

Knowledge flow from the top: the importance of teamwork structure in team sports

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Research questions: Downward managerial knowledge flow is essential for teamwork to function, yet the capabilities that coaches utilize to transmit knowledge to their players remain understudied. Drawing on contingency theory and the tacit–explicit knowledge distinction, the paper explores how and why managerial capabilities are used for knowledge flow in two different sport teams, organized with tall and flat teamwork structures.

Research methods: Case studies are presented of two Division I (National Collegiate Athletic Association, NCAA) sport teams in a major university located in the northeastern USA, representing tall and flat teamwork structures (American football and ice hockey). Data include a total of 30 in-depth interviews of coaches and players, along with observations of team meetings, games and practices collected during 11 months.

Results and findings: Findings reveal different knowledge flow patterns in the two cases. In a tall teamwork structure, capabilities focused on turning tacit managerial knowledge into explicit, subordinate knowledge. In a flat teamwork structure, capabilities emphasized transmitting tacit knowledge to players.

Management implications: The findings apply to team sports, franchises, sport leagues and, more broadly, to organizations that are concerned with understanding how knowledge flow is contingent upon the nature of the work. Specifically, the findings suggest that different knowledge flow capabilities can serve two functions: either to standardize work and maximize efficiency or to foster creativity and empowered learning.

Keywords: knowledge flow; organizational structure; sport teams; knowledge management; knowledge work

Introduction

Knowledge flow is a defining feature of successful teams and organizations ([Ancona & Caldwell, 1992](#); [MacNeil, 2003, 2004](#); [Mintzberg, 1973](#)) and is a necessary precursor for learning and creativity to create a competitive edge ([Nonaka & Takeuchi, 1995](#); [Zack, 1999](#)). Existing research in the knowledge management field places great emphasis on knowledge flow, which generally refers to the transfer of knowledge from one unit to another ([Erhardt, 2011](#); [Erhardt, Martin-Rios, & Way, 2009](#); [Jones & Mahon, 2012](#); [Martin-Rios, 2014](#); [Martin-Rios & Erhardt, 2008](#); [Rivière & Walter, 2013](#); [Zhao & Anand, 2009](#)), and has been examined through a broader knowledge management lens in

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sport contexts (e.g., Halbwirth & Toohey, 2001). However, capabilities for knowledge flow in team sports have received less attention. This is surprising given that team sports require significant knowledge flow between coaches and players; coaches not only need to transmit knowledge to coordinate roles and execution, but also to foster conditions for knowledge creation and learning among players on and off the field.

Managerial capabilities for knowledge flow, which we define here as a coach's decision to transmit knowledge to players, may be impacted by the need to transmit different knowledge, however. Coaches' knowledge of the game is generally gained over time and viewed as an asset and performance predictor (Cunningham & Sagas, 2004). Research in the general management field suggests that managerial knowledge generally involves a higher level of understanding of the operation. Managers (i.e., coaches) need to make decisions to address unanticipated events or problems that require tacit knowledge (Bennett, 1998; Hori, 2000; Wagner & Sternberg, 1985, 1987; Yim, Kim, Kim, & Kwahk, 2004). Others note that non-managerial knowledge typically involves more technical (i.e., explicit), task-related knowledge (Tan & Libby, 1997), which implies that knowledge flowing from managers to their team members (i.e., players) is generally more explicit. Yet, research on knowledge work would contradict the idea that tacit and explicit knowledge is tied to a person's organizational title or status. For example, complex, empowered teamwork requires tacit knowledge (e.g., Erhardt, 2011), which suggests that managerial capabilities for downward knowledge flow can involve the transmission of a great deal of tacit knowledge as well. This explicit–tacit debate raises important questions as to coaches' decisions to share explicit (e.g., technical and concrete aspects of the game) and tacit (high-level strategies and intuition aspects of the game) knowledge with their players.

