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Learning in multi-team systems: a qualitative study of learning triggers, readiness to learn and learning processes

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Learning in multi-team systems: a qualitative study of learning triggers, readiness to learn and learning processes

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Abstract

Purpose – Multi-team systems (MTSs) are expected to respond effectively to complex challenges while remaining responsive and adaptable and preserving inter-team linking mechanisms. The leadership team of an MTS is expected to configure and reconfigure component teams to meet the unique needs of each situation and perform. How do they learn to do this? This paper, using a recent MTS learning theory as a basis, aims to begin to understand how MTSs learn and stimulate ideas for future research.

Design/methodology/approach – The authors use two case studies to address research questions. The first case was a snapshot in time, while the second case occurred over several months. Interviews, documents and participant observation were the data sources.

Findings – As suggested by theory, findings support the idea that learning triggers, the timing of the triggers and readiness to learn (RtL) affect the type of learning process that emerges. The cases showed examples of adaptive and generative team learning. Strong and clear triggers, occurring during performance episodes, led to adaptive learning. When RtL was high and triggers occurred during hiatus periods, the associated learning process was generative.

Originality/value – Using an available theoretical model and case studies, the research describes how MTS readiness to learn and triggers for learning affect MTS learning processes and how learning outcomes became codified in the knowledge base or structure of the MTS. This provides a framework for subsequent qualitative and quantitative research.

Keywords Readiness to learn, Multi-team systems, Learning triggers, Learning processes

Paper type Research paper

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Introduction

Multi-team systems (MTSs) are discrete, fluid, and dynamic organizational forms created for specific tasks or events. Performance relies on a leadership team's integration of component teams with each team contributing specific functions before, during, and after the completion of the task or event (Mathieu *et al.*, 2001). MTSs are expected to respond effectively to complex challenges while simultaneously remaining responsive and adaptable, and preserving inter-team linking mechanisms. MTSs' leadership teams configure and reconfigure their component teams to meet the unique needs of each situation (including the possibility of a different set of component teams or a changing set of component teams as the situation unfolds) and perform (Sessa *et al.*, 2018, 2019). How do they learn to do this (Zaccaro *et al.*, 2020)? Theory suggests that the leadership and component teams as an MTS unit learn as they work (Sessa *et al.*, 2018, 2019). However, little research, to date, has explored MTS learning. The purpose of the case studies presented here is to begin to understand how MTSs learn with a focus on how learning triggers, the timing of the triggers, and readiness to learn to affect learning processes. This has implications for how an MTS as a unit codifies the learning within the knowledge and structure of the MTS to adapt and improve functioning for subsequent operations. We begin by briefly outlining a theory of MTS learning triggers and outcomes which serve as the basis for research questions for exploration in our qualitative case analyzes.

Overview of multi-team system learning literature

Goals and obstacles to reaching those goals establish the need for learning in MTSs (Sessa *et al.*, 2018, 2019). As the MTS is working within its complex environment, demands and opportunities happen in such a manner that the MTS cannot continue to work in the same way and be successful, thus stimulating or triggering the learning processes (Sessa and London, 2005). MTSs respond by reacting, structuring and restructuring to meet changing conditions (adaptive learning), proactively adding new skills, knowledge, and ways of accomplishing work (generative learning), and creating and recreating themselves into more sophisticated systems (transformative learning) (Sessa and London, 2005). As a result of these learning processes, the way the MTS works as a unit can change. The MTS's readiness to learn, that is, their openness to stimuli and alternate ways of dealing with them, helps the members of the MTS recognize triggers and implement change.

Triggers

Triggers for learning are occurrences that provoke a learning process response (Georganta *et al.*, 2019). The triggers may come from outside the system such as a change in resources, a change in the time frame, and new information or directions from stakeholders. Triggers may also come from within the system such as within component teams (e.g. personnel changes), new ideas, and reaching a milestone such as a sub-goal. Events, actions or decisions within a system at one level affect systems at the same or other levels via triggers for learning (London and Sessa, 2006). Although there has been little research to date on how triggers are recognized in the first place, organizational learning theory suggests that triggers for learning are events within or outside the organization that lead individuals to interpret the events, form insights, and generate responses that together become cognitive maps for understanding and future action (Crossan *et al.*, 1999).

Types of learning processes

Sessa *et al.* (2018, 2019) suggest that learning processes may be adaptive, generative or transformative. Studies of MTSs have found examples of adaptive, generative, and

transformative learning. Uitdewilligen and Waller (2012) found evidence of cyclical adaptation in an MTS. The MTS adapted by reshaping and aligning its structure and processes to address the immediate demands of the particular situation. A number of studies focused on the use of charters, debriefs, and training exercises providing examples of generative learning (Asencio *et al.*, 2012; Smith *et al.*,2020; Uitdewilligen and Waller, 2012). One example of transformative learning in which the MTS changed from an emergent system into a more sophisticated system is the development of the USA's National Incident Management System (NIMS) beginning from a devastating wildfire in California in 1970 in which an emergent MTS with responding agencies struggled with numerous problems with communication and coordination hampering their effectiveness. From the analysis of this disaster, came the ideas of an Incident Command System and a Multi-Agency Coordination System. (available at: www.fema.gov/txt/nims/nims_ics_position_paper.txt).

The MTS as a whole can engage in learning processes. This could happen through mechanisms such as drills and simulations to practice current processes and procedures via adaptive learning, try new technology or communication systems using generative learning processes or even try a novel, transformative structure. Second, learning can happen in the MTS's leadership team (Davison *et al.*, 2012), and the learning can flow down to the component teams via the leaders or integrating members (team members who communicate with members of the other teams). Third, learning can happen first in a component team and flow into the MTS as a whole (Crossan *et al.*, 1999; DeChurch *et al.*, 2020). Fourth, learning can flow horizontally from team to team via multi-team memberships (O'Leary *et al.*, 2011).

Learning outcomes and learning outcome codification

Changes occur as the MTS engages in learning processes. These changes may include how to structure and synchronize the various component teams, as well as how to reach the goals of the MTS. As one of the characteristics of an MTS is its fluidity, the MTS must ensure that any positive changes developed in one situation need to be retained so that they can be adequately retrieved and applied when needed in the future. The MTS learning process is not complete unless it is codified or embedded into the system in some way (DeChurch *et al.*, 2020). Crossan *et al.* (1999) call this institutionalizing. Repositories include individual members, roles and structures, standard operating procedures and practices, culture, and physical structures (Argote and Ingram, 2000). However, there has been little research to date regarding how changes as the result of learning processes in MTSs are retained.

