

Teamwork in the Performing Arts

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Invited Paper

This paper addresses the nature of teams and teamwork in the performing arts, including symphony, chamber orchestra, chorus, and jazz, as well as musical theater, straight theatre, improv, ballet, and puppetry. The results of an interview study of performing arts leaders in these domains are reported. These results suggest an “ecology” of performance. The characteristics of this ecology strongly influence the nature and roles of teams, as well as how teams are created and supported. Potential relationships among the attributes of this characterization are discussed.

Keywords—Ballet, jazz, management teams, mental models, operational teams, performing arts, puppetry, symphony, team performance, theatre.

I. INTRODUCTION

Teams and teamwork have been concerns of great interest for several years, perhaps gaining impetus from the quality movement. However, many proponents of team-oriented initiatives have found that success does not flow automatically from simple formation of teams. This has led to questions of the true nature of teamwork, the role it plays, and how it can be fostered. This paper addresses these questions in the context of the performing arts.

Much of the literature on teamwork—briefly summarized below—reports studies of business and operational teams. There has been a wealth of studies of how such teams function, how this functioning affects overall performance, how teamwork deficiencies can undermine performance, and how to foster teamwork, e.g., via team training. Paris *et al.* [1] summarize much of this work.

A significant portion of this research has been conducted in the context of supervisory control—a central theme of this Special Issue. Indeed, supervisory control of complex sys-

tems rarely involves solely a single human performer. The same is true of the performing arts, the domain addressed in this paper.

This paper builds upon our earlier speculations [2] regarding how the wealth of knowledge of team performance might be applicable to teams in the performing arts. Such teams are of particular interest because the team performance, in itself, is the outcome of interest, rather than a means to some other ends such as profit, safety or victory. This characteristic, we suggest, enables getting much closer to the essence of teamwork.

The next section of this paper provides an overview of a range of research into team performance. This includes results for business and operational teams, as well as selected studies of performing arts teams. This provides background for an interview study of performing arts leaders in symphony, chamber orchestra, chorus, and jazz, as well as musical theatre, straight theatre, improv, ballet, and puppetry. The results of this study are summarized in terms of an “ecology” of performance and hypothesized relationships among the attributes of this characterization.

II. BACKGROUND

This section reviews background studies in two broad areas. The first part of this review focuses on what is known about teams and teamwork in business and operational teams. The second part focuses on performing arts teams. In general, there are much richer data sources for the former than the latter. The study reported here is intended to contribute to a greater balance of data sources. This is motivated by an intuition that many best practices can cross between these domains.

We hasten to note that this section is not intended to provide a comprehensive review of the literature on team performance. Katzenbach and Smith [3] and Paris *et al.* [1] provide a rich set of linkages to the broad literature. In contrast, our goal is to summarize a few key insights that motivated and informed the study reported here.

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A. Business and Operational Teams

Many of the studies of team performance and the determinants of performance have occurred in the context of business teams and operational teams. Katzenbach and Smith [3] provide a good summary of the collective wisdom for business teams. The best practices they report have, for the most part, emerged from practice rather than empirical research.

Hackman [4] discusses business teams and common mistakes in adopting team models that can undermine anticipated success, often leading to frustration and perhaps cynicism. These mistakes include the following.

- Using a team for work that is better done by individuals.
- Calling the performing unit a team but managing members as individuals.
- Falling off the authority balance beam.
- Dismantling existing organizational structures so that teams will be fully “empowered” to accomplish the work.
- Specifying challenging team objectives but skimping on organizational supports.
- Assuming that members already have all the skills they need to work as a team.

Beyond these mistakes, Hackman discusses two overarching obstacles to success.

- The co-op obstacle—debating values, purposes, and collective directions endlessly.
- The corporate obstacle—gradual diminution of performance and commitment as teams encounter long-standing and team-unfriendly organizational arrangements.

He argues that avoiding mistakes and obstacles requires answering fundamental questions of who decides, who is responsible, who gains, and who learns. Explicitly addressing these questions can enable early identification and remediation of mistakes and avoidance of the two overarching obstacles. To a great extent, vigilance is the prescription for avoiding undermining the benefits of teams and teamwork.

Paris *et al.* [1] summarize alternative theoretical perspectives on teamwork and variables that typically affect team performance. Theoretical perspectives on teamwork include approaches drawn from social psychology, ecology, and human resources, as well as approaches that are functionally or task-oriented, technology focused, sociotechnically based, and system life cycle oriented. There are also approaches that attempt to integrate across several of these views. Approaches employed for studies of supervisory control and sociotechnical systems in general are often cross-cutting in perspective, e.g., cognitive engineering methods.

