

# SENSE-MAKING AND LEARNING IN COMPLEX ORGANIZATIONS: THE STRING QUARTET REVISITED

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## Session G-4

### Abstract

*"We are performing a masterpiece - something by Beethoven, Schubert, Brahms, perhaps Mozart. The quartet mechanism is functioning smoothly – tightly and solidly. A symbiosis emerges between the ethereal power of the music and the expressiveness of each of the quartet's members, lubricated by the sweat of a decade of hard work. The power of the resulting eloquence is more than the sum of its parts."*<sup>1</sup>

Why do musicians consistently succeed in achieving a degree of organizational perfection that many business leaders can only dream of? What makes some music ensembles function so seemingly flawlessly? What roles do learning and sense-making play in this? How *do* learning and sense-making occur in organizational settings that are characteristically transient, varying, ephemeral, and ambiguous – in other words, organizational settings typically experienced by ensembles? The authors explore the notions of learning and sense-making in a string quartet. The string quartet is viewed as a complex learning organization characterized by a dual dichotomy comprising individual-collective interactions and tacit-explicit knowledge processes. A construct describing the string quartet's field of interaction in terms of learning and sense-making is derived and deployed to analyze learning and sense-making in complex organizations such as the string quartet. The construct and analysis developed in this paper are based on a case study of the Carmina Quartet of Zürich, Switzerland.

**Keywords:** organizational learning and development trajectory, social interaction dynamics.

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### 1. Introduction

Imagine the scene: A chamber-music festival staged in the romantic setting of the inner courtyard of the ancient Kyburg, a Swiss medieval stronghold of the former Habsburg dynasty situated near Zürich; an apt setting for pondering the transcendental and ethereal nature of music and music-making. We are listening to the chamber ensemble’s interpretation of the richly textured and emotion-filled Schubert Octet in F-Major<sup>6</sup>. Schubert, when composing the piece in 1824 clearly must have felt inspired, perhaps even seen or heard something. His thoughts, inspirations and emotions he then put to paper in the form of a music score. Now, nearly two centuries later, we are left only with pieces of paper with some symbols, perhaps interspersed with a few sparse instructions. And yet, to the group of musicians comprising the octet ensemble, those few symbols are more than enough; more than enough to stir up their own imaginations, emotions and creativity, and more than enough to reach out and evoke powerful emotions in the audience attending the concert performance.

Fast-forward in time to another scene, though similar setting<sup>7</sup>: We are sitting in the Zürich Tonhalle, listening in on the Tonhalle Orchestra during its final rehearsal of Edward Elgar’s Cello Concerto. The musicians are now into the final movement. Yo-Yo Ma, the cello soloist, is engaging with the orchestra in an intense exchange of dialogue. After a while, conductor David Zinman almost imperceptibly withdraws; ceasing to beat the time to the point where he only occasionally, and then only very subtly, moves to the music with his upper body,

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<sup>5</sup> Quotation: Wendy Champney, violist, Carmina Quartet

<sup>6</sup> Franz Schubert (1797 – 1828): Octet in F-major for Wind and String Instruments, Op. 166, D803 (composed 1824).

<sup>7</sup> Tages-Anzeiger (Zürich); 10th September, 2003: „Nur die Leidenschaft ist zumutbar“ (Thomas Meyer)

allowing the cellist and the orchestra full freedom to engage in making music. There is no need for intervention of any kind on the part of the conductor. The observer perceives exquisite harmony of tone, intention and action between soloist and orchestra - an example of flawless sense-making in a complex environment?

Paradox though it may seem, one does wonder why many modern business leaders simply do not succeed in pulling off what musicians have excelled at doing over the centuries. Are music ensembles really that different from modern business organizations? We suggest they are not. The analogy to the modern business organization is striking: Musicians performing in ensembles are organized in complex organizational units. They routinely communicate extremely complex sets of ideas and emotions using only physical artifacts (their instruments) simple symbols and notation left by the composer. They succeed in creating cohesion and seamless harmony within an environment and process fraught with potential pitfalls and stumbling blocks. They achieve this by maintaining an exquisitely fragile balance between multiple, simultaneously occurring knowledge streams that feed on tacit and explicit, as well as individual and collective impulses. Moreover, when an ensemble performs a piece, it creates a musical space, in which the audience is invited to participate by virtue of its own imagination. As our co-author, Goerner, has pointed out, *“the music is already there in the room; it just needs to be made audible”*.

We argue in this paper that there are substantial lessons to be learned by the management of modern organizations from observing performing musicians and their mode of interaction and communication. In many respects, an ensemble is not unlike a modern business organization. Both exist in real time to generate value of some sort, whether for a concert audience or a group of customers. Both rely on complex organizational processes, involving interaction between individuals and the collective. Both rely on knowledge creation and its exchange, much of which occurs in the tacit, invisible realm. And, both can fail to generate value. Perhaps the only difference between the two is that “failure” in the case of an ensemble is immediately apparent; business failures may become obvious only after some time.

