An Effective Management of Human Resource on Organizational Learning

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ABSTRACT

The measurement of effective performance on organizational learning is of very important in today’s global competitive market. This paper proposes an effective procedure of human resource management, CBA Spiral Model, $C \rightarrow B \rightarrow A$, where $C$ stands for cognitive learning phase, $B$ stands for behavioral learning phase and $A$ stands for action learning phase. In the cognitive learning phase, Zaltman Metaphor Elicitation Technique was introduced for the exploration of the implicit and deep thoughts of vital risk factors, from the related members of the targeted organization tasks. In the behavioral learning phase, robust convergent Bayesian (RCB) model was introduced for measuring the effectiveness of the risk factors identified from the cognitive learning phase. Chiao’s verification & validation procedure was proposed, which also plays a vital role of determining the necessity of inner looping within the behavioral learning phase or the alternative of moving to the cognitive learning phase after major adjustments during the action learning phase.

INTRODUCTION

Organizational learning, nowadays, is widely considered as one of important issues for various types of companies actively pursuing their sustainable & successful operations in business arena. Recent studies have shown that practitioners, through intra-organizational learning activities, earnestly search for better opportunities for their long-term survivals and business competitiveness, particularly on the exploration of the risks prevention, the verification & validation of the selected methodologies, as well as the optimal and feasible strategies of technology adoption. Instead of viewing a corporation as an organizational ‘entity’, which is a non-existing rhetoric conceptual terminology, this paper will focus on the role of context and culture in shaping both the perception and experience of risk in work environment. Evidence from various organizational studies indicates that employees’ perceptions of risk are highly influenced by the culture and context of their work environment, leading to different ‘senses of risk’ among hierarchical managers, professional groups and levels of seniority within the work organization. If the perception of risk and safety can not be an unified phenomenon among employees within organizational settings, then it is difficult for this organization to achieve the shared beliefs, perceptions and attitudes, which are considered as the fundamental bases to the development and propagation of a good safety culture and the normal operation.

Organization safety is a dynamic phenomenon that requires the involvements of continuous improvements from a number of different perspective groups in order to prevent accidents & incidents and to improve productivity. In practice, there is a strong evidence of showing the existence of multiple subcultures within organizational environment, where professional, occupational or hierarchical subcultures have not shared information or failed to communicate adequately, sometimes with serious consequences. This paper will not attempt to directly focus how organization can communicate more
effectively to general public about hazards inherent in work environment. However, it does attempt to reveal that both culture and context can determine an individual’s perspective on risk and safety. Furthermore, those kinds of misunderstanding and miscommunications can not only cause errors but also prevent errors being trapped and mitigated.

An ideal learning organization will provide suitable environment, where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continuously learning how to learn together. Practical methods and feasible strategies should be checked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in responding to practical business challenging problems. The ineffectiveness of organization learning will tend to: lose interest in their work; lower their standards of achievement; lose confidence in themselves; give up quickly; fear any new task and refuse to try new methods or accept new jobs; expect failure; escape from failure by daydreaming; increase their difficulty in working with others; develop a tendency to blame others. All of the stated phenomenon can be in the risk category of either in the form of precursors of accidents or in the form of symptoms of unwanted incidents. As such, for better management issues of organization learning, this paper, in the following sections, proposes an effective procedure of human resource management, CBA Spiral Model, $C \rightarrow B \rightarrow A$, where C stands for cognitive learning phase, B stands for behavioral learning phase and A stands for action learning phase. Meanwhile, for the purpose of improving the sensitivity on the outcomes measurements of organization learning, an adaptive Bayesian algorithm and the verification & validation procedure (Chiao, T., 2006) will be briefly described in the sections of behavioral learning phase and action learning phase respectively.

**COGNITIVE LEARNING IN THE DISCOVERY STAGE**

Cognitive learning will focus on individual’s internal frameworks for knowing (i.e. cognitive schema) and on how those frameworks can be transferred to others and leveraged to improve personal and organizational decision making in dealing with risk & hazard situations. In the study of the organizational work environment on Statfjord A, an oil and gas production platform located on the Norwegian Continental Shelf, Marek et al. (1985) measured the perception of risk in four different occupational groups (i.e. administrative staff, catering staff, flotel crew and drillers). It turned out that each group lived and worked in their own ‘senses of risk’ which were constructed according to their (a) knowledge of the technology, processes and operations on their work environment; (b) current organizational and administrative practices; (c) present work conditions and tasks; and (d) prior professional background. They also concluded that employees’ responses to the survey questionnaire reflected different safety climates in subcultures. Gherardi et al. (1996) have also demonstrated the evidence of the multiplicity of safety subcultures. They compared the form and content of explanations for accidents provided by building engineers and site managers at a construction company and found that each group addressed problems of safety and risk from different interpretative perspectives. The site managers viewed safety in relational terms implying that risk should be dealt with by protection-oriented organizational behavior. The engineers viewed safety mainly in terms of planning and considered that it should be dealt with by organizational behavior-oriented towards co-responsibility.
Zaltman Metaphor Elicitation Technique

Under the premises of highly demands for an effective management procedure on the exploration of the implicit and deep thoughts of vital risk factors, from the related members of the targeted organization tasks, this paper proposes Zaltman’s technique.

