Diversity And Adaptive Distributed Learning In New Wave Organizations

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INTRODUCTION

The continuous change in all the aspects of business and technological systems suddenly makes diversity a central issue of organizational system design and management. The growing need in adaptivity to change requires a vision of organizational learning grounded not so much in “knowledge transfer” as in the process of continuous viability maintenance. Although a number of waves of organizational architectural innovations in change management area provide us with deeper understanding of the problem, there are remaining two troubling outcomes: lack of necessary level of success and the resulting need in continuous transformation to another wave of ideas when the previously used approach proves its insufficiency. These two situations are tightly interwoven since the new organizational transformations following the need of seeking better solutions are exacerbating the original problem of change impact. The resulting architectural instability and continuous blowing of the “new winds” are becoming (in addition to their recurring disappointing performance) so costly and risky that we arrive at the situation when the cure seems worse than the disease.

This is where diversity management comes into play as a major component of the solution. The paper offers the way of breaking such mutually destabilizing influence of environmental and internal reorganizational instability by providing analysis of the fundamental sources of inefficiency of the past approaches and proposing a design allowing to stabilize change management architectures. The proper use of diversity management and creativity of different autonomic positions allows organizations to be always on top of new waves of developments (be always a *New Wave Organization*) since the innovations can be absorbed and managed within the stabilized architecture decreasing the shocks of adaptive transformations continuous. The stabilization of the common view on various architectural aspects supports common language allowing for a more strategic and focused approach to the transformation projects and their administration, discuss sought outcomes, and weigh risks and benefits of the corresponding resource allocation.

CHANGE AND ARCHITECTURAL SOLUTIONS

The growing environmental dynamism and variability can be seen not only in impacts on the corporate life but also on the customers, supply/sales channels, and markets in general. The recent shift from mass-production to mass-customization targeted by corporations became insufficient for adaptation to the increasing turbulence of business and technological situations. The Ashby’s law of requisite variety (Ashby, 1956) requires respectively high levels of system’s own transformational change. This level is becoming too high for currently used approaches to change management and requires rethinking the source of their limitations and ways of overcoming them.

The main dichotomy between the clusters of approaches to change management is probably best represented by Theory E and Theory O (Beer and Nohria, 2000). Theory E can be seen as the one more controlling and exogenous (to the social structure of an organization) method of organizational transformation in response to changing business situation, while Theory O heavily relies on emergent processes and endogenous bottom up transformation proliferation.

The main tensions between these two managerial approaches (Michael Beer & Nitin Nohria, eds., 2000) include the differences between top-down versus participative leadership; structural versus cultural change initiatives; planned versus emergent efforts; shareholder value versus capacity to learn; leading or lagging timing in compensation change; model-based change handling versus participative actionable results, and a number of others.

Although the need in some balanced mix of Theory O and Theory E as a way to overcoming their individual limitations had been acknowledged before (Beer and Nohria, 2000)), the guidelines to the reliable way of doing this on organizational level have not been developed yet. The consensus was that the attempts to combine both are difficult, risky, and most likely futile (Beer and Nohria, 2000; Kotter, 1999). At the same time, the philosophical roots of the integral unity of these seemingly competing processes can be seen already in the philosophy of Yin and Yang. The intense and tightly coupled tensions between these two forces create the necessary complexity of the system putting it closer to the Edge of Chaos (Kauffman, 1995) where systems have the richest set of reactive (transformational) opportunities in terms of the Ashby's requisite variety.

The modern existing methods of mixing and balancing Theory E and Theory O style of change management are represented by the following major approaches (Graetz et al., 2002), which we will group into categories reflecting the specificity of such mixing:

- **Sequencing both approaches in time** (Lewin's method of unfreezing, moving, refreezing)
- **Juxtaposing both approaches in their direct confrontation** (socio-technical approach, where each domain serves as change or stability agent; organizational development, where the role of the interacting sides is played by consultants and employees)
- **Integrating both approaches in one actor** who is using both for better integration and coordination (organizational learning)
- **Choosing one fundamental measurable system parameter** (like cost, quality, etc.) and attempting to maximize its desirable measure consequently balancing Theories E and O in all related processes (TQM, lean production)
- Attempts to match the growing complexity of change with the **complexity of its model** (BPR, Best Practice, High Performance Organization.)