Performance episodes and hiatus periods

MTSs perform during performance episodes (Mathieu *et al.*, 2001). Performance episodes are distinguishable periods of time during which performance accrues and feedback is available. Within a performance episode, there are:

- periods of action during which time the MTS is doing its taskwork and include monitoring progress toward goals, systems monitoring, team monitoring, and coordination, and
- periods of transition during which time MTSs engage in mission analysis, goal specification, and strategy formation.

Sessa *et al.* (2018, 2019) introduced the notion of the time between performance episodes which they refer to as hiatus periods during which the component teams may go about their business independent of the MTS. They argued that whether the MTS and component teams are in performance episodes (as well as whether the MTS is in an action or transition

phase) or hiatus periods impacts whether an MTS notices triggers for learning and the learning processes that occur. Specifically, Sessa *et al.* (2018, 2019) predict that during action phases, it would be difficult to recognize and react to triggers and if they do, only adaptive learning processes would occur. During transition phases, triggers would be more easily recognized and various learning processes may occur. Finally, during hiatus periods, the recognition of a trigger may be lower, however, the MTS has the time, if need be, to engage in generative and transformative learning processes. Research is needed to address when learning triggers occur and how this timing influences whether and how triggers are interpreted by the MTS and the learning processes that occur.

Readiness to learn

RtL is how open the MTS is to change and how likely the MTS is to participate in learning activities. When RtL is low, a learning trigger needs to be strong to be recognized and the learning process that occurs will most likely be adaptive. When RtL is high, triggers do not need to be as strong, and both generative and transformative learning processes are more likely to occur (Sessa and London, 2005). London and Sessa (2006) argued that three components contribute to an MTS's readiness to learn: maturity of the MTS, openness to the environment, and meta-systems perspective.

Maturity of the MTS – degree of development. The experience of the MTS – that is, "where an MTS is" in its development– influences what the system is capable of noticing and doing. MTSs can move from a set of independent, fragmented teams with few structures, processes, routines, and coordinating mechanisms to bind them together as a system (Flestea *et al.*, 2017, for an example of an MTS in this developmental stage) to a more pooled operation with simple structures, processes, and routines (Crowe *et al.*, 2014), eventually becoming a tightly knit set of teams that interact in predefined and well-practiced ways (Uitdewilligen and Waller, 2012). The learning that occurs is commensurate with the development of the system. As more complex and sophisticated structures and processes emerge, the component teams begin to work and learn as a unit identified as the MTS (Kasl *et al.*, 1997; Zaccaro *et al.*, 2012). Mature MTSs learn to deal with the dynamic tension between:

- the component teams as self-sufficient units that may operate in other MTSs or outside the context of an MTS and
- the complexity of an MTS in which they are embedded and that needs the component teams to be tightly coupled, at least coupled sufficiently to accomplish the mission of the MTS (Luciano *et al.*, 2018).

Openness to the environment – scanning and interpretation. MTSs are open systems that process information from the environment. The environment is complex and changing, so the MTS must seek information and base its actions on that information. The MTS must have processes in place to detect and extract changes and other relevant information from the environment and additional processes to interpret and make sense of that information. This has been referred to as scanning and interpretation (Daft and Weick, 1984) or situational awareness (Uitdewilligen and Waller, 2012) Some evidence suggests that due to the task at hand, many individuals within the MTS are not able to attend to the situation (Bigley and Roberts, 2001) suggesting that processes need to be in place to scan and interpret environmental cues. One solution is the idea of vertical coordinated action between a team tasked with system-wide integration (the leadership team) and task-specialized component teams (Davison *et al.*, 2012; DeVries *et al.*, 2016).

Metasystems perspective – interaction and communication mental models. The role of the leadership team is to use their big picture perspective to coordinate, guide, and support component teams as they work on their team goals and the MTS goals (DeVries *et al.*, 2016; Fodor and Flestea, 2016; Rico *et al.*, 2018). For an MTS to reach its goals, there are both intra-team and inter-team processes that need to happen. Individual members primary foci of identification (self, component team member, MTS member, Connaughton *et al.*, 2012) can affect sharing of information between teams (Mell *et al.*, 2020), inter-team coordination failures (Lanaj *et al.*, 2013), and depletion of energy and focus across the system (Porck *et al.*, 2019), The leadership team needs to empower component teams to do their work, yet help coordinate and communicate top-down, down-up, and laterally (DeChurch and Marks, 2006; Fodor and Flestea, 2016; Rico *et al.*, 2018).

Research goals

The goals of this research are to explore how an MTS learns – more specifically, how readiness to learn and the emergence of triggers for change produce learning that is captured by the MTS for future operations. MTSs respond to events and challenges as they work, maintaining linking mechanisms between the teams that produce effective operations. Different degrees of change and learning may occur, including minor changes (adaptive learning), new ways of working requiring different skills and knowledge (generative learning), and sometimes substantive re-creation of the MTS's purpose and methods (transformative learning). The leadership team is central to this process in that it provides the coordinating mechanisms and adapts the structures and operations of the MTS, codifying the knowledge and changes in processes for continuity. Although many of the elements in the learning model already exist to some degree in theory and research, they have not necessarily been connected to MTS learning. We used the insights from our literature review to develop research questions. The research question for the two case studies include:

RQ1. How do triggers for learning, the timing of the triggers, and RtL affect MTS learning processes and outcomes?

RQ2. How does the learning process unfold over time?

RQ3. What was the outcome and how was the learning outcome retained?

We conducted a qualitative analysis of two cases to explore how triggers, the timing of the triggers, and RtL induce learning processes and change. The first case was a snapshot in time, while the second case occurred over several months. Open-ended interviews, documents, and participant observation were the data sources. The data are discussed in relation to insights about learning emergence that can affect the practice of MTS operations and suggest directions for future quantitative research.

Method

Our case studies explored MTS learning "in the wild." Specifically, we studied two cases using production MTSs in sequence to assess and learn from their similarities and differences, and build from the first case and broaden our understanding in the second. We studied production MTSs that organize multiple interdependent teams to produce an event or activity that recurs over time. They operate by coordinating component teams composed of numerous individuals within a temporary organizational hierarchy. The events we studied in each case were organized and implemented by a complex set of teams, each of

which had a specific function that needed to operate at given times and in coordination with other teams.