ZMET (Zaltman Metaphor Elicitation Technique), an interactive new technique invented by HBS professor Gerald Zaltman, will require all members of the survey subjects to do their homework. They are asked to choose at least eight photographs or other images taken from magazines, catalogs, or photo albums that represent their feelings on the target topics. It is important that subjects are given several days to ponder the issues before the beginning of the interview sessions such that the participants of a survey will come in at a fairly high state of readiness and with a lot to say. Working with a professional interviewer and a specialist in digital imaging, the subject will be led through a series of analytical conservations, based on the pictures, during a two-hour interview session that is designed to uncover deeper meanings and hidden thoughts about the topic. This session process will be done in a special way such that the interviewers will probe the participants’ thoughts, as opposed to prompt for answers.

The key issue of the ZMET technique will be on the adoption of metaphors, idiomatic expressions of the organization’s concerned problems, in which it provides feasible vehicles for employees to transport what may exist below their level of awareness into a domain of awareness. Basically, the interviewers/managers help the participated employees open up their subtle conscious windows into their own domain of thinking. The participated employees are encouraged to look in, and share with interviewers or managers what they see or they can aware of. The opening the windows of consciousness can be a complex and revealing process and usually with fascinating results. Often participants will comment at the end of the interview session that they didn’t know they had so many thoughts about the task topics, or they’re talking about how surprised they are, in terms of discovering just how strongly they felt about the subject matter. As an entrepreneur’s viewpoint based on author’s experience and expertise, the root causes, risk factors as well as the evaluation criteria of the candidate solutions for the organization’s risk impact problems can be identified, if thorough applications of ZMET technique can be conducted. Therefore the ZMET technique can be a feasible methodology on measuring the effectiveness on cognitive learning especially on the understanding and identifying the implicitly existed root causes and factors related to the risk environment.

Through this stage of mental process, the engendered creative thoughts & findings may cause conflicts among members of an organization. However, the generated new information and knowledge can be the essence of cognitive learning (Nonaka,1994). This phase of organizational learning, however, really depends on the effectiveness of ZMET applications as well as on individual’s ability to identify and alter the related pattern of cognitive association and share those changes with others (Brown & Duguid,1991). Evidence from a number of high-risk industries, not only demonstrates the diversity of perceptions, attitudes and beliefs, but also indicates that conflicts of opinions between subcultures (or among individuals who are members of those subcultures) can most likely be the precursor to accidents and incidents. The issue of risk and safety subcultures of an organization can be encouraged to share among organization members in order to identify and trap human errors before they are realized as accidents and incidents. Sharing one’s perspective on risk and safety depends on the ability of communications, which is the vital portion of Human Resource Management (HRM), a type of human factors which deals with non-technical skills. The cumulative evidences from various highly hazard, highly reliability industries have shown that failures of communication, poor teamwork and poor leadership are common human factors precursors to accidents. In many cases, sources of conflict arise
where different professional or occupational cultures clash only in their view of how the workload should be handled, who should make decisions or how the situation should be resolved. In other words, during the cognitive phase of organization learning, members of inter-subcultures and intra-subcultures should gain momentum, by which good communication skills can be developed, and methods for resolving conflict can be explored.

Recognizing Risk Factors of Organization Operations through Cognitive Learning Phase

Cognitive learning may happen in many methods, especially when acquired knowledge shifts a company’s cognitive map such that understanding or interpretation of events changes (Daft, R., 1984). Essentially, cognitive learning enhances an individual’s or organization’s ability to (re)create information and knowledge, opening new opportunities for interpretation and action (Nonaka, 1994). Sometimes the involving company intuition process is likely to exist in a climate of risk factors recognition and problem solving. In this phase, innovative new solution may occur because of the highly demands of resolving critical problems (March 1991). Such conditions may invoke company to make these novel connections, perceive new or emergent relationships and discern the risk impacts that have not been identified previously” (Crossan, M.,1999). Cognitive insight may involve a step of reframing or synthesizing of existing resources already accessible to the individual or company, may also require a procedure of transforming pre-existing ideas or assets that generate new knowledge.