In this paper we explore the centuries-old model of the chamber music ensemble from the perspective of a complex organizational learning unit. We examine the processes that support the interaction and alignment between individual musicians and the ensemble. We then examine the role of knowledge in the ensemble. We explore how it is created, converted and shared. We look at how knowledge supports the individuals’ and the group’s capabilities. We try to understand the role of implicit and tacit knowledge processes in the highly ephemeral environment of the performing ensemble. We explore the emergence and role of *unwritten rules* in the ensemble. Finally, we extend the notion of knowledge creation and exchange to learning and sense-making within the ensemble. We contend that each performance of the ensemble is a unique experience, and ultimately the outcome of a complex innovation process that is inextricably linked to individual and group learning and sense-making processes.

## **2. Learning and sense-making in complex organizations**

What do we mean when we say an organization is *learning* or that it is a *learning organization*? How would we recognize learning, if and when it does occur? Where does sense-making come into the picture? The notion of *learning* has held the attention of researchers and practitioners alike for a long time (Cyert and March, 1963; Argyris and Schön, 1978; Daft and Weick, 1984; Fiol and Lyles, 1985; De Geuss, 1988; Dibella and Nevis, 1998). Despite the efforts of these and other management thinkers, the concept of *organizational learning* is, in fact, by and large yet poorly understood and surrounded by conceptual confusion.

Argyris and Schön (1978) have articulated the dilemma in the following way:

*“There is something paradoxical here. Organizations are not merely collections of individuals, yet there are no organizations without such collections. Similarly, organizational learning is not merely individual learning, yet organizations learn through the experience and actions of individuals. What, then are we to make of organizational learning? What is an organization that it may learn?”*

Much of the early work on learning relates to learning by the individual. The systems thinking school (Senge, 1990) has extended earlier work focusing on the individual to include interactions between the individual and the organization. Learning in the organization seeks to reconcile the needs, motives, and values of individual members of the organization toward a collective outcome. The challenge lies in achieving a balance between diversity and consensus toward developing new knowledge, which leads to improved collective understanding. Dewey’s model of experiential learning (Kolb, 2000), portrayed graphically in Figure 1, emphasizes the developmental nature of learning. It describes how learning transforms impulses originating from experiential knowledge into higher-order purposeful action.

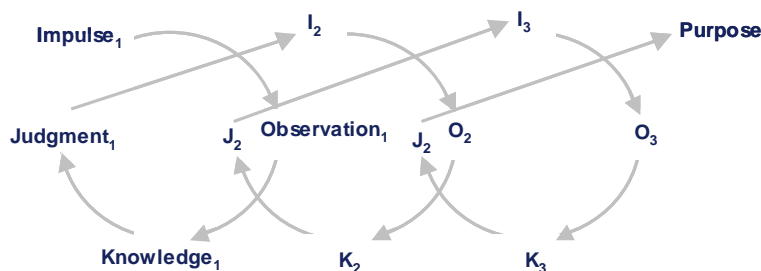


Figure 1. Dewey's model of experiential learning (Kolb, 2000)

Learning in the Dewey model is viewed as a dialectic process that integrates experience, concepts, observations, and action. Reflection and validation occurring between observation and judgment are based on a *here-and-now* perception of reality that is characteristic of highly tacit processes. The Dewey model represents a fundamental level of organizational learning. It describes how a member of an organization interacts with the organization's internal and external environment, and how this individual's perception of reality evolves over a series of feedback loops. This mode of learning has been referred to as *adaptive* or *single-loop* learning.

The notion of the organization as an intellectual, contemplative process has become embedded in the literature through the notions of *single-loop* (behavioral) and *double-loop* (cognitive) learning (Argyris and Schön, 1978). *Double-loop* learning involves questioning organizational norms and values which are seemingly unchangeable. It also exhibits *explorative* behaviors, where the organization learns through engaging in risk taking, playing with ideas, experimenting, discovery and innovation. This is in contrast to *single-loop* learning (associated with *exploitative* behaviors) that seeks to refine existing processes and emphasizes efficiency objectives.