The first case centered on an MTS that produced an annual multi-day music festival. Although we studied one festival, the festival had been in existence for 10 years, with the leadership team and some of the component teams participating each year, while other component teams are new. The MTS including the leadership team, and component teams working on artist relations (with subcomponent teams in hospitality and transportation), gates and security (which included subcomponent teams handling outside security, inside security, traffic management, and EMTs, as well as police), production (with subcomponent stage crews for each of the five stages, as well as lighting and audio teams for each stage), site operations, sanitation, and a smaller set of component teams for bar operations, sponsors, vendors, signage, and volunteers. Two of the partners in the leadership team owned a firm that provided financing, ticketing, contracts/booking, public relations, and marketing component teams.

The second case was an MTS producing two annual concerts produced by a student group, the Student Activity Board (SAB), which was a subcommittee of the Undergraduate Student Government (USB) at a large public university in the northeast. The SAB organizes multiple events during the course of the year such as homecoming, fall and spring concerts, and carnivals. Our study focused on two concerts in subsequent years. The MTS was composed of a leadership team comprising elected and volunteer students, a number of student component teams, teams of staff members, and external professional small businesses in the music events planning industry. The staff component teams saw themselves as both workings in a support capacity, a mentorship capacity, and, over the course of the study, increasingly viewed themselves as a quasi-leadership team. We followed the MTS in the fall semester when the leadership team was newly formed, as it planned and ultimately failed to produce a musical event and then again in the spring semester as it planned and successfully produced a musical event.

The second case, the university concert, differed from the first, the music festival, in terms of fluidity of system composition (Luciano *et al.*, 2018). The music festival leadership had been in existence with few changes of partners for 10 years, but many of the component teams were a different year to year. In the second case, the leadership team producing the university concert changed yearly although many of the component support teams remained constant year after year. Also, in the second case, data were collected at two points in time allowing us to assess whether and how RtL develops over time and how and how that influences the MTS.

Data collection

We used triangulation in both the data collection and data analysis. Data collection included interviews, documents, and participant observation. Multiple researchers independently coded the data and then came to a consensus. In addition, a music production subject matter expert (SME) served as a member of the research team for both data collection and data analysis.

For the music festival, we conducted 10 semi-structured interviews with nine interviewees centered around the festival that we observed. One participant (interviewed twice) was a festival organizer, while the other eight interviewees worked in a variety of component teams across the MTS, including festival site operations, festival production, stage management, brand partnership (sponsor relations), and touring support (for one of the artists). Four people were interviewed prior to the festival, and seven after the festival. For the first interview with a festival organizer, interview questions included a general

description of the festival: organizational structure, planning, show days, and post-production. In the other interviews, we asked interviewees to recall critical incidents with the following prompt:

> Think over the last three or so years and let's talk about some specific things that happened that have changed the way you do your work or how you interact with people or other teams within {the music festival}.

For each incident, we asked who recognized the need and how it was recognized, a description of the change process, and the results of the change process.

Three research members attended the festival as participant observers. The MTS members knew we were observing them as researchers. This "peripheral membership role" enabled us to "observe and interact closely enough with members to establish an insider's identity without participating in those activities constituting the core of group membership." (Adler and Adler, 1994, p. 380). One research team member had previously worked in the festival, and introduced us to various MTS members, obtained a two-way radio for communication on the grounds, and took us "behind the scenes."

For the university concert case, we conducted 19 semi-structured interviews and used participant observation. Twelve interviews were conducted with 11 interviewees (one was interviewed twice) during the weeks leading up to the fall event (Time 1), and 7 interviews were conducted during the weeks after the spring event (Time 2). Participants at Time 1 and Time 2 held roles in a variety of component teams such as the USG, SAB, the police department, and school administration. The interviews included a general description of the events, organizational structure, planning, and show days, and were asked about critical incidents using the prompt, "Is there anything you would have changed about the event?" For each incident, we asked for a description of the incident, the change process, and the results of the change process.

Coding

The transcripts of the interviews, various documents, and observers' notes constituted the set of raw data for each case. Both sets of data were analyzed using Miles *et al.* (2019) "codes and coding" techniques. We used deductive descriptive coding based on the components of the model, that is, we developed a "starting list" of codes based on our conceptual framework and key variable (learning triggers, RtL, and learning processes and outcomes) and expanded from the raw data. The process involved creating codes in the first case study, manually coding the data in the first case, then modifying the codes and manually coding the data in the second case. We selected this technique so that we could link the data back to the research questions. We further coded RtL using magnitude coding to determine the level of RtL. In this coding, we used numeric codes to indicate the amount of RtL.

Coding learning triggers and timing of triggers proceeded in the following steps by two independent coders:

(1) Learning triggers were identified from the interviews, drawing directly from the critical incident prompt.

(2) Triggers were coded in terms of where the incident occurred, specifically, whether it was during the event; in an event environment, that is, the neighborhood or political or school environment surrounding the event; and/or an element of the industry, that is, the music industry at large) and timing of the trigger (this year; previous year; and incrementally, that is, learning triggered in the past but continued to have an impact).

For the first case study, the two coders had 93% agreement in terms of where the incident occurred (we used percent agreement rather than kappa due to the small number of codes) and 80% agreement on the timing. For the second case study, the two coders had 82% agreement in terms of where the incident occurred and 73% agreement in terms of the timing. Disagreements were discussed to a consensus.

We coded RtL once for the first case study and at two points in time for the second case. Coding RtL proceeded in the following steps:

(1) Two coders separately read the interviews and the participant observation notes and noted passages that had to do with general learning readiness, development of the system, scanning and interpretation processes, and interaction and communication models. All passages from both coders were included in the coding for a total of 95 passages for the first case study, 85 passages for the second case study Time 1, and 32 passages for the second case study Time 2.