A real life application of cognitive learning can be exemplified by two employees at Patterson Fan Company who created an unusual-looking grill out of spare parts from the industrial fans manufactured in the South Carolina plant (Rosenwein, 2001). By cognitively reframing the usage of the flared fan parts, these two industrious employees developed a unique design which had greater heat circulation while maintaining temperatures of the cooler unit lower than that of standard grills. Chief executive officer Vance Patterson patented the grill in his name and the names of these two inventors. The spin-off company, in this situation, does represent a new crisis factors in the form of a unique product in a new market for the corporation. This is an example that cognitive learning in product design and the creation of a new organization may lead to new crisis factors for the ventures.

Cognitive learning may also involve certain degrees of changes in individual, in the organizational patterns of cognition, and different formats of shifts in the way knowledge is to be transferred within the organizational system (Glynn, M.A., 1994). These changes may generate new products or open up new markets. Cognitive learning can be even a source of risk factors recognition for new venture creation. In most cases, cognitive learning in companies occurs as a type of transformational capacity (Garud, R., 1994), which is the ability to redefine the meaning or value of currently existing ideas (or resources) into a new economic risk factor for the organization. The way of needy redefinition can be occurred in at least two formats, either through a transformation of currently existing resources into new products, or through a reinterpretation of internal processes in which more information and knowledge can be generated. For better manageable purpose, this paper recommends that the redefinition of risk factors have better to be converted, through a linear transformation, into quantitative variables. After the identification of feasible risk factors and the proper linear transformations, in the following section of the behavioral learning phase, a Bayesian methodology as well as the Chiao’s effectiveness measurements procedure (Chiao, T., 2006) for organization learning will be thoroughly discussed.
In his analyses of conflicting perspectives on accident causation and safety management inside a construction firm, Gherardi (Gherardi, S., 1996) recognized safety to be the outcome and process of social activity, mediated by technological artifacts, situated in international contexts and based on specific working activities not separated from other activities. He also pointed out that within any organization’s structure one can expect to find several subcultures or communities, each with a specific safety culture based on: (a) particular social organization of the practices whereby the activity is shaped by the distribution of knowledge, power, authority and reputation; (b) particular system of beliefs, attitudes and cognitions of risk and safety used in their working environments; (c) particular expertise required to become a competent member of that subculture. Based on the multiplicity of safety cultures, various activities of behavioral learning phase can be flourished.

Many of the classic ideas about organizational learning are based on the assumption that organizations are goal-oriented, rule-based, which mainly responding to repetitive behaviors that have been successful and avoiding perceivable risk factors. This kind of learning approach focuses on the “antecedents and changes in organizational structures, technologies, routines, and systems as the organization responds to its own experience and that of other organizations” (Lundberg, 1995). These types of theories argue that organizational learning ought to be an adaptive process and, thus is triggered only by performance gaps or other signals of poor marketing performance.

**Recognizing Risk Factors through Behavioral Learning**

Behavioral learning is primarily adaptive, focusing on the modification of routines and structures in the face of experience. The classic prediction is that a sequence of successful outcomes measurements yields the stability in routine functioning, while the failure outcomes measurements indicate that the drastic changes may be needed (Glynn, M.A., 1994). It can be shown that routines may be more mutable than previously thought (Feldman, M., 2000). By the same token, the benefits of newness is its flexibility, the capacity to change direction by altering even core properties of the organization (Lichtenstein, 2000). In this sense, behavioral learning can spark new crisis factor for new ventures in at least two ways: through modifications of routines that create unexpected extensions to an organization’s offerings, and through an ongoing stream of organization-wide adaptations that can lead to unexpected synergies and marketable solutions.

The behavioral mode of risk recognition focuses on the tangible outcomes of learning-by-doing, in which experts of organization learning have addressed on two perspectives. On one hand, it describes how organizations use existing information in order to compare current situations with the situations from the past and the related situations in other environments. In this approach, knowledge resources can be utilized only to the extent that can be classified and stored in the organization. Therefore many of the recent forms of knowledge management are driven by the utilization of information technology, which becomes a major driving force of behavioral learning modes. On the other hand, the theory of behavioral learning focuses on trial-and error adaptability. Through which learning-by-experience becomes embodied in the form of specific routines, systems and processes as well as the unexpected advancement in organizing new ventures. In theory, behavioral routines provide consistency and replication to the organization, and may increase its chances for long-term survival. In practice, the performance and improvement of routines can lead to organizational change, expanding the potential opportunities from learning experiences.
These two perspectives really highlight that behavioral learning will be an essential part of the formation phase on the risk region recognition. In the formation phase, the evaluation and elaboration processes can be helpful for the development of business concepts into feasible opportunities. Initially, evaluation involves distributing information to stakeholders in order to determine if the business concepts are feasible. This may very likely lead to a series of analyses and experiments that formally explore whether and how the risk regions can be avoided. As the remedy solutions on the risk impacts are organized and elaborated, the practical end results will be of responsive adaptive type. The adaptive quality of learning will be triggered primarily by specific incidents within the organization, such as performance gaps or other type of signals of poor market performance.