Within these views, there are a variety of variables that have been shown to influence team performance. Team selection variables include individual skills and traits, as well as team size, composition, and stability. Task design variables include workload and time constraints, team structure or architecture, and technology from both the perspectives of the task domain and the nature of supports for team performance. Team training variables include the content of training, the

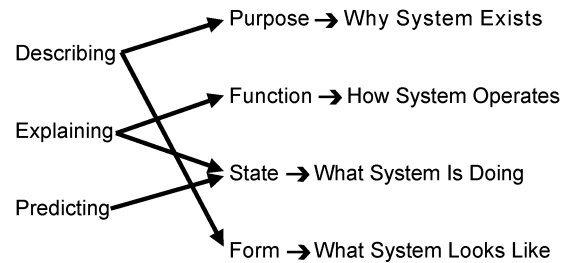


Fig. 1. Nature of mental models.

nature of performance feedback, and instructional strategies for improving performance.

The cognition of teamwork is discussed by Klein [5], including cognitive processes underlying teamwork, differences between planning and performing teams, and the use of the critical incidents methodology for the study of team performance. Klein argues that the five cognitive processes of teamwork include control of attention; shared situation awareness; shared mental models; application of strategies and heuristics to make decisions, solve problems, and plan; and metacognition.

These views can be elaborated in terms of what variables get paid attention, what “state” is inferred from these variables, how states are mentally manipulated, what means are used to prompt actions, and how these processes are themselves monitored and controlled. For many domains, the nature of these elements of cognition is dictated by the demands and constraints of the tasks and environment. We expect that this is the case for some performing arts.

Rouse *et al.* [6] discuss the role of shared mental models in team performance. As depicted in Fig. 1, mental models are the mechanisms whereby humans are able to generate descriptions of why something exists and its form, explanations of its functioning and what it is doing, and predictions of what it will do in the future [7]. It has been shown that teams benefit from support—training and aiding—that enhances the knowledge content of shared mental models as defined by Fig. 2.

Studies of business and operational teams have enabled understanding the role, nature, and impacts of teams and teamwork on organizational and system performance. To a great extent, these relationships reflect human adaptation to organizational and system demands. Consequently, applying this understanding to enhancing team performance in the arts requires characterizing the nature of these organizations and systems.

B. Performing Arts Teams

Performing arts teams have not been the subjects of extensive study like operational and management teams. Nevertheless, as this section illustrates, there has been a range of insightful studies. The study reported in this paper is intended to contribute to this emerging body of knowledge.

Orchestral Teams: Allmendinger *et al.* [8] have considered the factors that affect the performance of orchestras, in this case German symphonies. They found that orchestral standing is affected by the attraction and retention of

Level	Types of Knowledge		
	What	How	Why
Detailed/ Specific/ Concrete	Roles of Team Members (Who Member Is)	Functioning of Team Members (How Member Performs)	Requirements Fulfilled (Why Member Is Needed)
	Relationships Among Team Members (Who Relates to Who)	Co-Functioning of Team Members (How Members Perform Together)	Objectives Supported (Why Team Is Needed)
Global/ General/ Abstract	Temporal Patterns of Team Performance (What Typically Happens)	Overall Mechanisms of Team Performance (How Performance Is Accomplished)	Behavioral Principles/Theories (Why: Psychology, Management, Etc.)

Fig. 2. Knowledge content of shared mental models.

the best players, conductors, and guest performers. Having the resources to attract and retain such people enables this. This depends on the fundraising and financial management acumen of the organization. Finally, success in these activities depends on having the best players, conductors, and guest performers. Thus, the causality comes full circle.

They also studied the factors that differentiate underperforming and overperforming orchestras relative to player talent. They found that overperforming orchestras, again relative to talent, received more attention from their music directors, were composed of younger, highly motivated players, and were not well resourced. Underperforming orchestras, in contrast, received less attention from their music directors, viewed playing as “just a job,” and were well resourced.

Sciolino [9] considers the role of the orchestra conductor. He reports discord if musicians are allowed to relax and let their minds wander as they play. The performance tends to be uninspiring if the leadership of the conductor is indifferent. Similarly, the performance tends to be skewed if the conductor does not balance attention to the different instruments.

He further indicates that musicians will resort to well-learned patterns without the conductor, especially if they have years of “communal experience.” Finally, he concludes that the conductor’s baton represents the leader’s vision for the organization, although it has no meaning in itself. Thus, team leadership is much more subtle than might be imagined.

Murnighan and Conlon [10] studied 20 British string quartets to understand how the artistic and commercial success of quartets relates to abilities to address three paradoxes.

- Leadership versus democracy—four-person groups are small enough to pursue consensus decision making, but typically the first violinist is the leader.
- Role of second violinist—definitely a “second fiddle” role, but quality of performance is essential to overall performance.
- Confrontation versus compromise—as an intense and immediate artistic activity, conflicts often emerge and present dilemmas.