(2) The two coders coded whether each was an example of general learning readiness, development of the system, scanning and interpretation processes, and interaction and communication models. Passages could include more than one category (case 1: kappa = 0.96, case 2, Time 1: kappa = 0.88, case2, Time 2: kappa = 0.88). Disagreements were discussed to reach a consensus. Once each passage was categorized, each passage was coded by the two coders on a five-point scale (1 = low, 3 = medium, and 5 = high) within that category. For the first case: development = 49, kappa = 0.76; scanning and interpretation = 19, kappa = 0.77, interaction and communication = 27, kappa = 0.84. For the second case, Time 1, development = 52, kappa = 0.83; scanning and interpretation = 17, kappa = 0.81, interaction and communication = 19, kappa = 0.77. For the second case, Time 2 (development = 17, kappa = .85; scanning and interpretation = 3, kappa = 1.0, interaction and communication = 11, kappa = 0.68. To determine overall RtL in each case, we considered the levels of the three factors that contributed to overall readiness, as well as passages that were directly related to overall readiness, and together we discussed to reach a consensus.

Learning processes were coded as follows:

- Two coders separately read the interviews and the participant observation notes, noting for each learning trigger the related passages.
- Once all the passages for each learning trigger were identified, coders discussed and came to a consensus about whether subsequent behaviors were mostly adaptive, mostly generative or mostly transformative.

Researchers discussed and reached a consensus on how learning for key triggers was retained within the MTS: individual members, member or team roles, MTS structures, procedures or practices, culture or physical structure of the workplace.

Results

Triggers for learning

From the first case, we elicited 15 learning triggers (some triggers were mentioned more than once in an interview or more than one interviewee mentioned the same trigger). Five triggers occurred during the current festival (event, this year), 4 occurred in a recent past festival (event, previous), 2 occurred within the festival but were incremental (event, incremental), 1 was industry-wide and incremental, and 3 were due to the location of the festival and incremental. Three learning triggers, described in Table 1, were analyzed

Table 1.
Examples of three learning triggers in the multi-day music festival

Learning trigger and timing	Sample comments regarding the trigger	Learning process and flow	Learning outcomes and codification
Flooding at the site (performance episode)	It was the night of the show. We evacuated the site and then the next morning I was the first person on site. I could tell that there was significant. . .standing water and. . .damage to certain areas of the site that we needed to addressed before we brought patrons in	Adaptive – onsite leadership and component teams together drew on the experience of various members (experience at other festivals, occupational experience such as carpentry)	New knowledge held by individual members
Security threats (hiatus periods)	The world we live in today, unfortunately, can be a very, very cruel world as we saw out in Las Vegas last year	Generative – deliberate and ongoing planning process, discussions, negotiations to increase security yet serve the festival's logistical needs Triggers flowed in from the outside into the leadership team and then into relevant component teams	New skills for some individual members, new structures, new procedures. These changes triggered adaptive learning as they were put into place
Aging festival attendees (hiatus periods)	[The] average participant in year one was 22 years old. Now, our average participant is 28 years old and that means the expectations of the customers' change	Generative – leadership team noticed an industry trend, they "ran the numbers," strategized, and planned Learning flowed from the leadership team down as component teams were included to discuss. Then, change is made, analyzed, then iterated the following year	New component teams, operating procedures and practices, modification of the physical structure

further in the research questions: flooding at the site, security threat, and aging festival attendees. These three triggers were chosen because a number of interviewees discussed them and participant-observers were able to observe and experience them (Table 1).

We found a similar pattern of triggers in the second case. We elicited 11 triggers from Time 1. Five triggers occurred during the current festival (event, this year), four occurred in recent past festivals (event, previous), two occurred within the festival but were incremental (event, incremental), one was industry-wide and incremental, and three were due to the location of the festival and incremental. Two learning triggers, described in Table 2, were analyzed further in the research questions: issues with artist accountability, and an inefficient ticketing system. These two triggers were chosen because a number of interviewees discussed them both at time 1 and at time 2 (Table 2).

To summarize, learning triggers occurred both from within the MTS and from events happening outside the MTS that affected it in some way. Although most triggers occurred within a performance episode when they had to be addressed, others occurred during hiatus periods.

Readiness to learn

For each case, we examined overall RtL and its three theory-based component factors: the degree of development, scanning and interpretation, and interaction and communication mental models in both cases. In the second case, we assessed RtL at two points in time. We provide the results of readiness to learn separately for each case.

Case 1

Degree of development. We examined factors such as the existence of formal operating procedures, personnel retention and training, and communication mechanisms. We rated the festival's degree of development 3.5, meaning that the MTS was a pooled operation with simple structures, processes, and routines, but it was not working as a single unit. The leadership team members had been constant for 10 years. The MTS had formalized protocols, site plans, contracts, structures, processes, and routines in place to ensure linkage constancy. However, there was a great deal of fluidity in the component teams. Many of the component teams hired each year were either completely new vendors and teams or vendors and teams used in the past but composed of new members. While most of the teams and members were in the music festival business and had a working knowledge of a multi-day festival, some individuals were in a new role in this festival this year and had not had any training on how to do that job in particular. Additionally, although much was formalized, many component teams and members did not have knowledge of or access to them. For example, one interviewee stated, "Normally I would get a list of who gets what, however, that didn't exist here or didn't show up with enough time for it to mean anything to me."

Scanning and interpretation. We rated scanning and interpretation 2.5 meaning that this MTS has some processes in place to scan and interpret environmental cues. Scanning was limited to the leadership team and a few members in component teams. However, there were few mechanisms for inviting scanning and integrating information from other component teams or team members. For example, one of the partners on the leadership team walked around the festival to gather information and invited members to report problems to him. However, MTS members did not necessarily feel comfortable passing information on. "I didn't want to mention anything because there were bigger fish to fry with the weather and canceling and all, multiple bigger stressors than this." Or they were not invited to do so. One participant stated, "I don't make decisions. I'm present when decisions are made [. . .]" Finally, some formalized scanning and integration roles were missing: "At other shows,