While the first waves of these methods didn't lead to the expected advantages, the work continues in attempts of the new better ways of combining the benefits of both approaches. In the next section we will show the difficulties of reaching this goal and why all described methods (in their current generation) have the same inherent problem preventing them from reaching the necessary effectiveness and efficiency of coping with change.

CONNECTIVITY AND SENSITIVITY BALANCING

As we saw in our brief review – it gradually became clear that the real adaptive organization has to combine Theory E and Theory O in one architectural design when the push/control from the top meets enthusiasm, embracing, and creative collaboration of the bottom. At the same time the lack of success of such combination has two major problems at its core:

- Low level of architecting where changes in components drastically affect the whole design (noting that business and technological innovations are interwoven in a mutually accelerating loop of changes)
- Attempting tight coupling of both approaches within the same set of actors, structures, and processes

The continuously growing connectivity of participants and processes in socio-economic and technical systems is the source of major changes in business and technological environments (Sproull, 1995). In order to understand these two interconnected problems better we will use a connectivity/sensitivity coevolutionary model (Vengerov, 1999). Given the continuing growth of connectivity it is important to see its influence on the development of two polar trends. One of them can be seen in the increase of stabilization pressures limiting the degree of freedom of various parts and processes because of stricter control along newly introduced/enhanced connections. The opposing trend uses the growth of connectivity within the system and with its environment to increase the sensitivity of its components to the destabilizing influence of internal and environmental changes, which can now proliferate along the same newly introduced/enhanced connections. For example, pressures of releasing the power of creative, fast, and free-form collaboration onto the corporate turf can be seen in the methods of systems development that are shifting from the domination of structured approaches to agile methods and other less formal and more sensitive methodologies (Fowler, 2001; Aydin, 2005).

It is important to notice that these mutually opposing trends are inherently related, mutually restricting, and depending on each other for support. The initial destabilization and growth of system's sensitivity and emergent creativity is the foundation of learning, which leads to more adequate states of affairs and stability of supporting structures. The temporary stabilized system uses efficiency of the learnt patterns to provide resources for "feeding" the learning and adaptation mechanisms that, once again, start a new cycle of system's transformations. On the other hand, overstabilization of connectivity can impede sensitivity of loci to changing situations and visa versa.

The relationships between the stabilization effect of connectivity (c) and destabilization effect of sensitivity (s) in various systems were shown (Vengerov, 1999) to follow Lotka-Volterra type of dynamics expressed by a system of differential equations resulting in a rich Chaos Theory style behavior:

$$\begin{aligned} (1) \quad \dot{s} &= bs - nsc \\ (2) \quad \dot{c} &= -ac + msc \end{aligned}$$

Here a , b , c , d are the parameters affecting the stable solution in a form of a loop (limit cycle) on the s/c coordinate plane, having a critical point with neutral stability at $(a/m, b/n)$ and periodic interchangeable growth of s and c .

The main goal in the view offered by the equations (1) and (2) is in designing mechanisms supporting the effective and efficient looping through c and s with frequency matching changes of the environment. This corresponds to the known cyclical behavior of system's learning where the effectiveness of emergent learning of the new patterns should be balanced with efficiency of the reuse of the learned knowledge.

As a result we can see that once the levels of connectivity/stability and sensitivity/evolvability become necessary high – they cannot coexist within one cycle of learning/adaptation being mutually restrictive by the specific proportion determined by the equations (1) and (2) presented above.

The only solution in combining these levels is in their decoupling into separate clusters of processes involved into learning/adaptive cycles of managing sensitivity and stability. Since the approaches used in each feature and the very cultures of doing so are very different and largely incompatible the separation of the corresponding processes requires the design and maintenance of the proper channel-adaptor with sufficient mutual harmonization and interpretation capabilities. Such separation is not about making employees sometimes more creative and sometimes more obedient, but about the corporate fear of letting some processes and activities go. The dynamic separation of all corporate processes and activities into the ones out of direct control loop, capable of evolving and self-organizing on their own, and the ones still under tight control is not a simple matter, especially if they have to demonstrate reliable and efficient collaboration. The next section offers a solution as a virtualized architecture with a number of specific features.