Contingency theory (e.g., Galbraith, 1972; Miller, 1988), which argues that there is no one best way to organize knowledge flow, offers a helpful lens to reconcile this debate and shed more light on tacit–explicit knowledge flow. Previous research shows a range of psychological, social, organizational and systems contingency factors impacting knowledge flow including trust (MacNeil, 2003), conflict resolution (Panteli & Sockalingam, 2005), supervisory supportiveness (Janssen, 2005), psychological safety (Edmondson, 1999), social networks opportunities (Collins & Clark, 2003), knowledge-based human resource management systems (Erhardt et al., 2009; Jackson, Hitt, & DeNisi, 2003), knowledge management systems (Maier, 2004) and coordination systems (Gittell, 2001).

A key contingency factor that this study examines is how the structure of the teamwork itself impacts the capabilities for knowledge flow in team sports. Organization research defines teamwork structure as a system of coordinated tasks, activities and supervision directed to the achievement of a team's goals (Cascio, 1992; Hinds & Kiesler, 1995; Miles & Snow, 1978; Relvas, Littlewood, Nesti, Gilbourne & Richardson, 2010). In their seminal work, Burns and Stalker (1961) outlined two polar ways work is organized: tall or flat structures, where the former rests on clarity, fixity and hierarchical layers, whereas the latter is based on uncertainty and flexibility, with minimal chain of command. That is, tall organizations generally operate with a stable structure based on efficiency, whereas flat organizations generally operate with a dynamic structure to respond to change; these structures likely influence capabilities for knowledge flow. This research focuses on disentangling how and what knowledge flows from coaches to their players in two different teamwork structures. To do so, we adopt a qualitative, case-study approach utilizing two sports teams: American football (representing a tall teamwork structure) and ice hockey (representing a flat teamwork structure).

The remainder of the paper is organized by first framing the paper around the tacit–explicit knowledge debate and linking it with research on knowledge flow. Next, we discuss the relevance of managerial and non-managerial knowledge and link the discussion with organization research on work structure, which motivates our two general research questions. Through our fieldwork and analysis, the findings outline the role of tacit and explicit knowledge and how managerial capabilities for knowledge flow occur in tall and flat teamwork structures. In the discussion section, we then theorize why tall and flat structures call for different managerial capabilities for knowledge flow. One teamwork structure is geared towards standardization and efficiency, and the other is geared towards empowerment and creativity. This is followed by a set of grounded propositions based on our fieldwork and analysis. Finally, this paper concludes by offering practical applications to other sport settings and directions for future research.

Conceptual background

Over the last few decades, extant research shows a range of conceptualizations and taxonomies of knowledge (e.g., [Lam, 2000](#)). Knowledge has been defined as experience ([Conroy & Soltan, 1998](#)), solutions ([Snider & Nissen, 2003](#)), explanations ([Paris, Lipson, & Wixson, 1983](#)), conditional (know-when; [Bock, Zmud, Kim, & Lee, 2005](#)), axiomatic (know-why; [Sackmann, 1992](#)), transactive memory (know-who; [Wegner, 1986](#)), declarative (know-what, i.e., facts; [Mohammed & Dumville, 2001](#)) and procedural (know-how; [Anderson, 1983](#); [Balconi, 2002](#); [Kogut & Zander, 1992](#)). None of these definitions, however, seems to be universally appropriate, as the conceptualizations are dependent on the context ([Sfard, 1998](#); [Sveiby, 1997](#)).

Underlying these conceptualizations of knowledge is the level of tacitness, which impacts the ease or challenge for knowledge flow ([Polanyi, 1966](#)). Whereas explicit knowledge, expressed in declared and written rules, policies and directives, can be articulated and codified in symbols (e.g., documents, charts, emails and reports) and communicated through these symbols to other people, as knowledge turns more tacit, it becomes increasingly difficult to articulate, explain and share ([Kogut & Zander, 1996](#); [Nonaka & Takeuchi, 1995](#); [Winter, 1987](#)). Yet, tacit knowledge may be transferable given the proper managerial capabilities. A frequent quotation of Polanyi (1966, pp. 4–5) states ‘we can know more than we can tell’, which he further explains:

We know a person's face, and can recognize it among a thousand, indeed among a billion. Yet we usually cannot tell how we recognize a face we know. So most of this knowledge cannot be put into words. But the police have recently introduced a method [facial composite technology] by which we can communicate much of this knowledge... This may suggest that we can communicate, after all, our knowledge of a physiognomy, provided we are given adequate means for expressing ourselves.