In short, the process of behavioral learning will be more likely incremental and iterative and will also involve a constant cycling between the internal development of routines and their preliminary effectiveness in the organization environment. Likewise, the prevention of risk region is also an interactive iterative process. The outcome of each stage can be fed back to the initial input of the next stage. Hopefully, the overall framework will perform in an incremental manner and will ideally converge to the expected target values scheduled by organization’s strategic plan. This type of framework can be recognized as a dynamic moving adjustment process. In the recent discussion on Owen’s version of Bayesian algorithm (Owen, D., 1997), Chiao proposed a planned quality design of six sigma standard (Chiao, T., 2006) such that a sequence of iterative observed measurements will be justified that whether or not the convergence of the sequence will automatically guarantee the efficiency & effectiveness of the observations fall in the safety zone of target values of six sigma standard. It turns out that Chiao’s verification & validation process is of practical value.

Robust Convergent Bayesian (RCB) Model

A new version of Bayesian procedure (i.e. Owen’s version) will be implemented, which will lead to a strongly consistent estimator. The measure of the convergence is robust in the sense that it holds for a bundle of sequence of design vectors, \((d_i, p_i, g_i)\) where \(d_i\) stands for the dose level or the difficulty level, \(p_i\) stands for the discriminating power, and \(g_i\) stands for guessing parameter, and \(i\) stands for subscript or index variable.

Without loss of generality, we may assume that the observations \(X_i, X_2, X_3, \ldots\) are independent but not identically distributed. Each observation, \(X_i\), is 0 or 1, and the distribution of \(X_i\) is specified by

\[
P(X_i = 1 \mid \theta) = g_i + (1 - g_i) \Phi \left[ p_i (\theta - d_i) \right], \quad i = 1, 2, 3, \ldots \tag{1}
\]

where \((d_i, p_i, g_i)\), a design vector, with \(p_i > 0 \) and \(0 \leq g_i < 1\), which can be chosen differently with respect to each observation \(X_i\), and \(\theta\) is an unknown parameter. The main interest will be focused on the estimation of \(\theta\), and it is required to make a suitable choice of \((d_i, p_i, g_i)\), \(i = 1, 2, 3, \ldots\) and to obtain an appropriate estimator. Here, authors adopted a Bayesian approach with a normal prior distribution \(\theta \sim N(M_0, V_0)\).

In the arena of the bioassay applications, the model equation (1), regarded as a function of \(d_i\), is called a quantal response curve, \(\theta\) is called the median effective dose. Let \(X_i = 1\) be the situation that outcome measurement function value is within the safety zone, and \(X_i = 0\) stands for the case that outcome measurement function value is within the risk region. Then an iterative model can be generated by assuming that the probability of a person with the ability \(\theta\) knows the correct answer to the item \(I\) is \(P(U > d_i)\) where \(U \sim N(\theta, p_i^{-2})\) and that if this person doesn’t know the correct answer, he or she will guess
correctly with probability $g_i$. With respect to a bundle of sequences of three-parameter logistic vectors $(d_i', p_0, g_i)$, the probability that an individual with ability $\theta$ does the assigned task correctly is $P(X_i = 1 \mid \theta) = g_i + (1 - g_i)[1 + e^{p_i d_i}]^{-1}$. A Bayesian motivated estimator converges in mean square and almost surely to $\theta_0$, the true value of $\theta$. In situations such as this one, where there is no sufficient statistic of fixed dimensionality, a natural conjugate family of prior distributions indexed by a finite number of parameters does not existed. Updating by traditional Bayes’ theorem will lead, normally after only a few iterations, to posterior distributions which are mathematically intractable.

For the purpose of updating mechanism, a restricted Bayesian procedure is adopted with respect to the set of normal distributions and a normal prior distribution $\theta \sim N(M_0, V_0)$. Letting $M_i$, $V_i$ denote the mean and variance posterior to observation $X_i$, Bayesian updating is then performed with prior $N(M_i, V_i)$ and observation $X_i$, leading to posterior mean and variance $M_{i+1}$, $V_{i+1}$. This process recursively generates a sequence of normal distributions

$$F_n = \Phi \left[ (\theta - M_n) / V_n^{1/2} \right], n = 0, 1, 2, 3, \ldots$$

$M_n$, a choice of Bayesian estimator, is taken as the current estimate of $\theta$ between observations $X_n$ and $X_{n+1}$. It can be shown that as $n \to \infty$, $M_n$ converges to $\theta_0$ (the true value of $\theta$) both in mean square and almost surely. The difficulty of the selection of the $n$th item is the requirement such that $|d_n - M_{n-1}| < \delta$, $n = 1, 2, 3, \ldots$ where $\delta$ is an appropriately small constant to be determined. Furthermore, it is assumed that over all items, $0 < p' \leq p_n \leq p''$, $0 \leq k' \leq g_n / (1 - g_n) \leq k''$, the convergence of $\{M_n\}$ is guaranteed. If at each step, $p_n$ is maximized and $g_n$ is minimized, then the convergence of $\{M_n\}$ will be faster. As a rule of thumb, the sequence of items will be terminated when $V_n$ is acceptably small, and $F_n$ will be regarded as the posterior distribution of $\theta$.