A recently proposed framework for organizational learning by Crossan *et al* (1999) attempts to integrate both modes of learning (Table I) by building on the tension between exploitation and exploration in organizations. It places these two notions at the heart of strategic renewal, whereby renewal refers to the learning and knowledge generation that result when organizations explore for new ways of doing things while exploiting what they have already learned. The framework relates the interactions at the individual and the collective levels of the organization in terms of four inter-related learning processes

Level	Learning (and Sense-making) Process	Inputs / Outcomes
Individual	<b>Intuiting</b> → Dependent on some form of pattern recognition; → Pattern recognition supports exploitation; → Important also for exploration through new insights	→ Experiential Knowledge → Pattern recognition / Images → Metaphors
(Individual)	<b>Interpreting</b> → Explaining through words, actions → Development of cognitive maps → May result in potentially conflicting interpretations	→ Language → Cognitive map → Dialogue
(Collective)	<b>Integrating</b> → Developing shared understanding → Taking coordinated action through mutual adjustment → Shared understanding through dialogue, story-telling	→ Shared understanding → Mutual adjustments → Interactive systems
Collective	<b>Institutionalizing</b> → Establishment of routinized actions → Embedding of organizational routines → Embedding of 'unwritten rules of the game'	→ Routines → Diagnostic systems → Rules and procedures

Table I. Organization Learning Framework (Crossan *et al*, 1999)

The four learning processes are interlinked by *feed-back* (single-loop) and *feed-forward* (double-loop) learning loops. The four learning processes are based on multiple interactions of tacit and explicit knowledge. The Crossan *et al* framework, however, does not elaborate on how the potentially opposing but symbiotic notions of exploration and exploitation are resolved in the context of organizational learning and sense-making.

### 3. Extending the construct: Learning and sense-making in organizations

The Crossan *et al* framework relates individual and collective interaction, through four learning processes. In this framework, however, tacit and explicit contributions are suggested by implication only. We propose to account for tacit and explicit contributions by drawing on Nonaka and Takeuchi's (1995) theory of knowledge creation through interaction between tacit and explicit knowledge. The resulting construct, presented graphically in Figure 2, enables us to account for all factors contributing to an organizational *field of interaction*. The extended construct enables us to describe an organization's *field of interaction* in terms of interaction between the individual and the collective, and the organizations tacit and explicit processes. It consists of four quadrants - *interpreting*, *integrating*, *intuiting*, and *institutionalizing*. We do not claim novelty for the extended construct since Baumard (1999) has proposed a similar construct to help trace the evolution of conjectural knowledge in social environments at large. However, we are not aware of any earlier attempts top relate it to learning and sense-making in closed, formal organizations.

1. Positioned in the upper left quadrant, *interpreting* is the process by which the individual shares ideas in light of his or her own technical expertise on the basis of the cognitive map this individual has developed. The individual explains his/her ideas through words and actions; these may be in the form of metaphors, analogies, concepts, hypotheses, or models. However, multiple and differing interpretations perceived reality and experiential insight in an organization may lead to potentially conflicting situations. Interpreting is a quintessential knowledge-creation step, occurring largely through externalization.

2. *Integrating*, positioned in the lower right quadrant, is associated primarily with developing shared understanding and taking coordinated action through mutual adjustment. Knowledge is shared through social interaction; group dialogue and story-telling. New tacit knowledge such as shared mental models and technical skills may emerge from this learning interaction. This mode of knowledge creation is most often associated with the theories of group processes and organizational culture; it is also associated with the evolution of social astuteness.

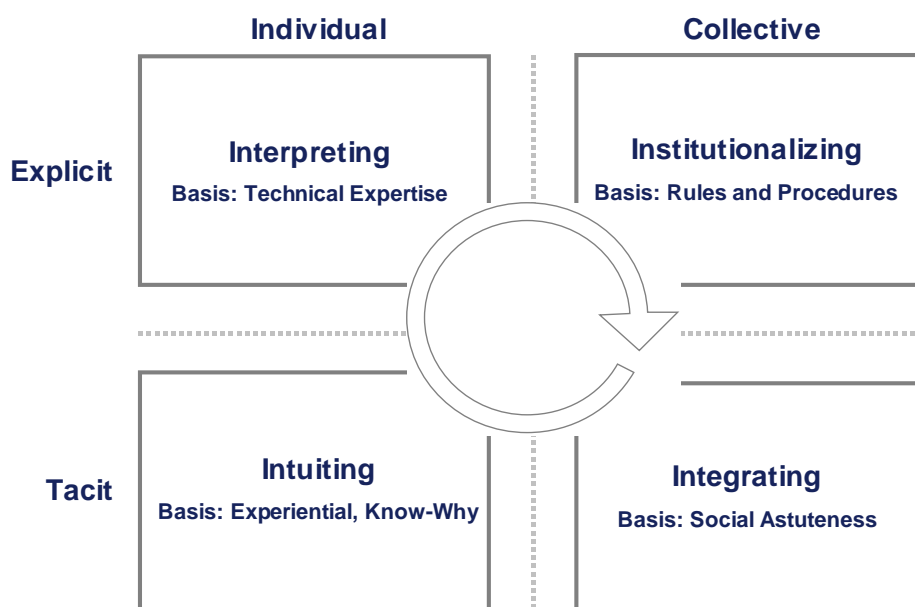


Figure 2. Construct for sense-making and learning in a dichotomous *field of interaction*

3. *Intuiting* is associated with the highly tacit process of pattern recognition on the basis of individual technical expertise (see Table 1 and Figure 2). This is the capability, for example, of an expert to foresee a pattern in a problem that a novice may not. This is the deep expertise each member of the string quartet has acquired over many years of study and practice. At the root of intuiting is the process of embodying explicit knowledge into tacit knowledge. It is closely related to "learning by doing". Experiences through socialization, externalization, and combination are internalized by the individual in the form of shared mental models and technical know-how.