Table 2.
Examples of two learning processes overtime in the university

Trigger time 1	Sample comments regarding trigger	Learning process and outcome at Time 1	Reinterpreted trigger (hiatus period)	On-going processes
Last-minute ticket sales (performance episode)	"We obviously knew that there were students that would come the last minute to buy a ticket. There were a lot more than expected. That required us to then hold a ticket box, the ticket officer longer than what was originally planned. That was along the lines of improvising and just engaging how many more students we will be expecting kind of thing"	Adaptive – better line control. The outcome–the ticketing office and personnel remained open longer than originally planned to accommodate the sales, the UPD and USG collaborated to control the stampeding crowd	Inefficient ticketing system	Generative learning – triggers reinterpreted as a need for a better ticketing system. Outcome-created an online ticketing system
Student behavior in ticket line (performance episode)	"A line ensued the night before which we weren't necessarily anticipating the length of the line because of the notoriety of the artist. We had people that were taking furniture from academic buildings, so they would sit on it"			
Artist canceling after signing the contract (performance episode)	"Last year, when [musician] canceled on the day of the concert. . .the solution that they came up with. . . was that we need to find backup parties for the artist who didn't show up. Our number one priority was to find an artist with the same budget as the artist who canceled"	Adaptive – found an artist to substitute. Outcome-new knowledge for individuals that they could hustle and find another artist	Artist accountability	Generative learning – triggers reinterpreted as a need to update the artist contract. Outcome – introduced a new clause into the artist contract
Artist canceling before signing the contract, low ticket sales/ canceled concert (performance episode)	"Our process is really good and there are things that we cannot control that would cause a cancelation. We cannot control whether or not students actually buy tickets. . . We have to cancel or we have to postpone or whatever it is" "The official statement is due to poor concert sales"	Adaptive – found an artist to substitute (based on past learning), but didn't have time to advertise, leading to low sales and canceled concert. Outcome – new knowledge for individuals that there are things beyond their control	Artist accountability	New learning process stimulated but too early to identify

there's a grass cop. So, there is a person whose sole task is to ensure that the grounds are being maintained and cared for and respected."

Interaction and communication mental models. We rated interaction and communication 3.5 meaning that there were some, but not many mechanisms in place to coordinate and communicate across teams. The leadership team had regular planning meetings. The leadership team members make decisions as needed and expect that their decisions are communicated. However, this can be haphazard, as one interviewee noted:

> They [the leaders] work as a team in the office usually right next to each other and post content all weekends. So, these things end up being decided among them as a whole and trickle down to the stage managers to implement.

However, these channels do not necessarily work smoothly, as evidenced by one person saying that it helps to know the right person:

> Just always knowing that chain of command and getting those questions answered by the right people and making sure that the right people know of the concern is always the challenge.

Overall readiness to learn. We used the three components that comprise RtL and a few phrases from the RtL coding to rate overall RtL. We coded RtL as a 2.5 meaning that this MTS had a low openness to change and had a low likelihood of participating in learning activities. Overall, we saw that the MTS was bifurcated – developmentally more sophisticated at the top of the MTS although it did not work as a single unit, with more scanning happening and integrated into the leadership team (and those they knew well), and fewer processes smoothly communicated to and from other component teams.

Case 2

Degree of development. We rated the MTS involved in musical event planning 3.5 at Time 1 and 4.0 at Time 2 in terms of the degree of development. Unlike the music festival that had a leadership team that had been with the festival for many years, the student team running the university concerts during the fall and spring were novices although the staff supporting the USG had been with the university for many years. During Time 1, staff component team members stated that they operated in a support capacity, "In my role as an advisor as opposed to a supervisor's capacity, I really can just provide institutional memory, history of events." However, in Time 2, leadership and staff component team members began to articulate that there were really two leadership teams – the student leadership team, now with some experience, and a staff leadership team. For example, one student stated referring to a staff support member, "Typically, [the support staff member] [. . .] will reach out to [. . .] to get the contract going, [. . .] to go over the security plans and risk management issues [. . .] So, she's really more than an advisor, she's providing critical, logistical and infrastructural support. Without that support, this event is not happening because students are students after all and what they get to think about is the big picture of who do we want, choosing talent, price point- they get a lot of guidance on that too depending on how much they have left in the budget. So [the staff member] really helps with all of this stuff." As the student leadership team developed working relationships among themselves and with component teams, the MTS increased its development between Time 1 and Time 2 and became a more tightly knit set of teams interacting in predefined and well-practiced ways as a single unit.

Scanning and interpretation. We rated scanning and interpretation 4.0 at Time 1 and 4.5 at Time 2 indicating an improvement in terms of having processes in place to detect changes and interpreting them. Some of the staff component team members saw that part of their role was to scan and then coach the leadership team. For example, one component staff

member stated, "I check in on the student planners just to make sure that they are doing okay" Later in the interview, he stated, "[The] concert will have a debrief, all these different things will have a debrief that is the event by the event."

Interaction and communication mental models. We rated interaction and communication mental models as 3.0 at both Time 1 Time 2 indicating that they had some, but not a lot of processes in place to coordinate and communicate between teams. Perhaps, due to the nature of the professional, non-university component teams in this MTS, they often did not meet with the leadership team or the rest of the component teams before the event. They came in to do their jobs and leave.

Overall readiness to learn. As for the first case, we used the three components that impact RtL and a few phrases from the RtL coding to rate overall RtL. We coded overall RtL 4.0 at Time 1 and a 4.5 at Time 2 meaning that this MTS started with fairly high openness to change and had a fairly high likelihood of participating in learning activities, to begin with, and that improved over time. As this MTS is in a university, at the individual level, most members (both administrative and student) understood that one of the functions of student-led events was to develop the students. Attention was paid to developing students, teams, and the MTS as a whole through role modeling and encouraging the use of appropriate learning behaviors throughout the system.

In summary, we found that many MTS attributions and characteristics affect RtL. Although the music festival MTS in the first case had been in existence for 10 years with most of the original partners remaining on the leadership team, many of the component teams (or component team members) were new, developmentally making this a new MTS each year. Although there were formalized structures, processes, and routines in place, component teams were not necessarily aware of them, leading to a bifurcation with a higher RtL at the top than at the bottom. In contrast to the first case, in the second case, the student leadership team was fluid (new each year) but the staff and external component teams tended to remain constant. In addition, one of the purposes of the MTS was learning, so the emphasis was on development, learning to scan and interpret, and the creation of MTS mental models. We did see an increase in MTS RtL over time, but that would presumably start anew each year.

Impact of learning triggers, timing, and readiness to learn on multi-team system learning processes and outcomes

We analyzed five learning processes stimulated by triggers in more depth to explore our three research questions. Three were from the first case. They were flooding, security, and aging attendees. Two were from the second case: Ticketing and artist accountability. As the second case had two points in time (fall and spring), we were able to see the evolution of learning over time.