Scholars offer a number of theoretical models influenced by a tacit–explicit distinction to describe aspects of different knowledge flow (e.g., [Augier, Shariq, & Vendelo, 2001](#); [Davenport & Prusak, 2000](#); [Jones & Mahon, 2012](#); [Osterloh & Frey, 2000](#); [Schultze & Boland, 2000](#); [Spender, 1996](#); see [Wang & Noe, 2010](#) for a review). The debate has typically centred on the importance of tacit and explicit knowledge flow within teams or organizations. However, little attention is given to the idea that tacit and explicit knowledge flow may call for different managerial capabilities.

Two streams of literatures have emphasized the importance of distinguishing tacit from explicit knowledge. The first stream grapples with understanding how managerial knowledge is different from non-managerial knowledge (or technical knowledge; [Abdolmohammadi & Shanteau, 1992](#); [Brockmann & Anthony, 1998](#); [Smith, 2001](#); [Stone, Hunton, & Wier, 2000](#); [Yim et al., 2004](#)). Much of this literature builds on work by [Wagner and Sternberg \(1985\)](#) that identifies managerial knowledge as a distinct set of tacit knowledge about managing self (maximizing task productivity on the right tasks), managing others and managing career (making sure superiors see your work as valuable and in alignment with organizational goals). [Tan and Libby \(1997\)](#) note that performance relates to different knowledge sets. For example, staff accountants (generally in non-managerial roles) rely primarily on technical knowledge, while senior accountants (generally equivalent to entry-level managers) view both technical and problem-solving knowledge as important. However, they note that for accounting managers, managerial knowledge, not technical or problem-solving knowledge, is the strongest predictor of job performance.

The second stream of literature, research on knowledge management, suggests that the work of non-managers (i.e., team members) can involve much tacit knowledge (e.g., [Berman, Down, & Hill, 2002](#); [Enberg, Lindkvist, & Tell, 2006](#); [Ryan & O'Connor, 2009](#); [Salisbury, 2001](#)). Given the complex questions and non-routine work, this type of work requires problem solving, learning and creating new solutions to address unanticipated problems where flow of tacit knowledge is essential ([Erhardt et al., 2009](#)). While these two research streams suggest that both managers and some team members use tacit knowledge, the use of different managerial capabilities for transmitting explicit or tacit knowledge may be rooted in the structural properties of the nature of the work itself ([Du, Ai, & Ren, 2007](#); [Erhardt & Gibbs, 2014](#)).

Structural properties of teamwork

There is an extensive body of research on work structures in the organizational theory domain, which has used various notions to describe how work can be organized, including: horizontal and vertical ([Aoki, 1986](#)), soft bureaucracy ([Courpasson, 2000](#)), sequential and reciprocal ([Thompson, 1967](#)), collaborative ([Heckscher & Adler, 2006](#)) and networked structures ([Martin-Rios, 2014](#)). Underpinning this research is the issue of centralized managerial control versus decentralized employee empowerment; efficiency versus flexibility as outlined by [Burns and Stalker \(1961\)](#). Organizational research has also influenced team-level research on structure ([Mohrman, Cohen & Mohrman, 1995](#)).

Teamwork organized around a tall structure is characterized by formal rules, rigid structures and standard operating principles. The tendency towards a tall structure increases as the team expands in size and when it operates in stable and predictable environments ([Adler & Borys, 1996](#); [Barker, 1993](#)). In this type of teamwork, team members receive and implement directives from above through a layered chain of command, typically focusing on operating efficiencies gained through standardization and specialization of tasks and duties, responsibilities and processes ([Thompson, 1967](#)). In contrast, flat teamwork structures are designed for flexibility, creativity and learning and are made possible through empowering individuals ([Drucker, 2009](#); [Duncan, 1976](#); [Heckscher & Donnellon, 1994](#); [Kogut & Zander, 1996](#)). Scholars who study flat structures stress the value of employee engagement by moving decision-making to those closest to the problem for speed and flexibility, which is made possible by vertical and

horizontal knowledge flow within the team (Gittell, 2001; Malone & Crowston, 1994; Mohrman et al., 1995; Schulz, 2001).