4. Finally, *institutionalizing* ensures that routines are “formally” embedded in the organization. It involves the process of combination that, in turn, converts concepts into system knowledge. Institutionalizing involves combining different bodies of explicit knowledge. This process may be used to operationalize visionary strategy, product concepts and organizational routines and procedures. The process may involve explicating written instructions or embedding unwritten rules. Institutionalizing contributes significantly to the formalization of organizational identity.

#### 4. Learning and Sense-making in the string quartet: A Case Study

Noxon (1996) has observed:

*“Making music together is an illustration of both individual and collective thinking toward creating a mainstream of consciousness which is equally potent when that thought is expressed in action or when the action is dormant and unobservable”.*

The string quartet, we propose, not only can be viewed as a complex organizational entity, it also lends itself well to the study of complex organizations - for the following reasons:

1. **The string quartet is a unique organizational form:**
  - a) It is self-governing and inherently non-hierarchical.
  - b) It features structure, processes, competencies and unique cultural attributes – elements we conventionally attribute to organizations.
  - c) Its task is extremely intense, being artistic, immediate (‘here and now’), complete and its members are reciprocally interdependent.
  - d) The outcome of the string quartet’s effort is ethereal; it is highly aesthetic and evokes emotions that tend to subside, however, with the fading sound of the last note. As such, every performance can be regarded as a unique journey and as ‘expressions of the moment’.
2. **The string quartet represents a intense work group (when in performance):**
  - a) High levels of individual responsibility and expertise are coupled with an intense interdependency that respond in real-time to intense, continually changing conditions that demand *on-the-fly* decision-making of the type typically found in senior management environments.
  - b) String quartets evolve and innovate continually; performances provide opportunities for testing of new ideas; the performance environment is highly contextual (here-and-now).
  - c) Paradoxically, absolute *perfection* as such is not the ultimate goal targeted; higher priority is given to not restricting, rather *catching in flight* the improvisatory impulse of the moment.
3. **The string quartet must ‘accept, confront and manage’ a host of inherently ‘non-resolvable’ paradoxes typically found in top management settings, including:**
  - a) The issue of leadership versus democracy.
  - b) The paradox of the second fiddle.
  - c) Resolution of group conflict through combinations of confrontation and compromise.

**Literature** The management literature focusing specifically on musical ensembles and their implications for the organizational sciences is limited at best. Bougon, Weick and Binkhorst (1977) carried out a theoretical and empirical study of the Utrecht Jazz Orchestra, using cause maps to track the nature of interaction between the ensemble’s nineteen members. Blum (1986) undertook an indepth study of string quartet playing through extensive interviews and dialogue with the members of the venerable Guarneri Quartet. Blum’s book provides excellent insights into the inner workings of a world-class string quartet; it seeks to draw out the distinguishing features of world-class performance in the world of string quartets. Butterworth (1990) relates in anecdotal manner the nature of the working relationship between members of the Detroit Strinh Quartet. Murnighan and Conlon (1991) provide the most extensive study of the relationship between the internal dynamics and success of intense work groups by examining 20 professional string quartets in Great Britain in the period of the early 1980s

But how does the notion of the extended construct developed in the earlier section help us to improve our understanding of learning and sense-making in the string quartet? We postulate the following:

1. Learning and sense-making in the string quartet is aptly described by the extended construct describing the *field of interaction* introduced earlier; The organizational environment of the string quartet is represented by the *field of interaction* in which learning and sense-making continually occur through interaction of the musicians, on multiple levels, and

- Learning and sense-making, as described by the construct, occurs on a continual, ongoing basis. In fact it can be described in terms of a **learning and developmental trajectory** that maps the evolutionary path of the string quartet as it progresses toward (and perhaps even surpasses) some arbitrary threshold performance level we call “world class”. The trajectory (Figure 4) consists of multiple strands representing various developmental processes such as the technical, social and communication processes. The premise is that the string quartet is positioned on a unique trajectory and that constituting strands may well feature varying time scales, maturity levels and degrees of interaction. Overall, the trajectory tracks not only the string quartet’s ongoing evolutionary progress but also its mechanisms for renewal and innovation.