Case 1

Flooding. The first night of the festival a rainstorm flooded the grounds. We observed the clean-up process and asked questions both during and after the festival of those involved. The MTS had a weather protocol in place addressing such issues as rain, electrical storms, and wind. They had experienced flooding before but had not changed the weather protocol to address that situation or put resources in place. The trigger was strong. It occurred during a performance episode (and was addressed during a transition period). And, overall RtL was less than optimal in this MTS. Theory predicts that adaptive learning would occur. "It was fairly obvious to everyone there was a problem;" the focus was on getting the festival grounds ready for attendees. At 6 a.m., owners, site managers, and site people

arrived observed the damage and discussed what to do. The MTS drew on past experience of various members (experience at other festivals or occupational experience such as carpentry), producing the solution of renting water pumps from a hardware store and pumping the water down drains in addition to mulching and squeegeeing hard surfaces. When asked how they knew to apply this solution: "I don't know, I've just been doing this [work] so long" and: "That was the best idea that we had. It worked." This was an example of adaptive learning. The MTS as a whole responded to the trigger, during a transition period, by reacting and adapting to the changing conditions.

As far as learning outcome retention, it occurred solely at the individual member level. Those involved in the brainstorming and execution of the solution, as well as those observing, learned this was a potential solution for their next events. It did not lead to any changes in MTS member or team roles, MTS structures, MTS operating procedures or practices, culture, and physical structure of the festival.

Security. The strong and multiple triggers occurred outside the festival, during hiatus periods such as the shooting at the Las Vegas music festival and other similar events around the world, the festival's host city requesting stricter security measures, and booking acts with gang affiliations and filtered into the MTS via the leadership team which had a higher RtL than the MTS as a whole. Theory predicts that the learning process would be a generative or transformative one. Over the years, the leadership team and relevant component teams engaged in a deliberate and ongoing planning process that involved adding procedural skills and knowledge to their operations to increase safety measures. New procedures were added to the gate entry process such as pat-downs, explosive-sniffing dogs, and metal-detecting wands. These procedures were not added as an automatic response to preceding incidents; rather, the festival intentionally and proactively added skills and knowledge that would adequately respond to the trigger while serving the festival's logistical needs, indicating generative learning. For example, when the city demanded that every attendee passes through a metal detector, the leadership team and relevant component teams deliberated and negotiated on appropriate techniques that would both satisfy the enhanced security requirement, as well as ensure smooth operations. The MTS compromised by wanding random people. This element to the entry process required security personnel to take on a procedure and new skill as they decided how frequently the random wanding would occur and who would wand whom (i.e. separate male and female wanding lines). Interestingly, generative learning created further triggers for adaptive learning. Procedural changes (new security measures) created a need for more security lanes and security staff to ensure smooth logistics. "I think the past three or four years we have changed up the entry gate or gates at this particular festival to. . . accommodate for different security procedures." The festival did not add new skills or knowledge to their personnel's portfolios but rather added more volume of existing structures (i.e. entry lanes, security staff).

As far as learning outcome retention, the emphasis was on minor changes in MTS structures (adding more gates) and MTS operating procedures or practices (random wanding, etc.). These were limited to only one element of the festival and did not impact changes in other parts of the festival or the experience of the festival (either as a worker or attendee).

Aging festival attendees. As the festival industry became saturated (the trigger, occurring within various hiatus periods over the years, but, perhaps, not as strong and clear as other triggers), the MTS leadership team (which was stable and had a higher RtL than the MTS as a whole) noticed this and searched for ways to differentiate themselves and give attendees "a more unique experience." One response was an industry-wide push toward

"maturing with your audience." Theory predicts that the learning process would be a generative or transformative one. The leadership team decided to do address this by adding "more VIP options" to keep up with the changing attendee expectations. The strategy was twofold: to give the festival a "signature" reputation for quality and to capitalize on the financial opportunity that came with more desirable products and higher trafficked food and beverage areas leading to a higher volume of sales. This change in attendee expectations triggered generative learning. After running the numbers, the MTS "made the decision to make the infrastructure investment and the staffing investment" to provide the VIP offerings. Investments included new products (wine and cocktails), extra bars and lounges, additional bartenders, leasing a trailer to house the material, and a golf cart to transport it. A higher priority was placed on "working with vendors who provide something interesting, something unique." Because changes affected almost every component team, managers from all teams were included in meetings to discuss the new plan, answer questions, and work out kinks. Learning was codified through the addition of teams to staff the VIP areas, updating of operating procedures and practices, and finally, the modification of the physical structure of the festival. Each iteration of the festival builds on the previous year's setup. Knowledge is retained through the planning materials such as site maps, and organizational outcome measures of success.

Case 2

Ticketing. At Time 1, interviewees described how long ticketing lines led to operational and budgeting issues. The issue began when the USG (and the SAB) underestimated the number of students who would walk-up to purchase tickets for an event. The underestimation led to three triggering events. The high volume of unanticipated customers led to keeping the ticketing office open longer than expected. Second, student behavioral problems occurred. As they waited in line, ticket-buyers pulled furniture from the academic buildings to rest on. "A line ensued that night... We had people that were taking furniture from academic buildings, so they would sit on it." Finally, the line led to stampedes when the doors opened. These three triggering events at Time 1, occurring during an action phase within a performance episode, were interpreted as a need for line control service from the University Police Department (UPD). MTS RtL as a whole at this point was at an intermediate level. As predicted by theory, the learning process that would occur is adaptive learning. The first learning processes were adaptive and successful but costly: at the event, the ticketing office and personnel remained open longer than originally planned to accommodate the sales, and the UPD and USG collaborated to control the stampeding crowd.

After the event, during a hiatus period, the trigger was reinterpreted. The UPD, a stable component team, re-interpreted the triggers and developed a new insight that they were dealing with an inefficient system and then communicated to USG the need for an online advance ticketing system to reduce the number of walk-ups, as well as give the UPD a realistic sense of the crowd size to expect. However, USG and the SAB saw the online ticketing system as a "big financial commitment." The next couple of concerts continued to have long ticket lines with a UPD presence, which was also an added cost for USG. Thus, "it took quite a while for Student Activities and USG to come fully on board with online ticketing." Ultimately, through generative learning processes including "through conversation [and] dialogue, administrators found the money to make [the online ticketing system] possible."