Organizational research has also influenced sport management research on sport teams and franchises regarding the importance of structural characteristics of specialization and standardization (e.g. Mansfield & Killick, 2012). In sports, the structural properties of teamwork are very much influenced by the nature of the sport. For example, in Formula One racing, the driver is central to the team, and is supported by the team administrators who handle contracts, legal issues and races, the team sponsors that support the team financially and the team technicians responsible for the car, performance, fuel and technical analyses. More flat structures can be observed, for example, in football; teams are generally less hierarchically structured, including players, non-playing members (coaches and support staff), management members (handling contracts, recruiting, schedules) and medical staff.

While structures in team sports can be highly complex and are further complicated by blurred lines between team members and non-team members (e.g., sport volunteerism; Park & Kim, 2013), the structural properties of sport teams (i.e., tall or flat), as they link with capabilities for knowledge flow, remain understudied. Our analytic boundary conditions (Gully, 2000) of knowledge flow capabilities is on the downward flow of knowledge that occurs between the coaches and their players; representing a team as our unit of analysis. Specifically, our central research questions explore *how* and *why* managerial capabilities for explicit and tacit knowledge flow operate differently in these two types of teamwork structures. Formally, the research questions states:

RQ1: How are managerial capabilities used to transmit explicit and tacit knowledge to team members?

RQ2: Why do these capabilities operate differently in tall and flat teamwork structures?

Methods

Data collection

The two teams in this study played in National Collegiate Athletic Association (NCAA) Division I men's leagues at a major state university located in the north-eastern USA. Each team had a winning season during the time of data collection: the American football team had an impressive record, winning seven of eight games and advancing to the quarter finals in their conference, and the men's ice hockey team made the national playoffs, indicating that both teams were highly successful.

In keeping with the canons of inductive research (Glaser & Strauss, 1967), this study includes several sources for data collection to triangulate the data (Mathison, 1988). Part of a larger research project, the bulk of our data were collected through recordings and transcripts from a total of 30 semi-structured interviews with male players and coaches. From the American football team, we interviewed the head coach, coordinators (offence, defence and special team), an assistant coach, offensive players and defensive players (follow-up interviews were conducted with the head coach, one coordinator and two players). From the ice hockey team, we interviewed the head coach, associate coaches, offensive players and defensive players (follow-up interviews were conducted with the head coach, one associate coach and two players). We also collected supplemental data through observations and recordings of team meetings and observations of practices and

games. Using a range of methods to study the teams at work not only strengthens reliability and validity, but also allows for a more in-depth understanding of the relationships under investigation, both from a spectator's view of the game and from a deeper understanding about how coaches engage in knowledge transfer. Data collection continued for 11 months, until reaching the stage of 'theoretical saturation' ([Glaser & Strauss, 1967](#)). [Table 1](#) outlines the list of informants and the source of data.

Sample questions from semi-structured interview template include:

- Coaches:
 - Tell me how and what knowledge you share with the players.
 - Is your knowledge (e.g., game strategies, tactics) changed as you communicate with the players? If so, how and why?
 - To what extent do players need to know the overall game strategy?
- Players:
 - How does the coach share knowledge with you?
 - What knowledge is given to you by the coach (e.g., overall game strategies, role-specific tasks)?
 - How does he help you understand these elements of the game?

We used the university campus to interview coaches and players. Coaches and players were informed their participation was voluntary, and all accepted their requests for interviews. We assured interviewees that their answers would not be linked with their name and would be reported anonymously. Given our grounded theory approach, where data and analysis oftentimes run parallel ([Miles & Huberman, 1994](#)), we conducted a series of follow-up interviews to probe deeper into the patterns discovered in our analyses regarding how knowledge transfer occurs between coaches and their players. In addition

Table 1. List of informants and source of data.

Interview data	Number	Observational data	Number
<i>American football</i>	15	Team meetings	3
Coach		Practices	4
Head coach	2	Games	6
Offensive coordinator	2		
Defensive coordinator	2		
Special teams coordinator	1		
Assistant coach	1		
Player			
Offensive player	4		
Defensive player	3		
<i>Ice hockey</i>	15	Team meetings	3
Coach		Practices	6
Head coach	2	Games	9
Associate coach	2		
Associate coach	1		
Player			
Offensive player	6		
Defensive player	4		
Total	30	Total	31

to the interviews, the researchers further observed the teams (in team meetings, practices and games) to validate informants' statements with actual knowledge transfer. Thus, the data include observations of a total of 61 field events.