Based on interview of the 80 performers and comparisons of the 20 groups in terms of artistic and commercial success,

their results show that successful string quartets understand and implicitly manage their inherent group paradoxes while less successful quartets do not.

Jazz Teams: Jazz has received considerable attention, both in itself and as a potential metaphor for improvisation in teamwork. Weick’s studies date from the early 1970s until now. Early work focused on single variables such as the credibility of the composer of jazz orchestra compositions [11]—low-credibility compositions are performed more poorly initially. Weick has also developed and extended methodologies for inferring the “cause maps” of jazz teams that indicate relations between a range of individual and team characteristics [12]. He argues that the causal relationships among variables in these maps define the social structure of the groups.

More recently, Weick and his colleagues have advocated jazz as a useful metaphor for considering improvisation in many types of organizations. His recent articulation [13] of the merits of this metaphor draws heavily upon a wealth of insights by serious “students” of jazz, e.g., Berliner [14]. Jazz as a metaphor does have critics who emphasize elitism and sexism as two very undesirable characteristics of this metaphor. However, the validity of this criticism likely reflects taking the metaphor too literally [15].

Barrett [16] suggests seven central elements of jazz.

- Provocative competence—deliberate efforts to interrupt habit patterns.
- Embracing errors as a source of learning.
- Shared orientation toward minimal structures that allow maximum flexibility.
- Distributed task—continual negotiation and dialogue toward dynamic synchronization.
- Reliance on retrospective sense-making.
- “Hanging out”—membership in a community of practice.
- Taking turns soloing and supporting.

He explicates and uses these characteristics as a basis for recommending organizational practices for nonjazz contexts that can take advantage of the nature of improvisation in jazz.

- Boost the processing of information during and after actions are implemented—provide “licenses to play” with processes, practices, and performance.

Objective	Learning Exercise
Focus	Exposure, Ensemble Counting, Pass the Pulse, Pass the Clap, Story Story Die
Awareness	Random Walk Thru Space, Glass Cobra, Pass the Pulse, Pass the Clap, Check In Name Game, Ensemble Counting
Listening	Yes, Minefield, Breaking In/Breaking Out, Check In Name Game, Story Story Die
Trust	Minefield, Lead Running Blind, Word Association, Glass Cobra
Surrendering	Mirror, Mutants
Accepting & Responding	Sound & Motion, Machine, Check In Name Game, Story Story Die, Random Walk Through Space
Improvising	Orchestra, Jam Session, Improvising Lost Scenes, Mirror, Mutants, Story Story Die

Fig. 3. Training of ensemble teams.

- Cultivate provocative competence—create expansive promises and incremental disruptions as occasions for stretching out into familiar territory.
- Ensure that everyone has a chance to solo from time to time.
- Cultivate “comping” behaviors whereby those not currently soloing accompany those who are soloing.
- Create organizational designs that produce redundant information that fosters cross-organizational sharing and multiple “inventions.”
- Create organizational climates that value errors as a source for learning rather than a cause for reprimand.
- Cultivate serious play—too much control inhibits “flow,” or peak performance opportunities.

Much of the above research on jazz has focused on mapping insights from this domain to others. However, other sources such as Berliner [14] provide deep insights into the nature of jazz in itself.

Theatre Teams: Considering theatre productions, Fig. 3 summarizes a wide range of exercises for training ensemble teams in terms of the learning objectives of these exercises, some of which are drawn from [17], but most of which are drawn from common experience. These exercises each take between 5 and 20 min and are most often employed during the first few days of the rehearsal period, after which the team often selects a handful of preferred exercises to be used as rituals before every rehearsal and performance. These exercises are most often employed in educational settings such as high school and university drama programs, as well as conservatory programs. Aside from accomplishing the objectives indicated in Fig. 3, these exercises foster close personal relationships among team members.

C. Summary

Several theoretical findings are relevant to this study. First is the notion that teamwork is not the same as “taskwork” [1]. Put simply, there are important activities, associated with people working together to create a shared product, beyond everyone doing their own task-related work. Performing arts

work best when a collaborative product is created rather than just a sum of solos.

Second, mechanisms are needed for people to anticipate others’ actions and needs. This mechanism has been conceptualized as a shared mental model [6]. This mechanism forms the basis for expectations of what team members will do and what they, in turn, expect from others.

Third, a means is needed for fostering shared mental models. One means is training, either in the context of performance or via exercises designed to foster team members’ understanding of each other. To the extent that a conductor or director designs and coordinates the teamwork, members of the team may focus more solely on task performance.