**Field of Interaction** The *field of interaction* of the string quartet can be viewed to be positioned between two dichotomies, as shown graphically in Figure 3. The individual and the collective represent one dichotomy. The other involves the interaction between tacit and explicit processes that occur within the quartet. The *field of interaction* represents not only the immediate audible outcome of the string quartets productive efforts; it also represents the complex organizational “playing field” (pun unintended!) of the quartet, in which learning and sense-making take place. The purpose of this paper is to arrive at a better understanding of what transpires in the *field of interaction*. The string quartet’s *field of interaction* – indeed, we may extend this to include any organization - provides the infrastructural and cultural backdrop against we seek to understand learning and sense-making in that environment.

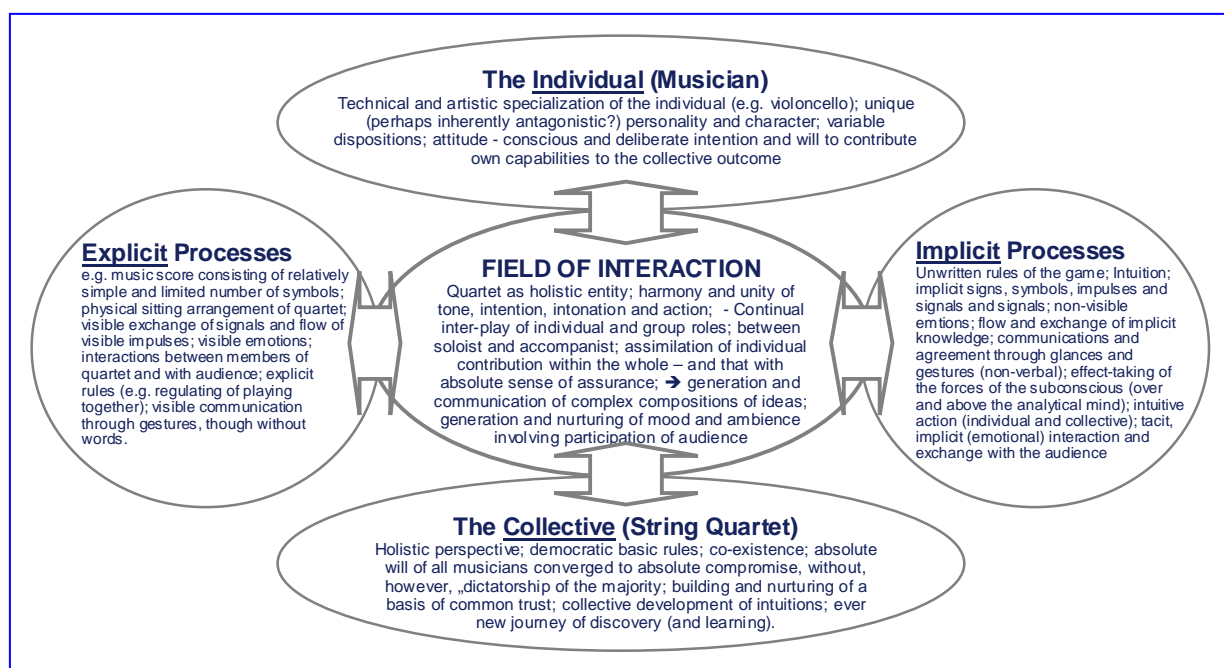


Figure 3. Field of interaction as a function of multiple-dichotomy interaction in the string quartet

**Learning and Developmental Trajectory** Learning and development within a string quartet can be described in terms of its unique *learning and developmental trajectory*. A string quartet, indeed any organization for that matter, has its own, unique trajectory. An understanding of the dynamics of the trajectory and its constituent strands, we contend, provides the key to understanding the processes of sense-making and learning within the string quartet. As depicted in Figure 4, the trajectory represents a path showing increasing performance along some arbitrary metric. The trajectory consists of inextricably entwined strands representing the organization’s constituent processes. For example, there is the technical process representing the quartet’s technical evolution, its development as an ensemble that ultimately attains its unique trademark ‘sound’. The social development of the quartet as its members grow together over time and develop a unique culture is another strand, as is the

communication process, as the quartet's members learn to rely on numerous highly complex forms of communication such as non-verbal exchange and breathing.

The notion of the *learning and developmental trajectory* also throws up the question about the limits of the string quartet's learning and developmental potential. The schematic in Figure 4 suggests that there are asymptotic limits to any quartet's learning and development, but that these are very different for each string quartet (or organization, for that matter). Shown in the schematic is one string quartet designated  $\alpha$  and one  $\beta$ . One ( $\alpha$ ) achieves the breakthrough into the world-class region, the other,  $\beta$ , falls short of this distinction. We explore some of the determining factors for this differentiation.