Coding and data analysis

We built grounded theory based on a coding process to identify patterns and themes that constituted the basis for our theory to explain how and why managerial capabilities are used for knowledge flow in two different sport teams, which ultimately resulted in a set of grounded propositions. Accordingly, we organized data for cross-case pattern sequencing (Eisenhardt, 1989) and tabular displays (Miles & Huberman, 1994). These are appropriate methods when reporting results from exploratory case studies and are widely applied in management research (Chandler, 1988; Mintzberg, 1989). We adopted Miles and Huberman's (1994) three-stage coding process, involving open coding, axial coding and selective coding, to explore how coaches transmit knowledge to their team members. The first author generated an initial coding scheme of the data from the interview transcriptions (500 pages) and from notes about the observations. Utilizing the initial coding scheme, a research assistant coded a sample from 10 interviews to assess the validity of this process.

We then generated a list of 42 descriptive codes about how knowledge flow occurs in the two different team structures. Next, all authors, along with two research assistants, individually sorted and grouped the initial descriptive open codes into more analytical categories (axial coding) that would represent and explain capabilities for knowledge flow. In a series of discussions, we compared and contrasted individual codes, eliminating unnecessary codes and merging overlapping ones. Finally, all three researchers analysed and grouped these categories into larger themes that would serve as the foundation of the overall theoretical framework to understand capabilities for knowledge flow. Table 2 contains examples of codes for each stage.

Two cases of sport teams

One challenge with using sports as a context to study knowledge flow is that readers vary with respect to their understanding of the sport (as they do with the details of specific teams and organizations); some readers are not familiar with the sport at all, which creates difficulty trying to understand and relate with the phenomenon under investigation. Additionally, some readers are very familiar with the sport and could quickly point out exceptions to patterns noted in our fieldwork, making any transferability of our findings difficult. Given this dilemma, we decided to examine each sport at the aggregate level and divide the individuals associated with each team into two groups: coaches and players.

American football and ice hockey are highly technical and complex games. In American football (with its roots stemming from rugby football), two teams, with 11 players each on the field, attempt to score points by advancing the ball into their opposing team's end zone. Players can score points by carrying the ball over the opponent's goal line, catching a pass thrown over that goal line, or kicking the ball through the opponent's goal posts. The team includes a total of 70–80 players during the season and a coaching staff of 13. A large team makes division of labour critical and naturally creates a tall teamwork structure with clear roles and a multi-layered chain of command (Keidell, 1987). Players are members of three sub-teams (offence, defence and special teams), with

Table 2. Open, axial and selective coding for knowledge flow capabilities.

Open codes	Axial codes	Selective codes
American football <ul style="list-style-type: none"> • Telling • Set plays • Coaches know • Sheet of info • Play book • Documentation • Doing your job • Dummy it down 	American football <ul style="list-style-type: none"> • Scripted plays (turning tacit to explicit) • Management control (centralized knowledge flow) • Channels of communication (chain of command) • Codified instructions (documentations) • Conforming (follow of explicit assignment) 	American football <ul style="list-style-type: none"> • Scripting • Simplification • Individual directives
Ice hockey <ul style="list-style-type: none"> • Guiding • Instructing • Showing • Describing • Systems • General guidelines • Instant feedback • Grasping • Freelancing • Skeleton agenda • A few things to emphasize 	Ice hockey <ul style="list-style-type: none"> • High-level understanding (loosely defined system) • Tacit game sense (intuition to anticipate) • Improvisation (empowered alternative solutions) • System implementation (practising general principles) • Non-scripted communication (general points to emphasize) • Shared strategic thinking (understand the overall system) 	Ice hockey <ul style="list-style-type: none"> • General principles • Exemplifying • Experiential learning