Clearly, much is known about teams and teamwork, although this brief review, admittedly, only provides a few key highlights. Numerous insights are available for a range of operational, management, and performing arts teams. In the following study, the focus was on differences underlying a considerable variety of performing arts teams. The goal was to understand the dimensions underlying these differences.

III. METHOD

The objectives of this study included assessing arts leaders’ perspectives of the role and nature of teams and teamwork in the performing arts. It was also important to gain an understanding of the “ecology” of performance in terms of salient attributes that differentiate the various arts. This study is viewed as precursor of observing performing arts teams as they are formed, rehearse, perform, and mature.

The interview questions are shown in Fig. 4. Twelve arts leaders in Atlanta, GA, were interviewed, in most cases the artistic director of the organization. The full spectrum of the performing arts organizations was represented, including the following:

- ballet (1);
- jazz (1);
- orchestra:
 - chamber (2);
 - chorus (1);
 - symphony (1);

Background Questions

1. What is your personal education/training in the performing arts? In areas other than the performing arts?
2. With which performing arts organizations have you been affiliated?
3. With which performing arts organizations are you currently affiliated?
4. When were these performing arts organizations established?
5. How have these organizations changed since their establishment?
6. On what 'schools of thought' (if any) are these organizations based?
7. How would you characterize the kinds of productions that are produced?
 - o Small ensemble pieces, large cast, musicals, puppetry, avant-garde, dance, performance art, other?
8. Do you feel that these organizations have adequate resources to accomplish their goals?
 - o How did the presence (or lack) of resources affect teamwork?

Teamwork Questions

9. Is teamwork necessary to accomplish the goals of the types of productions with which you are involved?
10. What kinds of teams work in these productions?
 - o Actors, build crew, electricians, production managers, front of house, everyone working as one team?
11. Is formal or informal training an important element of how individuals are prepared to work in teams?
12. If so, what types of training are employed? Where did these methods of training come from?
13. Can you evaluate the success/quality of a recent project in which teamwork was an important element?
14. Did team training improve the teamwork? Did teamwork improve the performance? What specifically was improved?
15. What challenges did you encounter while working on this project? Did teamwork help to overcome these obstacles?
16. Can you describe a memorable teamwork experience that occurred in a production with which you were associated?
17. Is there a difference between team of a 4 person cast and the team of an 80 person musical cast?
18. Is there a difference between teams where the director participates in performance, such as a conductor, and teams where the director is not present during performances, such as in theatre?

Wrap-Up Questions

19. Do the various performing arts – for example, Atlanta theatres -- compete for an audience?
20. What other insights can you provide to elaborate your answers thus far or perhaps touch on other related issues?

Fig. 4. Interview questions.

- puppetry (1);
- theatre:
 - regional (1);
 - urban (2);
 - suburban (1);
- arts center (1).

The resulting demographics of the interviewees are summarized in the next section.

All interviews, but one, were conducted in person, in most cases by two interviewers, and lasted one to two hours. Data were captured as handwritten interview notes. Handwritten notes were compiled in a database with fields for interviewees, questions, and responses. Responses were also classified in various content categories. The database was then sorted by these categories. Viewing the spectrum of entries for a given category enabled refining the category label and, in some cases, reclassifying responses. Such changes prompted resorting of the database. This iterative process led to better-defined categories and clearer discrim-

inations and interpretations. This overall approach yielded the results and interpretations presented in the next section.

It is important to emphasize the fact that the "data" reported here are leaders' perceptions of the factors influencing the teamwork and performance of the type of performing art with which they have most experience and knowledge. Actual performances were not observed. Issues such as the extent and nature of team training are not best addressed by observing teams—although, admittedly, the impacts of training could be assessed in this manner.

IV. RESULTS

Almost all of the interviewees had university or conservatory degrees in their specialty, e.g., music, chorus, or theatre. Some had comparable education, but did not complete degree programs. Only one interviewee did not have formal education in performing arts.

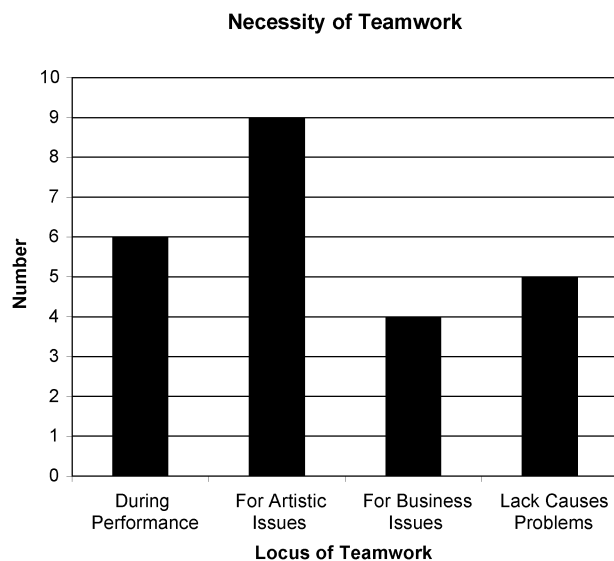


Fig. 5. Necessity of teamwork in the performing arts.

