr> <tr> <td><b>Initiate</b></td> <td><b>Benchmarking,</b> Cost-benefit analyzer,...</td> </tr> <tr> <td>Diagnose</td> <td>Documentation prototyping,...</td> </tr> <tr> <td>Redesign</td> <td>Devising,...</td> </tr> <tr> <td>Reconstruct</td> <td>Training transition,...</td> </tr> <tr> <td>Evaluate</td> <td>Monitoring ,...</td> </tr> <tr> <td colspan="2">...</td> </tr> </table>	Stages	Function	Envision	Engendering support,...	<b>Initiate</b>	<b>Benchmarking,</b> Cost-benefit analyzer,...	Diagnose	Documentation prototyping,...	Redesign	Devising,...	Reconstruct	Training transition,...	Evaluate	Monitoring ,...	...	
	Stages	Function															
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	Diagnose	Documentation prototyping,...															
	Redesign	Devising,...															
	Reconstruct	Training transition,...															
	Evaluate	Monitoring ,...															
...																	
Related Non Action Type Noun	Software																
Related Action Type Noun	Development, management																
Advantages	Proper enterprise resource planning, effective supply chain management, high groupware & collaborative systems performance, efficient customer relationship management																
Disadvantages	Increasing risk, slowing the process down, difficulties in improving organization's constraints																

**TQM to BPR**

...									
Goal	Integrating the business environment with respect to using models, techniques, functions and tools to achieve steps such as envision, initiate, diagnose, redesign, reconstruct, evaluation,...								
Basics	<table border="1"> <tr> <th>Stages</th> <th>Function</th> </tr> <tr> <td>...</td> <td></td> </tr> <tr> <td><b>Benchmarking based on Error detector</b></td> <td></td> </tr> <tr> <td colspan="2">...</td> </tr> </table>	Stages	Function	...		<b>Benchmarking based on Error detector</b>		...	
	Stages	Function							
	...								
	<b>Benchmarking based on Error detector</b>								
...									
...									
Advantages	Reducing development cycle time, improving team performance , ..., in order to solve the problem of increasing risk, slowing the process down, difficulties in improving organization's constraint								
Disadvantages	Time & cost consuming, ignoring some customer requirements, ..., regarding proper enterprise resource planning, effective supply chain management, high group ware & collaborative systems performance ,...								

**Figure 1.c**

**Figure 1** Hierarchical framing for composing the concepts BPR, TQM, and KM

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