VIRTUALIZED MULTICYCLE ARCHITECTURE

As it was mentioned above, the sufficient **virtualization** and **learning cycle separation** are the two main features of change management architecture necessary to stabilize common views, methods and areas of analysis, and establish common ground for effective administrative communications. The first feature is supported by special layered-style architecture, while the second is being addressed by the use of a three-cycle COLA architectural pattern (Vengerov, 2006).

Fig. 1: Multilayer COLA/ADL architecture

MULTILAYER VIRTUALIZATION

The multilayer architectural organization includes the top virtual architecture (VA) layer, which is insulated from specifics and continuous changes of technology architecture (TA) layer and business architecture (BA) layer via the use of the special Framework (FW) layer (see fig. 1).

The goal of the FW layer is in supporting the design of the high-level processes, entities and services of VA, stemming from business and technological innovations in a way that they will fit the architectural features of the VA layer. Frameworks, in general, represent a modern architecting approach to systems with high dynamics of changes. They usually are formed by a continuously evolving set of generalized forms and processes (patterns), which could be recomposed and reused in various ways. On the one hand FW-layer guides the evolution of BA/TA innovations to fit the VA-design, on the other hand, reminding a Lego set, it can allow switching to a different Lego set with different shapes, sizes and methods of connection. At the same time the final designs (like Lego houses, towers, cars, etc.) of VA remain intact from the principal point of their appearance and meaning.

The separation of the meaning of the final architecture from the details of its biz/tech implementation not only stabilizes the overall architecture but also releases the freedom of creative adaptation on technological and business layers. This also allows for less constricted search of the best methods and forms of socio-technical engineering (Luna-Reyes et al., 2005; Cherns, 1976; Clegg, 2000; Mumford, 2003), while preserving top-down guidance of the VA-layer, stabilizing the language and the main concepts of the architecture. The FW-layer performs mutual adaptation (mainly at organizational design speed, although with some automation seen in e-commerce systems) of the socio-technical and business evolution with fundamental virtualized views of the VA-layer.

MULTICYCLE ORGANIZATION

The cycle separation is implemented on the VA-layer and is based on Context-Oriented Learning Architecture (COLA) design (Vengerov, 2003; Vengerov, 2006), which supports the separation of the learning cycles, where one of them seeks dynamic harmonization with external environment (He), being more sensitive and emergent in its nature, while another seeks harmonization of the more stable internalized (Hi) structures and processes. These cycles are connected via the special cycle which learns to support mutual coevolution (not control) of both external and internal harmonization processes and results (Hi/e).

He-Cycle

In a somewhat simplified sense the external harmonization cycle (He) is an embodiment of Theory O while Hi corresponds more to Theory E. He-cycle also could be seen as endogenous organizational model versus more exogenous flavor of the internal harmonization cycle (Hi). The He-cycle reflects the emergent context-based reactive, perceptual, almost phenomenological, approach to harmonization of the current interactions with the environment of an analyzed system. The reason for such separation is in the observation that self-organization of viable systems allows for the highest level of sensitivity and sufficiently unrestricted creative processing of the environmental dynamics as the main source of change pressures. Later during the processes of its internalization the goal changes from adequate reflection (vision) of the external dynamics to the most cost-effective design/administration of the internal reactive mechanisms.

The higher level of sensitivity and creativity of processes dealing with the immediate harmonization of the outcome/input as direct relationships with environment leads to a separate learning cycle, which should dynamically embrace all processes and activities falling within this domain. The differences in harmonization methods between creative sensitivity of He and stability of Hi can be more effectively maintained in case of their loose connection allowing to stabilize the necessary core processes, while release the ability to better match environmental pressures. For example, on a high level of organizational view, the CRM and SCM subsystems should be less controlled and stabilized than ERM counterparts. At the same time within each of these systems there are parts dealing more directly with changes in environmental behavior in comparison to the tighter control and efficiency of other parts.