**Robust Convergent Bayesian Forecasting**

Assume the exact distribution of $\theta$ posterior to one observation $X$ on item, and $(d, p, g)$ is derived for the prior $\theta \sim N(M_0, V_0)$. If the person obtains the correct answer to the item, then according to the traditional Bayesian theorem, the posterior probability density function, denoted by $p.d.f(1)$, and is of the value computed by

$$P(\theta \mid 0) = A^1\left[ g + (1 - g) \cdot \Phi \left[ p(\theta - d) \right] \right] V_0^{-1/2} \cdot \phi \left[ (\theta - M_0) / V_0^{1/2} \right]$$

where $A^1$ is the normalization constant and

$$A = g + (1 - g) \cdot \Phi \left( -D \right) \text{ and } D = (d - M_0) / (p^2 + V_0)^{1/2}$$

Similarly, if the person obtains the wrong answer to the item, the posterior probability density function, denoted by $p.d.f(0)$, and is of the value computed by

$$P(\theta \mid 0) = \left[ \Phi \left( D \right) \right]^1 \cdot \Phi \left[ p(d - \theta) \right] V_0^{-1/2} \cdot \phi \left[ (\theta - M_0) / V_0^{1/2} \right]$$

The *Robust Convergent Bayesian Forecasting algorithm* can be formulated by the following expressions for the posterior means and variances.
$$E(\theta \mid 1) = M_0 + (1 - g)V_0(p^2 + V_0)^{1/2} \phi [D] / \Phi (D)$$

$$E(\theta \mid 0) = M_0 - V_0(p^2 + V_0)^{1/2} \phi [D] / \Phi (D)$$

$$\text{Var}(\theta \mid 1) = V_0\{1 - (1 - g)(1 + p^2V_0^{-1})^{-1} \phi (D) [[(1 - g)\phi (D)/A - D]/A]\}$$

$$\text{Var}(\theta \mid 0) = V_0\{1 - (1 + p^2V_0^{-1})^{-1} \phi (D) [\phi (D)/\Phi (D) + D]/\Phi (D)\}.$$ 

In terms of a measurable terminology in organizational learning, the likelihood of the next performance attribute, given that the present stage is in the risk region or not, will be denoted by equations (6) & (7) respectively. Similarly, the variance of the next performance attribute, given that the present stage is in the risk region or not, will be denoted by equations (8) & (9) respectively.

**Multistage Stratified Adaptive Procedure**

With respect to the Traditional Bayes’ Theorem (TBT), the merits of Owen’s version Bayesian Technique (OBT) will be on the flexibilities of the selection for a bundle of sequence of three-parameter logistic vectors \((d_i, p_i, g_i)\), where \(d_i\) stands for the dose level or the difficulty level, \(p_i\) stands for the discriminating power, and \(g_i\) stands for guessing parameter, and \(i\) stands for subscript or index variable. Instead of providing the uniform training materials for all employees of an organization, the OBT approach can provide a special kind of tailor-made training materials, more flexible and better focusing on each individual’s, with maximum customers’ satisfaction and it can also achieve more balanced utilization of organization resource effectively. For an organization with \(k\) subculture groups, the Multistage Stratified Adaptive Procedure (MSAP) can be as follows:

**Step_01**: Ranking the \(k\) subculture groups according to the value of discrimination power, \(p_i\), in ascending order. Start the subculture group with the lowest \(p_i\), followed by the next to the lowest value in \(p_i\), and so on until the last subculture group with the largest, parameter value in \(p_i\).

**Step_02**: Partitioning the learning materials of an organizational training session into \(k\) stages, with members administered from the \(j\)-th subculture during the \(j\)-th stage.

**Step_03**: At each stage, two items are chosen from the un-administered items of the corresponding level with difficulty matching as closely as possible to the current ability estimate. The individual item with difficulty closest to the estimated ability is administered, if a random number from \(U(0,1)\) is less than 0.5, otherwise the individual item with second closest difficulty parameter is displayed. This arrangement of randomization procedure will reduce the possibility of getting the same individual sequences among different prospective. The training curriculum will move to the next stage and the individual item stratum when a pre-specified number of items have been administered.

**Step_04**: The process of MSAP will be continued until the last set of individual items has been administered from the last subculture.