Considering the background questions in Fig. 4, interviewees completed their education in ten different states and two countries. Only four places were represented more than once—New York (three times), Florida (two times), Georgia (two times), and Pennsylvania (two times). Six interviewees had five or more organizational affiliations prior to their current organization; four had three, one had four, and one had two. Seven are currently affiliated with two arts organizations; three are affiliated with one, one is affiliated with four, and one with three.

Regarding their current affiliations, three interviewees are affiliated with organizations over 50 years old; five with organizations over 20 years old. Two interviewees belong to organizations over 10 years old; one over five, and one less than five. The biggest changes experienced in these organizations are leadership (four), people (three), and budget (three). Size and facility were each reported by one interviewee.

Seven interviewees reported mixed “schools of thought” while five reported focused schools. Types of productions include orchestral (two), chamber (three), mixed theatre (five), and focused theatre (two). With regard to resource issues, eight noted money as scarce while three indicated “not money.” Four people-related responses include technical people (two), performers (one), and leaders (one). Two interviewees indicated facilities and one indicated time as scarce resources.

Moving on to the teamwork questions, Fig. 5 summarizes interviewees’ perception of the necessity of teamwork in the performing arts. Note that addressing and resolving artistic issues was reported by 75% (nine) of the interviewees, while the importance of teamwork during performance was indicated by six, and for business issues by four. In addition, five indicated the lack of teamwork as a source of problems. Obviously, much of the teamwork happens prior to performing. Regarding the nature of teams, 100% (12) noted performance teams, while artistic teams were noted by seven interviewees and business teams by nine.

Considering use of team training, 11 interviewees reported use of informal methods and two reported use of formal methods. Five interviewees reported using selection as a primary approach for assuring that people will be able to function successfully as team members. The types of training employed varied considerably as shown in Fig. 6.

Asked to discuss a recent experience where teamwork made a difference, interviewees reported the types of experiences shown in Fig. 7. Examples of conflict and how it was resolved were noted five times. Compensation, unanimity, and energy were each mentioned twice. These reflect the team performing beyond what was normally possible. Design concerned the team having to redesign a production just one day before opening and succeeding admirably. In eight of these cases, success was attributed to teamwork, while in four it was attributed to teamwork and team training.

Interviewees’ perceptions of the nature of the challenges underlying these experiences included dealing with conflict (three times), compensating for deficiencies (two), redesigning productions (two), dealing with tedium and complacency (two), maintaining discipline (one), and taking risks (one). They saw well-functioning teams as helping to address these challenges.

With regard to a memorable, as opposed to recent, experience, interviewees most often (six times) mentioned instances of high levels of collaboration. Also mentioned were experiences of very high energy levels (two), feelings of community (one), joys of performing (one), and failure due to lack of teamwork (one).

The perceived impacts of team size are summarized in Fig. 8. People reported that large teams need conductors (three times), need training (one), create more energy (two), and sell more tickets (one). Small teams do not need conductors (two) and individual skills are critical (three). Two interviewees suggested that the complexity of a production is more an issue than number of performers, e.g., 16 violinists playing exactly the same thing is not as complex as four different horns playing an intricate piece.

Regarding the impact of the leader also performing, five interviewees, mainly from theatre, argued that the leader (director) should “give” the production to the performers, at the latest upon opening. Two interviewees indicated that the leader should not perform, and one each indicated that the leader is needed less if the team is well trained, the leader performing is risky, the leader may need to steer, and the leader’s impact is huge.

The first of the wrap-up questions concerns possible competition among performing arts organizations in Atlanta. Fig. 9 summarizes interviewees’ perceptions. The lack of competition and inclinations to collaborate are most notable. To the extent that there is competition, it is primarily for audience, but also for money, scripts, and performers.