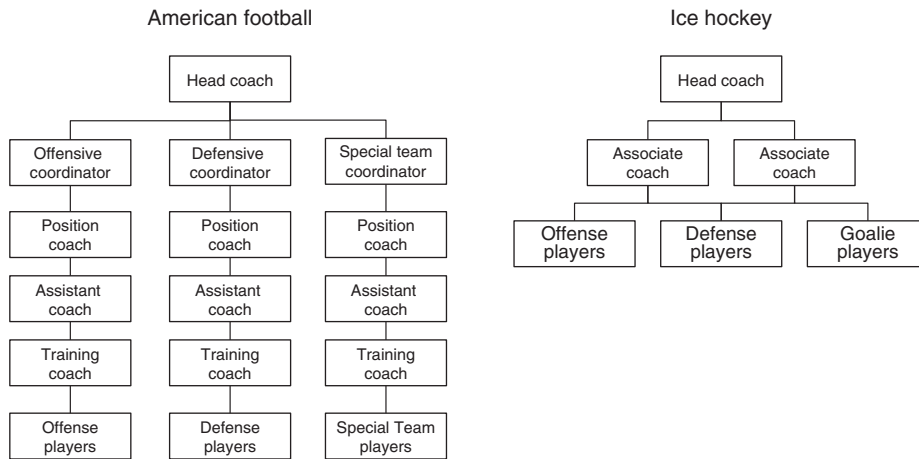


Figure 1. Teamwork structures in American football and ice hockey.

11 different roles for each sub-team. [Figure 1](#) depicts each role and the number of hierarchical layers of coaches through which knowledge must flow.

Ice hockey is played on ice, where the players use sticks to shoot a hard rubber puck into their opponent's net. The team includes three coaches (a head coach and two associate coaches) and 25 players, including forwards, defencemen and goalkeepers. With the exception of penalty time, each team has six players on the ice: five members on the ice skate up and down the ice trying to take possession of the puck and score a goal against the opposing team, and a goalkeeper tries to stop the opponent's puck from entering the goal. Ice hockey has a more flat teamwork structure – with fewer coaches reducing the layers through which knowledge flows (Mohrman et al., 1995; see [Figure 1](#)). The relatively small size of the team, along with a wider span of control, further contributes to a flat structure (in contrast to American football).

Findings

The findings revealed two distinct sets of managerial capabilities necessary for knowledge flow, driven and influenced by each teams' work structure (see a conceptual map outlined in [Figure 2](#)). Coaches of the American football team turned tacit knowledge into more explicit knowledge through three core knowledge flow capabilities: scripting, simplification and individual job directives. In contrast, coaches of the ice hockey team adopted knowledge flow capabilities that conveyed tacit knowledge to players through general principles, exemplifying and experiential learning.

Knowledge flow in American football

In American football, coaches' responsibilities included a high-level strategic game plan, relying on scouting reports, and intuition about strategy options, which informed weekly practice routines for each subunit. The coaching staff dedicated a great deal of energy and effort to turn their tacit, managerial knowledge into explicit knowledge for the players. In order to address a team of 70–80 players, each role and knowledge delivery responsibility was broken down in great detail among coaches and players, as one coach explained:

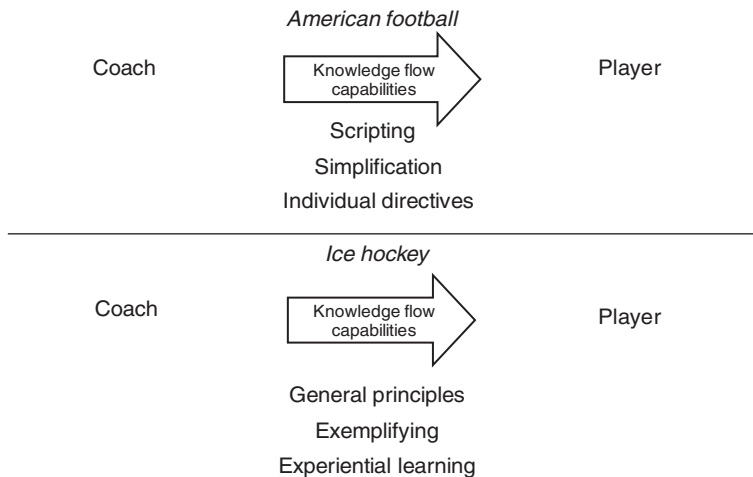


Figure 2. Managerial capabilities for knowledge flow in American football and ice hockey.