In short, MSAP will be suitable to an organization of multi-levels in multi-stages respectively, according to the individual item’s value in discrimination power \(p_i\). Each member of the subculture group
will encounter an unique material, which ca be adaptively selected based on his/her responses to the previous question. In contrast to the traditional standard training curriculum, MSAP will have a lower rates of learning overlapping portions.

Chiao’s Verification & Validation Procedure

Without loss of generality, we may assume that $M_n$, the current numerical value, follows a standard normal distribution and control vector be defined as $p_i = 1.0$, $d_i - M_n = 0$ and $g_i = 0.2$, for $i = 1, 2, 3, \ldots$ and further assume that the sequence of six observed sample values of $M_n$ as {pass, fail, pass, pass, fail, fail} where “pass” means that the sample value is not in a risk region, and “fail” means that the sample value is in a risk region. According formulae (6) and (7) from the procedure of The Robust Convergent Bayesian Forecasting algorithm, then the responding posterior central tendencies and standard deviation can be calculated and be listed as in Table 1.

| Table 1 Sequence of posterior central tendencies and standard deviations |
|---|---|---|---|---|---|---|
| Sequence number | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| Indicator value of $M_n$ | n/a | Pass | Fail | Pass | Pass | Fail | Fail |
| Posterior central tendencies | 0 | 0.376 | -0.127 | 0.127 | 0.359 | 0.04 |
| -0.221 | 0.317 | 0.563 |
| Posterior Variances | 1 | 0.859 | 0.606 | 0.541 | 0.487 | 0.385 |
| 0.317 |
| Posterior standard deviations | 1 | 0.927 | 0.778 | 0.736 | 0.698 | 0.62 |
| 0.563 |
| Observed posterior central tendencies | = 0.0923 |
| Observed pooled posterior variances | = 0.639 |
| Observed pooled posterior standard deviations | = 0.7994 |

Through the recurrent applications of The Robust Convergent Bayesian Forecasting algorithm, we may have three sequential observed values, $\{ M_n \}, \{ \sigma_n^2 \}, \{ \sigma_n \}$. Let $T$ stands for the ideal target value for the sequence $\{ M_n \}$. Let $R$ be the region of the form $(T - \xi, T + \xi)$ where $\xi$ = the maximum tolerable error with respect to six sigma standard. Then we may consider the limit values of $\{ M_n \}$ when $n \rightarrow \infty$. In her paper, Chiao, T.,(2006) suggested that “Verification = pass” stands for the convergence of $\{ M_n \}$, “Verification = fail” stands for the divergence of $\{ M_n \}$ and “Validation = pass” means that there exists an integer $N_0$ such that $n > N_0$, all $M_n$, the values of sequence $\{ M_n \}$, will be in the target region $R$. Otherwise, we will define it as “Validation = fail”. Then, in case 1: (Verification = pass, Validation = pass) means that the adopted methodologies in both Cognitive and Behavioral learning phases are successful with respect to the mission of the organizational learning. This case means job well done. Unless mission statements of organizational learning have been changed, otherwise there is no need to go through tedious steps in action learning phase. For the case 2: (Verification = pass, Validation = fail) means that more minor remedy solutions of double loops at certain stages of the behavioral phase are needed or additional major adjustments should be applied before repeating the iterations in the behavioral learning phase. In the case 3: (Verification = fail, Validation = fail) means that the organizational learning process are not successful from the first two phases and the training managers in the action learning phase should serious be in charge for making intelligence decisions & adopting proper strategies before moving to the cognitive learning phase again for the second cycle of the CBA Spiral model.
ACTION LEARNING IN THE EVALUATION & RESOLUTION STAGE

Action learning approaches involve the practice of correcting misalignments between the levels of expectation and reality in order to generate more effective organizational behavior in real time. The reflective and personal nature will jointly make action learning less common than the other two phases. By challenging long-held patterns of belief and behavior, at the same time, it may rapidly transform an executive’s capability to communicate and to develop effective strategic competencies. Many industry practices and activities are shaped by the distribution of knowledge, power and authority, when considering how different hierarchical levels within an organization might respond to risk. In general, behaviors leading to accidents could possibly occur at three levels: operational, tactical and strategic. At the daily operational level, employees hardly make adequate risk considerations in their execution of routine, automatic, skilled behavior. At the tactical level, managers apply rules which are largely dictated by circumstances, so specific assessments of risk may not necessarily take place each time a rule is applied. At the strategic level, authorities often have many risk considerations, trade-offs between safety and costs and sometimes even deliberately accepting the expectation of the calculated risks. Although risk-taking is the cause of most accidents, however, managers as well as decision authorities are rarely in a position to fully evaluate the risks they are taking. Since they are carrying out most of their activities at an automatic, pre-attentive level, there is simply no capacity for a conscious consideration of risk. In most circumstances, workers often lack sufficient information about the fuller organizational context in which they are carrying out their activities, since they are very much focused on completing specific tasks at their own particular work-site within their own particular area of expertise. Relevant information, communicated by other individuals or groups working at the same site or from other locations within the organization, may help broaden perspectives and provide a more comprehensive picture, particularly with respect to risk and safety.