At Time 2, USG members described adopting the UPD's suggestion, noting that "it was a big lift." The USG contracted with an outside ticketing vendor to set up the online ticketing system. USG members, the ticketing office personnel, and the front desk staff were trained

on the system. At Time 2, a participant noted, "It's been absolutely successful because the floor tickets were sold out in 2 days, all bought online."

The learning processes unfolded over time in response to the nature of the trigger, the MTS's RtL, and the flow of learning processes through the system. The trigger at Time 1 was clear, immediate, and forceful, both in terms of student safety and budgeting issues. The MTS handled the issue adaptively. However, the trigger persisted, long lines occurred at subsequent events, and the original solution was costly. Based on regular re-occurrence, during hiatus periods, the UPD (a stable component team) re-interpreted the trigger as an inefficiency, engaged in generative learning and came up with the solution of an online ticketing system, and attempted to transfer that learning to the MTS as a whole. Ultimately, the USG accepted the solution proposed by the UPD and instituted the new practice of an online ticketing system, which is now formally codified into the system in the form of an online ticketing system.

Artist accountability. During the semester prior to Time 1, an artist canceled last-minute, and the USG adopted by hustling to find someone new within 24 h. The outcome was successful. Learning was codified in individual MTS members: "This taught us how to work better under pressure and taught us how to negotiate on the spot and convince an artist to come up from New York in less than a day." Afterward, during the hiatus period, a generative learning process occurred via continued discussions with the leadership team and a number of the staff component teams, and the learning was formally codified into a contract clause that artists needed to be accountable and on time.

During Time 1, another artist canceled, but this time two weeks prior to the event. The trigger was strong and happened during a transition phase. The artist was able to cancel because the contract had not yet been executed and the contractor clause instituted earlier did not have an impact. In addition, as the contract had not been executed, no tickets had been sold. At this point in time, RtL was intermediate. Theory suggests that the various learning processes could occur. The USG responded to the trigger as they had learned was successful the semester before, they hustled and found a replacement artist. However, the replacement proved to be an inadequate market draw, marketing was not timely enough to be effective, and ultimately not enough tickets were sold, so the event was canceled.

At Time 2, during a hiatus period, the leadership team, along with staff component teams continued to discuss how "artists not showing up is a very difficult situation" and they had no control contractually. Although their RtL was higher at this point, their solutions continued to be on how to ensure that the "show goes on", which included having a backup artist and "taking extreme measures to ensure artist show up," "doing reference checks on the artists, ask [. . .] will they arrive on time" and writing into the contract, "that we have the right to forfeit payment or reduce the payment if the artist does not show up on time." Interestingly, they did not reframe the triggering event during the hiatus period. Their learning processes continued to be based on the artist canceling at the last minute (the first trigger). The processes did not address the problem that caused the second cancellation: that a contract had not been secured in a timely manner.

But there is an indication that they are beginning to attend to the contract process issues. In Time 2, a member of a staff component team described continued difficulty with securing artist contracts due to a multi-step contract negotiation process between multiple component teams both within and outside the university, as well as the artist. "We need a lot of time for that because this year more than any other year the contracts took a lot of back and forth [. . .] which is why we have such a short window of time for ticket sales this year [. . .]" Interestingly, although they mention their own internal contract negotiation processes are complex and involve multiple component teams, they are not yet looking at streamlining

them. However, the trigger may be in the process of being reframed and refined. The same staff member adds two important pieces of information to the discussion. First, she now recognizes that the staff component teams may actually do more than support and mentor the leadership team, stating:

> But the weight of the responsibility is mostly on the professional staff members because these are student-run events and if something wrong happens, it's not the student's fault, it's our responsibility.

In addition, she takes ownership of the contract negotiation process, "it's really myself and [another staff member] who does the contract negotiation."

The learning process for artist accountability triggers was still in process between Time 1 to Time 2. The nature of the trigger, the MTSs RtL, and the flow of the learning through the system produced a mix of adaptive and generative learning processes. The trigger was clear, immediate, and forceful, but unlike in the case of the ticketing system, no teams (leadership or component) are addressing the trigger itself. The MTS has repeatedly taken steps – some "extreme" – to try to control how the artist operates, but the MTS does not appear to be considering major changes to their own operations.

Summary. We found triggers for learning in these five events to vary in their clarity. Three triggers were strong and clear (flooding, security, the initial ticket incident), artist accountability trigger was strong, but, perhaps, not clear, and aging concert attendees were the least strong and clear. The triggers also varied in their timing. Three triggers occurred during performance episodes (flooding, ticketing–time 1, artist accountability – time 1) and required immediate action. The remaining two triggers occurred during hiatus periods and incrementally over time (security, aging attendees).

The theory predicts that when the trigger occurs within a performance episode, that the learning process would most likely be adaptive. In addition, that when RtL was lower, the learning process would also most likely be adaptive. The three triggers occurring during performance episodes did lead to adaptive learning. Interestingly, in the case with lower RtL, the learning process began and ended during the performance episode and the learning outcome was encoded at the individual level. In the case with higher RtL, the initial trigger was re-interpreted by relevant component teams later during a hiatus period for further reflection and consideration, and flowed into the MTS as a whole, ultimately leading to generative learning processes and outcomes codified into various MTS systems, structures, and processes.

The theory predicts that when the trigger occurs in a hiatus period, generative or even transformative learning may occur, particularly if RtL is higher. Two triggers in the first case occurred during a hiatus period. The MTS RtL was bifurcated. The two triggers entered in through the intuiting and interpreting of the more permanent leadership team (which had higher RtL) who engaged in generative learning processes. In the second case, the two triggers were re-interpreted (or are being re-interpreted) by the more permanent component teams. In all four cases, the learning processes and outcomes filtered from the leadership or component team into the entire system.

Discussion

The purpose of the two cases was to better understand what MTS learning at the macro or organizational level looks like "in the wild." Using existing theory and research to help frame our observations, we examined learning triggers, the timing of the trigger in relation to the progress of the event, RtL, learning processes, and learning outcomes. We also observed how these components interact. Our findings suggested that learning triggers, the

timing of the triggers, and RtL affect the type of learning process that emerges. Learning processes impacted how the outcomes were codified. The cases showed examples of adaptive and generative team learning. Strong and clear triggers, occurring during performance episodes, led to adaptive learning. When RtL was higher and triggers occurred during hiatus periods, the associated learning process was generative. Adaptive learning processes led to outcomes that were codified within individual members while generative learning processes led to outcomes that were also embedded in the system itself. Interestingly, the MTS with higher RtL later readdressed learning triggers that occurred within performance episodes while the MTS with lower RtL did not.