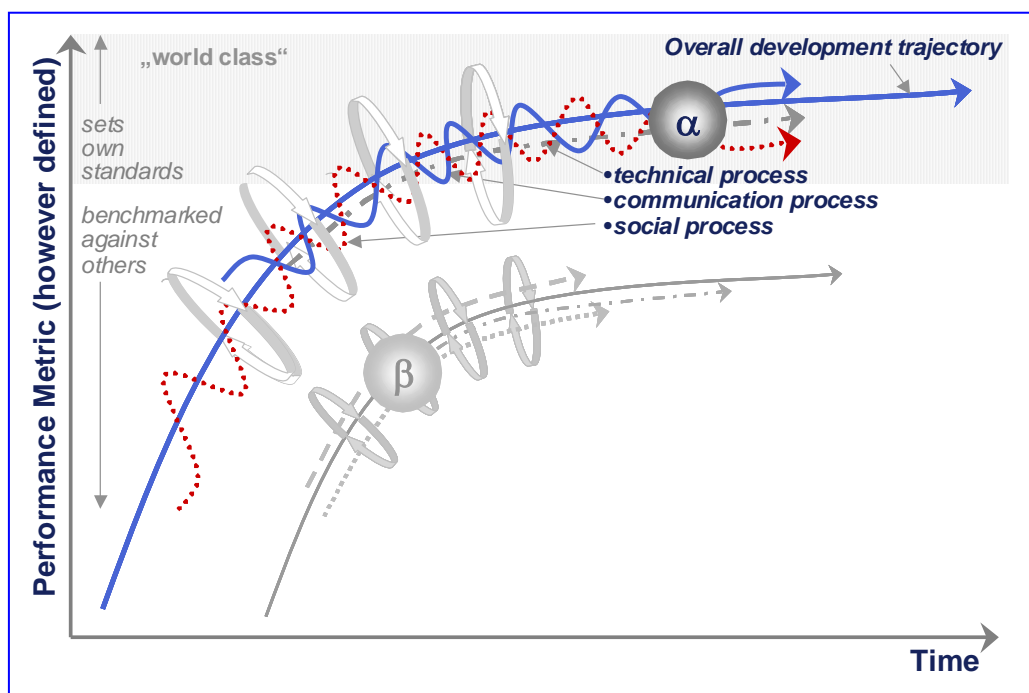


Figure 4. Developmental trajectory featuring multiple strands

## 5. Research

In order to derive substantiation for these postulations, we engaged in an intense exchange and dialogue with members of the Zürich-based Carmina Quartet. Formed in 1984, the Carmina Quartet is now firmly established among the ranks of the top international quartets. After having made their debuts in 1994 at London's South Bank Centre, the Amsterdam Concertgebouw, the Kleine Philharmonie in Berlin, and the Konzertverein in Vienna, they have gathered large followings in the major European music centers. They appear regularly in cities such as London, Paris and Zurich, and at the festivals of Bath, Hohenems, Graz, Salzburg, Montreux, Lucerne and Schleswig-Holstein. Tours outside Europe have included Australia, Israel and Japan. The members of the Carmina Quartet are Matthias Enderle (violin), Susanne Frank (violin), Wendy Champney (viola), and Stephan Goerner (co-author of this paper; violoncello). The Carmina Quartet is quartet-in-residence at the Winterthur (Switzerland) Music Conservatory.

Our research is based on:

- a) A number of semi-structured interviews with members of the Carmina Quartet
- b) Focused briefings and debriefings with the quartet's members
- c) Workshop type sessions in which specific questions and issues were explored with the quartet
- d) Limited observation and reflection of the quartet in action
- e) Archival research and analysis



The themes currently being explored with the quartet included the following:

**1. Sense-making and knowledge exchange within the quartet (when performing)**

- a) The role of non-verbal exchange; for example, *breathing*
- b) The nature of tacit and explicit knowledge exchange
- c) Mechanisms and processes by which fusion of mental models and emergent resolution through adaptation in a complex system in which differing, even opposing views co-mingle within a shared framing of issues occur

**2. Organizational culture and the nature of interaction**

- a) Leadership versus democracy; the issue (or ‘non-issue’) concerning the role of the ‘second fiddle’
- b) Conflict management; specifically compromise versus confrontation
- c) The quartet’s *unwritten rules of the game*
- d) The notion of a *fifth presence* when in concert

**3. Development dynamics along the quartet’s learning and developmental trajectory**

- a) Structure of the trajectory in terms of its constituent strands
- b) Varying dynamics, time scales and maturity of individual strands
- c) Performance measures and benchmarking

**4. Innovation and organizational renewal**

- a) The notion of renewal (e.g. each performance representing a unique experience)
- b) Spontaneity and the role of *playing* in innovation

**6. Research Outcomes: Summary of Learning and Insights**

The research reported on in this paper is on-going (see also Odenthal, Goerner and Tovstiga, 2004); we present here some of the early findings and their analysis.