Action learning may create a context for both the discovery and formation phases of risk factors in combination. Asking the reflective questions that are at the centerpiece of action learning requires a personal willingness to uncover one’s hidden assumptions, and thus may face the discomfort of recognizing that one’s espoused theory may be different than one’s theory-in-use in the organization (Argyris, 1990). Developing such an awareness that leads to a realignment of belief and behavior allows company to break through defensive routines that keep people from producing their best work (Tobert & Associates, 2004). With the openness of the environment setting, the action learning can itself become a competitive advantage for creative thinking, innovation and productive interaction.

Recognizing Risk Factors through Action Learning

Action learning, the third phase of CBA Spiral Model, may also realize the potential crisis factors in advance. By focusing on the underlying norms of the organization and questioning whether the rules of engagement are appropriate, action learning can create a culture of openness, effectiveness, and aggressiveness (Argyris, 1990). This kind of settings can be helpful for risk & safety management. An organization will otherwise more likely vulnerable to accidents if it lacks of proper atmosphere of openness, effectiveness, and aggressiveness. Especially, when risk factors were founded, the critical information may be blocked because of without organization supports. The broadening & increasing the awareness levels may motivate individuals’ connection between espoused theory and theory-in-use (Schon, 1983).
The context of openness also connects the two different views of risk factors recognition. On one hand, the double-loop nature of action learning operates at a cognitive level, offering tools for questioning and reframing longstanding beliefs and attitudes. When these cognitive models block the emergence of a new insight, action learning may need to provide more supports for the discovery phases of risk factors recognition. However, action learning happens in real time, that is, in the interactive process of enacting ongoing activities, solving conflicts and adapting to new circumstances in an ongoing way. This type of cooperative inquiry occurs in real time with partners should also committed to integrating actions and inquiries. As such, double-loop learning will be an essential tool for successfully implementing a new insight. In other words, action learning is a base for an ongoing iterative process of reflection & action, which can be used to tie together and create synergies between the discovery and the formation phases of risk factors recognition.

In the next section, authors provide tangible suggestions and examples of how company can use each of these three modes of organization learning in order to improving their efforts on risk recognition.

The Role of Organization Learning in Risk Impacts Recognition

The risk recognition model describes crisis as a form derived from dangerous consequences that result from an organizational innovation or new strategic direction. In the previous section, authors proposed that these outcomes can be strengthened by organization learning. Although, the way of linkage between venture creation and organization learning is unique, the approach recommended here is, in some ways, parallel to the literature that has connected individual capability with organizational innovation through the instructions of learning and action (Feldman, M., 2003). In practical sense, the more of the three phases of organization learning that a company or an entrepreneur can enact, the more likely that new risk factors will be recognized, which can also be considered as influential strategic advantages. On empirical data, there are occasionally situations that risk signals are not likely to be detected, which can be enumerated as the following cases, (1) Weak or subtle risk signals, (2) Presence of strangers as distraction, (3) Source of risk signals are not reliable (i.e. from outside source, or from whistleblower), (4) Inadequate channels for communicating risk or threat signals, (5) Signal of threat embedded in routine messages, (6) Risk/threat messages systematically distorted, (7) Organizational or professional norms against communicating risks and warnings, (8) Risk/threat messages are discounted due to inconsistency with dominant beliefs, (9) Signals that do not coalesce, can not be compiled, or do not reach appropriate persons.

One of the practical experiences from action learning in risk prevention will be the willingness of having an agreement on new rules of promises that allow individuals to speak freely in their honest opinions and without worry about defensive reactions from their colleagues or managers. In other words, various forms of these three phases of organization learning can be successfully utilized to create new and unexpected methods for risk prevention. In the following table (Table 2) it briefly summarizes the ways in which these methods can be mixed with creative activities and how each one can increase the possibilities of the risk prevention.