This dichotomy of these two lines of processes is described in COLA approach [Vengerov, 2006] bringing their relationships to the explicit architectural level. The latest socio-technical experimenting with Web 2.0 models showed the possibility and effectiveness of emergent self-organization at high levels of mutual sensitivity without too many controlling constrictions. Unleashed diversity of perception and cognition of individuals becomes an important “diversity capital” creating the synergy of “social processing” with whole being more than just the sum of its parts. Suddenly organizational learning is not just about making people learn but about “clouds” of interests, mutual sensitivity, and emergent creative efforts. Socially based organizational evolution proved to be not only workable but explosively effective. Web 2.0 Web sites accounted for 12 percent of all U.S. online traffic in April, 2007 according to a new study from Hitwise (Hitwise, 2007). Such new socio-technical capabilities form the basis of the emergent sensitivity of He-cycle.

He cycle has five main functions:

1. Managing the **attention** of external sensors/information intakes
2. Creating a set of **sensible percepts**
3. Seek the **higher level meaning** of such percepts
4. Seek **activities** increasing the harmony of the external situation
5. Establish **relationships** of mutual influence/coevolution with Hi through Hi/e that are adequate to the current situation

The main feature of these processes is in the possibility of “quick-n-easy” representation of locally-perceived events (e.g. blogs, opinions, suggestions, polls, discussions, etc.) with local sense determination and following more global aggregation with higher meaning discovery. The resulting two-level structure of local and aggregated views of He can be extended to a multilevel form when peers learn from each other as well as from the aggregated social vision, which in turn evolves from local experiences in a multilevel-learning fashion (Vengerov, 2002).

Hi-Cycle

The Hi-cycle of learning deals with more stable processes allowing for control methodologies to use their efficiency and well-developed toolbox of management methodologies and technologies. After all, no matter how turbulent and emergent the fuzzy and contextual learning process is in the He-cycle, it attempts to discover the

knowledge patterns of a more stable character. Once found, they should be used in a Model Driven Architecture (MDA) style for the purpose of inferential expansion, efficient reuse, and enhanced coordination of control. Not everything is changing and emerging, and more stable components can be better dealt with by using special methods and technologies designed for efficient utilization of stabilized components and areas of activities.

Hi/e – Cycle

The learning cycle, aimed at the proper harmonization of the He and Hi-cycles (namely Hi/e), is the place where most of the magic happens. The new Web2.0 methods and experiments, the development of some new Web standards supporting the use of stateful services, while allowing for their somewhat separate existence (Vengerov, 2006), and serious advancements in group decision making and distributed intelligence allow to create a process of dynamic coevolution of He and Hi without their mutual tight coupling and control by either side. The methods and technologies of adaptive distributed learning (Vengerov, 2006) are new factors allowing for the effectiveness and sustainability of the VA functionality combining all three learning cycles.

The “soft emergence versus hard control” balancing and harmonization largely relies in our architecture on adaptive learning and interpretive abilities of Hi/e cycle (with proper cooperation of He and Hi). Significant knowledge, which could be effectively used in implementation of the specifics of our multicycle harmonization, has been accumulated in various domains (not only organizational change management) dealing with high level of change. Sociobiology (Wilson, 1975) focuses on clusters of sensitivity capable of their own dynamics and intentionality compared to the behaviors of isolated human beings that form them, Minsky (Minsky, 1985) saw similar clusters in societies of individual processes among individuals. Distributed cognition (Hutchins, 1995; Perry, 2003) is interested in clusters of interacting processes within internal and external spaces of individuals effectively allowing to combine computers, other people, external memories, and various information processing mechanisms into one cognitive system. Memetics (Dawkins, 1976) offers a high level of virtualization of cognition where regardless of the carrier, memes are capable to form stable self-supporting systems. Connectionist approach (Smolensky, 1991) to the growing power of contexts over evolving patterns has been used in complex systems analysis resulting in studies, modeling, and application of non-symbolic processes supporting overall systems adaptivity and viability. Methods of soft computing (Zadeh, 1994) including various forms of fuzzy, evolutionary, and reinforcement learning of current contexts use these processes for determining the best course of actions under the circumstances of the given contextual experience. These developments offer important results that show the possibility of successful implementation of He/Hi balanced harmonization.