**6.1 Learning and sense-making**

These occur within the *field of interaction* described earlier in the paper. Learning takes place by way of the four continually on-going and coupled processes introduced in Figure 2: *interpreting, intuiting, integrating* and *institutionalizing*:

**Individual and Explicit – Interpreting** Each individual in the string quartet is a highly accomplished professional. Mastery of specific technical skills (mastery of a stringed instrument) and proficiency in music performance are prerequisites for joining a string quartet in the first place. The performance of a string quartet is characterized by a high degree of variability in energy levels – both experienced and generated by the individual musician and his ensemble colleagues. In continually changing roles, the individual may at times draw on the energy of the ensemble, and alternately, be pushed almost to the limits of his or her energy.

Listening is very important for interpreting. Musicians develop exceptionally finely-tuned listening skills. For example, when a musician engages in playing a solo passage, he or she “hears” the musical phrase in question in advance of the actual playing. The musician does this with an “inner” ear; a highly implicit “hearing-in-advance” of a sort. When the musician then actually does play the phrase in question, the result is perceived by the individual as “external” information and immediately verified against the “pre-heard” version. This “dialogue with one-self” is carried out continually by all members of the quartet. On the rhythmic level, every individual’s contribution is ultimately synchronized and modulated by the collectively perceived rhythmic flow. Every member of the performing quartet hears and “feels” the fundamental rhythm and flow; all share responsibility for it in equal measure.

Dialogue plays an important role in achieving alignment and cohesion within the quartet. Engaging in dialogue requires suspending own assumptions, and willingness to enter into genuine “thinking together”. Dialogue engages the individual musician in:

- freely and creatively exploring complex issues through active listening while suspending one’s own view;
- moving beyond one’s own understanding and becoming an observer of one’s own thinking;
- letting go of power differentials between ensemble players and treating each member equally; exploring own assumptions behind closely held views leading to divergent thinking, particularly where achieving a richer grasp of a complex issue rather than fostering agreement is the goal.

**Individual and Tacit – Intuiting** The personality of the individual is an important factor. It determines the behavioral attributes of the individual musician - her/his attitude, inquisitiveness, and willingness to collaborate and cooperate within the group. Sub-conscious levels of the individual bring emotional and intuitional behavioral attributes into play. Individuals blend their capabilities, emotions, and creative energy into the totality of the quartet's performance. Personal vanity is an issue that needs to be dealt with constructively. Susanne Frank, second violinist of the Carmina Quartet, notes that vanity is always an issue, but that it must be exploited with regard to the best interests and benefit of the entire work of art. Indeed, she goes on to point out the importance of establishing and maintaining the right balance between adaptation of the individual to the quartet's consensus and individual creativity.

Each musician acquires, nurtures, and exploits experiential knowledge in a unique way. For violist Wendy Champney, experiential knowledge, amongst other things, translates to a number of heuristics that each member of the quartet intuitively develops and deploys. These can include psychological and physical preparations. Champney, for example, has a rule of thumb which boils down to initiating an entry "10% too early", in order to compensate for the 2.5-meter distance separating players and her viola's characteristic (physical-technical) response-time lag. Other heuristics may involve deploying specific tactics for bridging the psychological and emotional bridges between the individual and the other members of the ensemble.

**Collective and Tacit – Integrating** Our co-author, Goerner, describes the string quartet as a relationship between four musicians and their musical capabilities. The relationship is founded on shared mental models, and intensive, multi-layered communication exchanges that occur between the musicians in the course of a performance. The communication in the string quartet is complex and consists of a variety of explicit and implicit exchanges. Communication, for the most part, is nonverbal. It occurs through collective, inner sensing within the quartet, and through musical-acoustical or visible cues. Communication may also occur through gesturing or mimicry. While performing, the musicians of the string quartet communicate with themselves, their fellow musicians and the audience. Communication can take on a variety of forms. Breathing is extremely important form of communication and integration, as is the very entity of silence.

In addition to the "pre-hearing" described earlier, the string quartet's musicians also talk about an external "post-hearing" that occurs in parallel. All musicians respond and react continually to the audible and visual impulses they are registering around themselves. These are highly complex communicative exchanges within the group. In the course of a performance, for example, these may serve to continue the development of a musical idea initiated by one of the quartet's members; an imitation of a musical stimulus given by one of the members of the ensemble, or even the generation of a contrasting interpretation of a passage. This process occurs on a continual basis during a performance.

The quality of the developing shared understanding within the quartet depends to a large degree on the contextual peculiarities of the quartet – the "*here and now*" of the acoustical environment, the complexity of the music, the psychological and physical disposition of the musicians and that of the audience. The fact that these are never reproducible from one performance to another represents a continually new challenge for the ensemble. Every performance is a new experience, and needs to be "staged" anew. Violinist Matthias Enderle uses the metaphor of a movie production, pointing out that in the case of a movie, scenes and scene fragments are assembled from repeat shootings and cuts that are compiled into an organic whole some time removed from the actual shootings. Not so in the case of a concert performance of a string quartet, Enderle notes; the final "cuts" occur live, in real time. Rehearsals play a very important integrating role. They provide opportunities for experimentation with variability, and for finding the right balance between tactics and intuition. Achieving the right balance of spontaneous interaction and meticulously rehearsed coordinated action requires intense and focused effort over many years. Susanne Frank, second violinist, describes how quartet members develop a "seventh" sense as a result of working together over many years; this enables them to compensate anticipatory weaknesses mutually.