<p>| Table 2 Approach of Learning That Generate New Opportunities for Risk Prevention |
|------------------------------------------|---------------------------------|---------------------------------|
| Nature of organization learning         | Elements affected by organization processes | Potential risk factors for organization learning |
| Cognitive                                | Identify and alter              | Design and develop new            |
|                                          | cognitive patterns, generate new| way of risk management;           |
|                                          |                                 | Applications knowledge in         |
|                                          | Existing and potential knowledge;|                                  |
|                                          | Systemic                       |                                  |
|                                          | Processes on the communications |                                  |</p>
<table>
<thead>
<tr>
<th>Behavioral</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alter tangible processes through experience: Determine feasibility through trial-and-error learning processes;</td>
<td>Transforming the context by questioning Assumptions and aligning espoused belief with actual practices;</td>
</tr>
<tr>
<td>Existing and emerging routines; Choice of Bayesian estimators; Robust convergent Bayesian forecasting process; Multistage stratified adaptive processes;</td>
<td>Underlying norms and beliefs; Interactive rules of promises;</td>
</tr>
<tr>
<td>Streamline processes to achieve new efficiencies; Integrate learned experience to improve tangible process;</td>
<td>Accelerate innovation Processes; Generate highly productive and creative organizations and collaborations;</td>
</tr>
</tbody>
</table>

**CONCLUSION**

An organization learning process includes its commitment to learning, the structural processes that contribute to or detract from learning, the quality of learning processes, and the rate at which new learning is applied to organizational processes. Each of these has important strategic implications in terms of how effectively a firm can add value and thus achieve or sustain a competitive advantage (Teece, D., 1998). Similarly, organizations can be actively successful depending upon the degree that whether or not they can identify and evaluate the risk factors.

By introducing **CBA Spiral Model**, authors have demonstrated that the risk impacts recognition of a creativity-based entrepreneurial activity will support the premise such that organizational learning can enhance the possibility of the risk factors recognition. First of all, in the cognitive learning phase, risk factors recognition will be revealed through the conversion of information into knowledge, such that what exists as a tacit knowledge can be reframed into feasible & practical opportunities in avoiding risks in advance. Secondly, in behavioral learning phase, risk recognition involves adaptation adjustment and change. Both robust convergent Bayesian forecasting algorithm and multistage stratified adaptive processes are introduced for the improvement of organizational learning’s efficiency and effectiveness. Finally, in the action learning phase, risk factor recognition relies on a willingness to suspend assumptions and reframe current expectation, while, at the same time, submitting one’s emerging conceptualization(mental mode) to a series of tests to see how well aligned it is to the reality of the situation.

The successful recognition of a risk factors will depend on the ability of individual and organizations to learn through all phases of the process. If this is true, then each mode of learning phase should be useful for increasing the degree of risk factor recognition. For improving the results of creative organization learning problem, a decision will be evaluated on the necessity of whether or not the next loop iteration on **CBA Spiral** path. In short, this may lead to the following Proposition statement.

Proposition: The more degree of organizational learning practices that are enacted by an organization, the more likely that newer risk factors will be recognized.

It is better to manage an organization through a proper strategies of organizational learning in proactive manner. The capability of recognizing risk factors may provide a key advantage in which an organization may remain viable and competitive status in a ever-changing environment. Future research may provide an expansion on these insights and endeavor empirically to test how learning
methods might better be integrated into risk factor prevention such that the risk factor recognition will become an essential strategies and subcultures of an organization’s learning operations, in which we had once called total quality management and now with the current prevailing terminology of six sigma management. It is our hope that by providing these modes, we may provide valuable referential support for organizations to avoid accidents and to prevent incidents.

Table 3 Classification Systems for Risk Factor of Organization  
(Matthew W. Seeger, Timothy L. Sellnow and Robert R. Ulmer, Communication and Organizational Crisis)

<table>
<thead>
<tr>
<th>Meyers and Holusha 1986</th>
<th>Coombs 1999</th>
<th>Mitroff and Anagnos, 2001</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public perception</td>
<td>Natural Disasters</td>
<td>Economic</td>
</tr>
<tr>
<td>Sudden Market Shift</td>
<td>Malevolence</td>
<td>Informational</td>
</tr>
<tr>
<td>Product failure</td>
<td>Technical Breakdowns</td>
<td>Physical-Loss of key plants</td>
</tr>
<tr>
<td>Top management succession</td>
<td>Human Breakdowns</td>
<td>Human Resource</td>
</tr>
<tr>
<td>Cash crisis</td>
<td>Challenges</td>
<td>Reputation</td>
</tr>
<tr>
<td>Industrial relations</td>
<td>Mega damage</td>
<td>Psychopathic Acts</td>
</tr>
<tr>
<td>Hostile takeover</td>
<td>Organizational Misdeeds</td>
<td>Natural Disasters</td>
</tr>
<tr>
<td>Adverse international events</td>
<td>Workplace Violence</td>
<td></td>
</tr>
<tr>
<td>Regulation/Deregulation</td>
<td>Rumors</td>
<td></td>
</tr>
</tbody>
</table>

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Shrivastava, P. (1983) Variations In Strategic Decision-Making Process; Lamb, R. (Ed); Advances In Strategic Management; vol. 2; pp.177-189; Greenwich, CT; JAI Press.