We observed a variety of triggers. They came from outside the system and inside the system (Georganta *et al.*, 2019). Events, actions, and decisions from learning processes in some cases led to new triggers within the system instigating more or different learning processes (London and Sessa, 2006). The triggers also occurred during performance episodes (Mathieu *et al.*, 2001) and hiatus periods (Sessa *et al.*, 2018, 2019).

We examined RtL. In one case, the components of maturity, openness to the environment (scanning and interpretations systems), and meta systems perspective (interaction and communication mental models) were suggestive of a lower RtL (Sessa *et al.*, 2018, 2019). Due to the fluidity of the component teams (Luciano *et al.*, 2018), the MTS was essentially new each year and thus did not learn very well as a unit (Kasl *et al.*, 1997). It did not have strong processes in place to help with scanning and interpretation (Daft and Weick, 1984) although it did have a leadership team that understood its role to include integration (Davison *et al.*, 2012; DeVries *et al.*, 2016). The leadership team also worked fairly well helping with interaction and communication mental models (DeVries *et al.*, 2016; Fodor and Flestea, 2016; Rico *et al.*, 2018). In the second case, taking place in a learning institution (and with the understanding that one of the functions of the MTS was learning), we did observe an MTS with higher RtL and that it developed over time.

We observed learning processes and outcomes that we could categorize as adaptive and generative, but we did not observe any instances of transformative learning (Sessa *et al.*, 2018, 2019). More observational research is needed to better understand what a transformational learning process "looks like" in MTSs. In terms of flow, we found that in some cases, the MTS engaged in learning processes as a whole, in some cases, processes started in the leadership team (Davison *et al.*, 2012) or in a component team (Crossan *et al.*, 1999; DeChurch *et al.*, 2020) and then flowed into the rest of the MTS. We did not see evidence in these cases of learning flow via multi-team memberships (O'Leary *et al.*, 2011). Interestingly, when we observed learning to flow from one leadership or component team into the system, it was from a stable (not new) team. In terms of learning outcome and codification, we found that individuals were always beneficiaries of the learning through their exposure to problem-solving and solutions, whether this occurred as a result of an adaptive or generative learning process. However, as a result of the generative learning processes, changes were also embedded in the system, through amendments to policies, procedures, contracts, and shifts in infrastructure (Argote and Ingram, 2000).

How do these components interact? Theory suggests that timing of the trigger (performance episode vs hiatus period) would impact the type of learning process such that triggers within performance episodes would most likely lead to adaptive learning processes, while triggers within hiatus periods may also lead to generative and transformative learning processes. Further, RtL also impacts recognition of the trigger and the learning response such that low RtL is associated with adaptive learning processes and high RtL is associated with generative and transformative learning processes (Sessa and London, 2005; Sessa *et al.*, 2018, 2019). In five events that we observed, we observed similarities to theory. However, we

also found instances not addressed by the theory. In the first case, we found that the MTS RtL was bifurcated such that the leadership team had higher RtL while the MTS as a whole had lower RtL. In the second case, we found that triggers can be reinterpreted over time and that this reinterpretation can drive different learning processes. In both cases, we found that generative learning processes led to a greater number of and more diverse codifications than adaptive learning processes. In both cases, we also observed that when learning flowed from one team into the system, the team (leadership or component) was a stable, not fluid part of the system.

Implications for research

These two case studies suggest that the initial theoretical model (Sessa *et al.*, 2018, 2019) can be used to frame additional research. Although we were able to observe most components of the model, more work is needed. Three areas stimulated by this research include trigger reinterpretation over time, a richer conceptualization of RtL (particularly when leadership or component teams are fluid), and a more nuanced understanding of how learning outcomes are codified. Clearly, we need to study different types of learning processes (including transformative), how they are triggered, the timing of the triggers, how RtL affects the learning processes, and how learning flows through the system (including both triggering additional learning and continued learning over time) and is encoded. We chose to observe the learning in our case studies at the macro level while others have focused on the meso level (DeChurch *et al.*, 2020). Additional theory and research are needed at all three micro, meso, and macro levels. Other future research must move into a more deductive phase with hypothesis testing and move from qualitative to quantitative research. In addition, this study suggests that we should consider a broader array of MTSs to determine how differences in compositional attributes, linkage attributes, and developmental attributes (Zaccaro *et al.*, 2012), as well as boundary conditions, impact the learning process. Finally, more applied research is needed to determine how to help an MTS characterized by fluidity unify and work and learn as a unit.

Implications for practice

Although more research is needed to better understand learning processes in MTSs, our research suggests that there are things that OD practitioners and MTS leaders can do already to help MTSs capitalize on learning processes beginning with the realization that MTSs can and do learn and develop. These include the following:

- Develop ways of measuring and assessing RtL. Help leadership teams use these measures to diagnose and improve themselves and the MTS.
- Help the MTS form and develop into a more sophisticated system (with particular attention to the impact of the entry of new leadership or component teams).
- Help leadership teams design and institute procedures into MTSs to ensure that scanning and interpretation are taking place.
- Help component teams understand their role in the larger MTS system, including a big picture perspective and where they fit. With the knowledge that individuals and component teams need to focus on doing their jobs and accomplishing their goals, the leadership team can provide coordinating and communication mechanisms. Help ensure that component teams have the resources to work within the system (for example, FAQs, who to access for what, etc.)

- Coach leadership teams on how to use charters, debriefs and training exercises to prompt generative learning processes when needed. Help leadership teams incorporate review processes into MTS practices before, during, and after events.
- Help the leadership team recognize that they are responsible for encoding learning into the system via standard operating procedures, practices, processes, and structures, so that future iterations of the MTS can benefit. Help them make these readily accessible to component teams.

Conclusion

This case study used a recent MTS learning theory supplemented by additional MTS literature to stimulate research questions and guide observations and analysis of 2 music production MTSs. As suggested by theory, findings support the idea that learning triggers, the timing of the triggers, and RtL are associated with the type of learning process that emerges and outcomes. While this study demonstrated that the theoretical model can be used to frame additional research and can be used practically, it also outlined some places that the model should be refined.

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