**Collective and Explicit – Institutionalizing** The string quartet achieves unity of purpose and spirit through collectively held democratic ground rules. These serve to counter the potential dialectic of self-versus collective identities within the quartet. It also serves to regulate potential asymmetries of power relations, and emotions that threaten the group's unity. Some of the rules may be explicit (such as showing up at the regular, agreed upon practice sessions). Most, however, are implicit or unwritten. A certain number are intuitively understood by all members of the quartet as a result of common

professional training (much as other professional groups also share common behavioral codes). Many of the quartet's important rules are unwritten. These have evolved within the quartet over time and provide the real basis for the social process of its functioning. The overall working model within the string quartet is one of democracy and consensus. It is based on deep mutual trust – in the other members' technical and communication skills; collective development of intuition; and shared aspiration for ever more perfection. The basis of trust nurtured within the group enables unencumbered sharing of knowledge. This, in turn, provides the fertile ground for rich experimentation leading to experiential learning and innovation, driven by the collective inquisitiveness of the group.

### **6.2 Organizational culture and nature of interaction**

Top-notch quartets recognize inherent paradoxes (such as leadership versus democracy, confrontation versus compromise, and the notion of the 'second fiddle'), but manage not to be encumbered by these. Paradoxes are tolerated and there is no deliberate attempt on the part of the quartet members to unequivocally resolve them. It appears that world-class quartets thrive on a certain degree of ambiguity. A paradox in itself: members of top-notch quartet members place a premium on their ability to 'move forward' in spite of potential differences that may come up as a result of the inherent paradoxes. The key to the success of these quartets lies in the manner in which they succeed in moving beyond the paradoxes. For example, while democracy is generally espoused, the need for periodic directive leadership is recognized and accepted by all members of the quartet. Leadership may manifest itself in interchangeable roles (for example, variable and interchangeable lead roles are taken on by individual quartet members on an as needed basis – often as dictated by the music score). Potential conflict, when it does arise, is typically worked out through playing than through talk. Quartet members grant themselves sufficient personal space to absorb conflict without having to compromise.

### **6.3 Development dynamics along the learning and developmental trajectory**

The notion of the learning and developmental trajectory reflects well the evolutionary path of a string quartet. The trajectory features a number of critical juncture points along its path. Each of these is a determining factor in the direction and slope path of the trajectory takes in its further development. We asked the question: What differentiates a top-notch string quartet such as the Carmina Quartet, one that is firmly positioned in the world-class region and many of the lesser quartets? We still need to explore this question further; our findings to date do appear suggest that the difference lies in which the two classes of quartets manage to resolve the issues that crop up at their respective critical juncture points. Longevity of a string quartet, while once an important criterion for the success of a quartet, does not appear to be substantiated by our findings. Quartets positioned in the world-class performance region generally do not benchmark themselves against other world-class quartets; they do however, do develop their unique signature *sound*.

### **6.4 Innovation and renewal**

Shared understanding is created out of potentially conflicting and ambiguous situations. String quartets appear to draw creative, innovative energy from these settings. Indeed, innovation and renewal – ever more important for a string quartet, once positioned in the world-class ranks – occurs in the border region between stability and instability (bounded instability). Innovation is driven by commonality of purpose coupled with a complex situation-driven mix featuring both high tolerance *and* the discipline of command-and-control type management styles. Innovation is supported by both generative and adaptive learning. Each performance provides new opportunities for experimentation, spontaneity – and above all, opportunities for *learning through play*.

## **Summary**

This paper presents a first attempt at trying to make sense of a complex organization in terms of its learning and sense-making. We conclude that learning in a complex organization such as the string quartet occurs due to deliberate and focused interaction of the individual musicians and the other members of the quartet against a backdrop of paradox and ambiguity. Shared mental models, exchange of tacit and explicit knowledge through intense, multi-layered communication on multiple levels support learning and sense-making in the string quartet's *field of interaction*. The quartet's evolutionary development, on the other hand, can be described in terms of a *learning and developmental trajectory*.

Understanding the string quartet's complex processes of learning and sense-making presents formidable challenges. The string quartet, as indeed all complex organizations, is made up of individuals, but can be understood only in its collective form. When a fragment of it is pulled out for examination, it comes out vine-like, trailing roots back to deeply ingrained and intensely shared values and practices, which for the most part are highly tacit in nature. We may conclude that this is what makes the string quartet's learning and sense-making processes elusive and fragile. For world-class quartets such as the Carmina Quartet, this provides the key to its success.

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