The final question concerned other insights and issues not raised by the interview questions. The interviewees offered several overall observations on the nature of performing arts. They noted the inherent collaborative nature of the performing arts—first-rate performances depend on everyone, not just a few team members. They also emphasized the

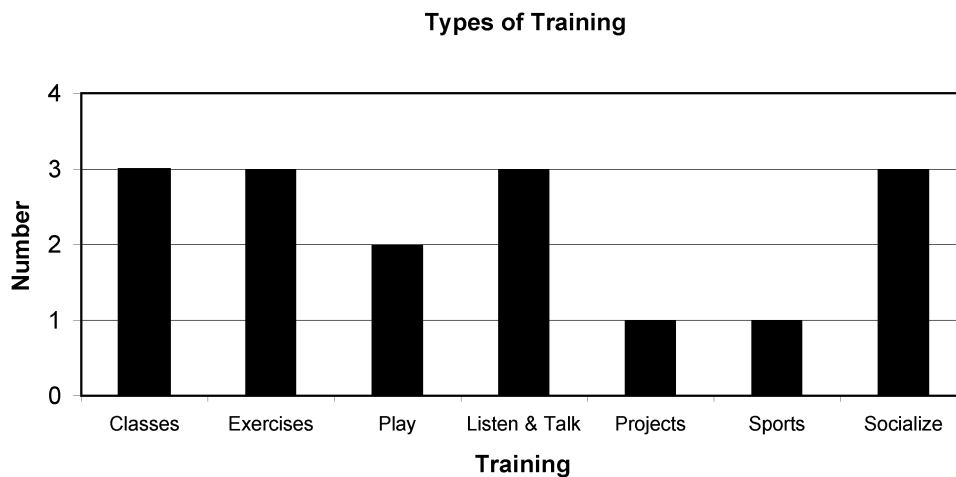


Fig. 6. Types of formal and informal team training employed.

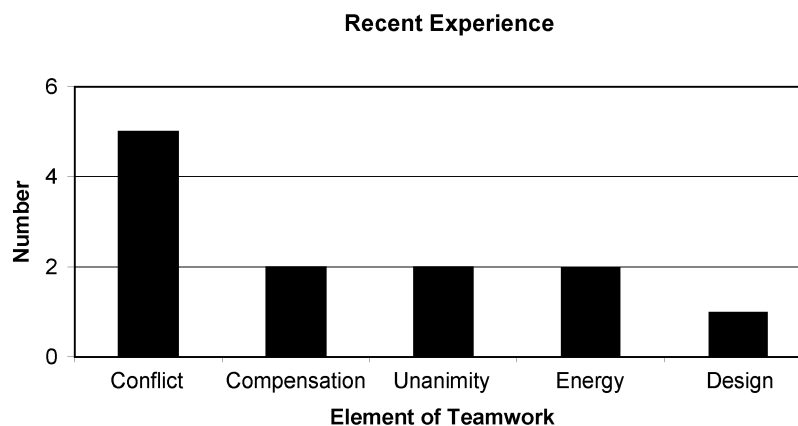


Fig. 7. Types of experiences where teamwork made a difference.

role of energy, passion, and drive in people who pursue the performing arts. With regard to unasked questions, they thought we might have asked why people volunteer to perform and otherwise participate. They also thought we might have asked about why many performing arts teams persist for so many years.

Several comments related to the nature of team performance. One interviewee discussed the role of body language in team communication during performances. Another emphasized the role of mutual respect in team performance in the arts. It was noted that performance skills are a given in professional performing arts organizations, but team skills are not. Also emphasized was the extent of changes over the course of production runs.

Many interviewees provided organizational perspectives on the performing arts. The economic roles and impacts of performing arts organizations were noted. Concern was also expressed for the abilities of performing arts organizations to adapt to change. Several people mentioned the demanding nature of underresourced arts organizations. There were also quite a few comments about the impacts of recent events, i.e., the recession and the events of 11 September 2001, on support for the performing arts.

It is useful to recall that these results reflect leaders' perceptions of the factors affecting team performance and

the means adopted for fostering team performance. Actual performances were not observed. From this perspective, the roles of leaders are key. The context of these roles is elaborated in the following section.

V. DISCUSSION

The most striking element of interviewing such a rich set of arts leaders was encountering much greater diversity than expected. This led to the realization that this study was, for the authors at least, uncovering the "ecology" of performance. It is interesting to consider the basis for this diversity.

It appears that five dimensions are useful for differentiating the 12 performing arts organizations studied:

- 1) size of performance—number of performers and other participants;
- 2) complexity of performance—extent of required coordination;
- 3) locus of coordination—rehearsal versus performance;
- 4) familiarity of team members—ensemble versus pickup;
- 5) role(s) of leader—prepares team; does versus does not perform.