The workflow continuously shifts the “hard” more stable parts from He into Hi/e cycle where they come in closer interaction with pressures from Hi being able to coevolve better than in direct conflict-baring interaction of Hi and He. Newly discovered knowledge patterns like stable trends, models, effective processes can be validated against the existing rules, norms, and procedures with the possibility of mutual influence. Understandably, it is easier to persuade the existing business process “establishment” of accepting some corrections and modifications if it comes from time- and social experience-tested effectiveness of the new patterns of operations. The “softened” in this process parts of Hi decrease their influence on He, automatically allowing for broader experimentation/discussion in the areas of organizational life that seem to be subjected to change.

Such mutual learning and coadaptation of He and Hi versus attempts of mutual control and continuous conflict resolution is the key method of He and Hi harmonization based on adaptive learning by Hi/e and its soft transmission of the results to either side for consideration. The described processes of supported coevolution of He and Hi result in Hi/e becoming a learning cycle and an entity of its own, capable to influence both sides by “playing center against both ends.”

The Specific Features Of The Architecture

The presented architecture has a number of important features, determining its success. Since the main goal was in stabilization of the language and its forms describing the organizational adaptive learning architecture, the following features contribute to such stability:

- High-level virtualization
- Multilayer structure with framework adaptation
- Learning cycle separation (loose coupling)
- Recurrent use
- Decoupling and relative independence of business and technological processes and services

High-level virtualization requires that all processes and structures dealing with the VA-layer are described not in terms of specific business rules and supporting technologies but in terms of clusters of mutual sensitivity of elements and processes playing their roles according to the specifics of respective learning cycles.

Multilayer structure supports interpretation of specific features and situations, which is performed between higher (VA) and lower (BA, TA) levels of abstraction of respective layers by using the framework-type architectural approach to change management. This separates high dynamics of specific business or technology forms and processes from affecting the principal structures of VA, while allowing higher level processes direct the development of the lower level ones.

Learning cycle separation supports independent semi-autonomous “life” of the three regions of adaptation and learning the higher levels of respective harmonies. This means the relative independence of He-cycle dealing with such external situations as customer satisfaction, supply/sales networks, competition/cooperation, etc. from Hi-cycle dealing with stabilized forms and processes of organizational dynamics as well as with effective and efficient use of the learned knowledge patterns that can be incorporated in the proper control mechanisms.

Recurrent use means that the described architecture could be applied to bigger or smaller entities (like units, projects, and processes within the whole organization) in their analysis and development. This greatly simplifies the design of the necessary complexity matching environmental features by reusing same procedures, technologies, and forms of organization on various levels and locations throughout the whole organization.

The described above recurrent use supports **decoupling and relative independence** of many of company's services (business and technological) that represent value of their own which could be increased by the proper composition of this services at the proper time (dynamic composition versus preprogrammed optimized procedures).

CONCLUSION

The paper analyzes the cause of the change management problems in one-cycle learning methods attempting to combine the creativity, richness, and the resulting bottom-up evolving of the organizational solutions with the need to maintain top-down control and stability of some vital organizational processes. We presented an approach to change management with a corresponding architecture allowing to set a common reference plane in continuous development of socio-technical and business forms of adaptation. The approach allows to effectively use the necessary level of diversity in an organization for social fusion of many views into the higher level organizational vision and intelligence without the loss of the desired degree of control over the main processes. This assures that regardless of the coming innovation waves in change management, an organization following the suggested approach will always be able to accommodate the latest wave, becoming a continuously New Wave Organization (NWO) while maintaining a stabilized architecture. Future work in the direction of the more detailed forms of balanced integration of Theory O and Theory E approaches seems important. Additional research and experiments in methods and forms of implementation of the proposed architecture in various NWOs will allow for the more detailed discussion tailored to specific business cases. The architecture methods of change management seem to be general enough to be used in various situations where the balanced coexistence of the means of stability/control and means of high sensitivity/evolvability is necessary.

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