Impact of Team Size

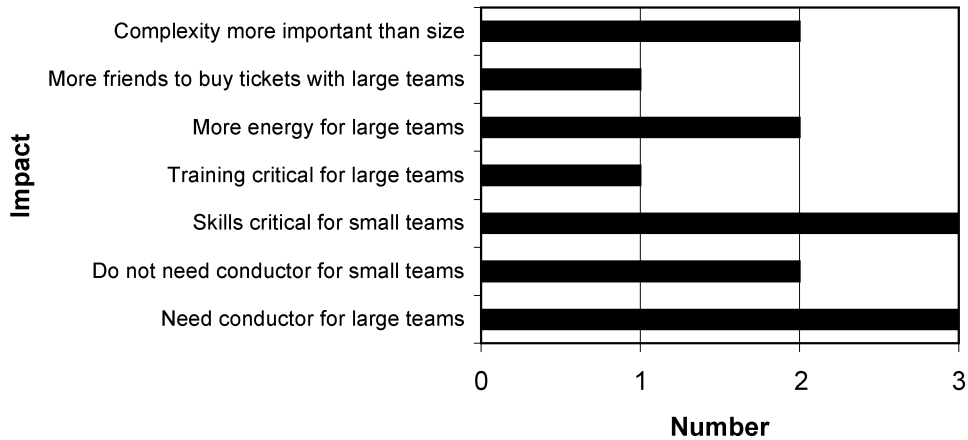


Fig. 8. Impacts of team size.

Extent of Competition

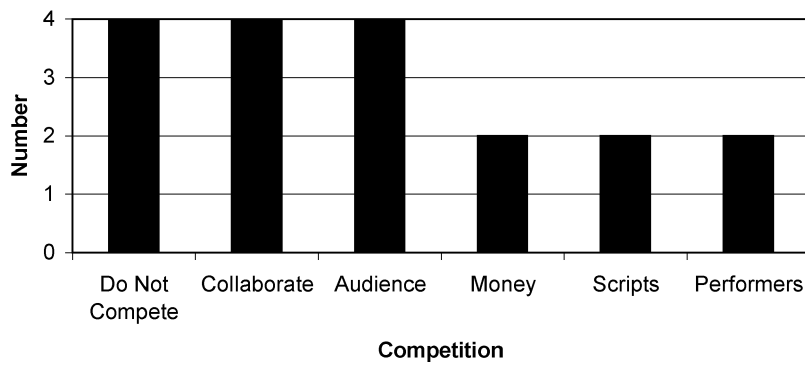


Fig. 9. Extent of competition among performing arts.

Symphony orchestras and large choruses epitomize a large number of performers requiring extensive coordination with considerable rehearsal involving mostly ensemble performers and a leader who performs with the team. Opera and large musicals are similar with the primary exception that the leader seldom performs with the team. Jazz and improv theatre are perhaps the other extreme, with a small number of performers with minimal coordination that is often accomplished during the performance. In this case, ensemble teams are the norm and leaders almost always participate in jazz and often participate in improv.

The nature of the performance interacts with these dimensions. The arts studied included music, words, and movement as the media of expression. Coordination to assure blending of performers' expressions is important in symphony orchestras and large choruses. This requires extensive rehearsal. Jazz and improv theatre, in contrast, do not pursue blending in this sense. Spontaneity is central to these art forms. Preparation for these forms of performance does not tend to emphasize repetition. Ballet, for example, would seem to fall somewhere in between these extremes.

A question of particular interest is how the above dimensions affect teamwork and how teams are supported. Fig. 10 provides a summary of potential relationships among these key variables as gleaned from the interview data. The

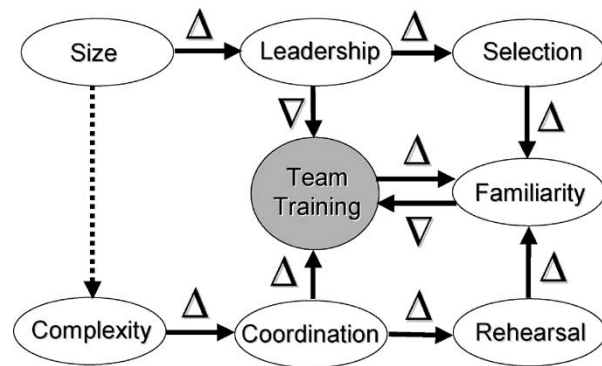


Fig. 10. Potential relationships among key variables.

primary outcome of interest is the extent of team training. Everyone interviewed extolled the benefits of teamwork; the prevalence of team training reflects explicit intentions to foster teamwork.

The solid arrows in Fig. 10 designate crisp relationships, with upward-pointing deltas indicating positive relationships, and downward-pointing deltas indicating negative relationships. The dotted arrow designates a less crisp relationship.

Not surprisingly, increasing team member familiarity decreases the prevalence of team training; further, increasing

team training increases familiarity. Thus, ensemble teams may limit training to situations with new team members or possibly unusual productions. Selection may also be used to choose people who “fit in” and, at least stylistically, are therefore more familiar.

The presence of strong leadership, especially leaders that perform, decreases the prevalence of team training. Such leadership also strongly affects selection, with the aforementioned impact on familiarity and, hence, team training. Rehearsal also increases familiarity. Needs for coordination strongly affect needs for rehearsal. Needs for coordination tend to increase with the complexity of the production.

Size affects needs for leadership, with the just noted impacts on the prevalence of team training and use of selection. Size and complexity, as indicated by the interview results, are not synonymous. Nevertheless, very large productions do tend to be more complex than small ones, at least very small productions. Except for these extremes, however, we expect that the correlation may be weak.

Note that the dynamics portrayed in this figure imply decreasing frequency of formal team training, either due to increasing familiarity or leadership decisions. High turnover among performing team members would tend to lower familiarity and, hence, increase use of team training until new performers are assimilated. Thus, team training may “come and go” with changing composition of performing teams.

Fig. 10 provides a qualitative model or theory of the relationships among the dimensions of the ecology identified in terms of how these dimensions affect the prevalence of team training. This model does not predict how training will be pursued or how training affects performance. Nevertheless, it suggests the situations where training will be employed to assure successful teamwork. The arts leaders interviewed perceived such teamwork to be central to successful performance.

Revisiting the theoretical findings reviewed in Section II, it is clear that arts leaders recognize the importance of teamwork beyond taskwork. They see collaboration as central to excellence in the performing arts. The mechanisms that they adopt for assuring teamwork vary considerably with the nature of the art form, as well as for the reasons depicted in Fig. 10.

The notion of mental models, while not explicitly suggested by any of the arts leaders interviewed, relates to two phenomena that were mentioned repeatedly. First, of course, performers need “models” of the performance at hand—what relates to what, when it relates and, in some cases, why it relates. Second, performers need mechanisms to form appropriate expectations of fellow team members. In some cases, the score or script provides expectations, but in others team members need deeper understanding of each other as individuals.

The means used to foster mental models vary considerably. The models associated with individual performance, i.e., taskwork, are assumed to be developed when team members are selected. Indeed, this tends to be an implicit or explicit selection criterion. In situations where the score

or script does not fully define performance, additional means—often informal—are typically employed to enable people to understand each other’s inclinations, motivations, and so on. This is common in theatre and jazz, for example.

Thus, we find that the theoretical findings from research on business and operational teams are useful for understanding teams in the performing arts. Perhaps the largest difference between domains is the fact that the excellence of performance in the arts is often dominated by the quality of collaboration among team members. The performance product is inherently a “group product.” Individual accolades seldom occur without the whole functioning well. This is manifestly true to the audiences of arts performances. Quality is immediately rewarded; lack of quality meets faint praise. Business and operational teams seldom have such immediate scrutiny and feedback.

VI. CONCLUSION

Our conclusions regarding the “ecology” of performance and the relationships among the dimensions of this ecology are based solely on arts leaders’ perceptions of the key variables and relationships among them. Thus, our conclusions represent well-informed hypotheses more so than empirical facts.

Our next step involves conducting *in vitro* studies of the formation and evolution of performing arts teams. Specially, we are focusing on small theatre casts and jazz ensembles, as well as teams in several nonarts domains such as racing car pit crews and fast food restaurant teams. We intend to make video and audio recordings of the discussions and debates associated with selection of team members, preparation for performance, and communication during performance.

We also intend to come full circle to formulate a framework for relating teams in performing arts, operations, and management. As noted earlier, many have extolled performing arts teams as at least metaphors for management teams. The arts leaders we interviewed also mentioned numerous occasions of management teams watching them rehearse.

We expect, however, that the parallel is not as straightforward as advocated. At extremes, for instance, we expect that management teams of large government agencies would find adoption of insights from observations of jazz and improv groups less direct than insights gained from symphonies and large choruses. Similarly, managers of entrepreneurial startups would find observation of symphonies and choruses less insightful than jazz and improv.

In general, the mapping from performing arts teams to operations and management teams might be accomplished through the dimensions of the ecology outlined in the previous section. In terms of these dimensions, we can see, for example, that an established product planning team is quite different from a pickup new product development team. Depending on the task complexity involved, coordination of the pickup team could be enhanced by selection and/or training. In the absence of both of these types of support, team performance is likely to suffer.

An interesting mapping involves the relationships between creative teams in the arts and similar teams in engineering. It can be reasonably argued that invention and innovation in the arts and technology involve quite similar psychological and social processes [18]. However, consideration of the dimensions of the ecology of performance quickly yields the observation that composers are akin to designers, while performers are similar to users. Thus, the performing artist is more like an operator of a complex system than the designer of such systems. This, of course, is the underlying premise of other papers in this Special Issue.

At this point, however, the many relationships outlined in this concluding section remain speculations. Several issues of measurement and inference, not to mention causality, need to be addressed before such studies can be conducted and this framework populated with sound conclusions.

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