In each play, there are 27 different things happening at the same time. So we have to break it down to each component, if not, it would be a very slow process. We have coaches that [*sic*] have very specific jobs. Each coach has their own strength; they can refine their part and then later bring it together to the overall team. It's much more efficient and you can get more things done.

Scripting

The first managerial capability for knowledge flow that emerged in our data analysis is referred to as scripting. Scripting was a process where managerial tacit knowledge is turned into explicit player knowledge by codifying (writing down) the knowledge as detailed instructions for each player about what to do in a particular situation. Scripts were detailed directives describing the nature of each individual assignment (play) and the role of each person. These scripts were shortcuts for coaches to communicate with players. As the head coach explained: 'We script our plays, you know. We have a coach, say, the offensive coordinator, he would have a script of plays to run during the different situations that come up within a game'.

When the coach called a play (e.g., 'Blue 39'), the players were required to know their individual assignment in that particular play. Coaches used scripts in practices as detailed blueprints for players, which specified how players (for different positions) should move their feet and hands, as well as the exact running pattern on the field for each player for each play (e.g., for defensive line, the script included short and precise rules: 'feet are narrower than shoulder width', 'butt is higher than shoulders', 'weight is on the down hand and front foot'). Coaches drilled these plays over the week through training periods as one player explained: 'Our position coaches, they write out the practice script where we have about 22 periods which are about five minutes long and they break it down so every five-minute period, we are working on something different'.

Scripts given to players operated as an action to be executed, whereas the coaches controlled the thought processes and decisions about how and when to choose a particular play, as one senior player explained:

So you know, the coach, the defensive coordinator has a chart of the personnel and he has a chart of what defensive calls we are going to make for those certain plays. ...it's all just kind of laid out for you. It's not just off the top of your head. But that's how it's given.

As such, scripting as a capability required coaches to boil down the essence of each play into specific instructions that would be easily transferable to each player.

Simplification

Knowledge flow in a tall teamwork structure also required an element of simplification in order to prepare the players for the game. Coaches spent a significant amount of time reducing the complexity of the coming week's game for each player, which we refer to as simplification: a capability whereby coaches simplified managerial knowledge into simpler cognitive chunks of explicit knowledge. This simplification was carried out to eliminate knowledge that was not directly related to each role. That is, coaches purposefully replaced higher-level tacit knowledge (involving the overall game plan, strategy and the underlying logic about play design and selection) with technical explicit knowledge necessary for an individual to carry out a specific task, independent from other players. As such, players operated on general knowledge about the strategic aspects of the game, as one coach explains: 'we will dummy it down to where the team, the offence, has a basic understanding of the game plan'.

The goal of simplifying was to remove the strategic thinking from the players. That is, the scope of the overall strategy of the weekly game plan was less critical than understanding the technical aspects of a particular play, as one coach explained:

Because all of the sudden they [players] are in a situation and they always run it this way, but it is different this week. He forgets what I said why it is different this week, now he is hesitant. A term we use is analysis to paralysis. That is something that is always a part of my coaching philosophy that I take. Don't give them too much because if they start analysing everything, they are going to start slowing down.

Accordingly, coaches aimed to transmit simplified, task-specific explicit knowledge for execution that required minimal strategic processing, in order to maximize execution efficiency.

Individual directives

Turning managerial knowledge into explicit player knowledge also seemed to diminish the importance of knowing others' roles and responsibilities. During the interviews, players and coaches clearly emphasized a narrow focus of 'doing your individual job'. Coaches carefully documented each player's specific objective and role, and expected players to carry out and deliver the specific assigned tasks. All players received a playbook in the beginning of the week for the upcoming weekend's game, which outlined their jobs, or roles, as a senior player explained:

a lot of it is written. We'll all receive the packets regarding the game plan that comes from the coaches. And we are required in our free time to study these game plans and get a basic understanding of it.

Most players did not need to know the other players' jobs, which resulted in little overall interconnectedness among players. Understanding how each job linked to the others remained a managerial concern, while players generally executed their individual directives (i.e., where to be, which path to run, who to block), as one of the coaches explained:

We can't have players trying to do other players' assignments. Each player has to execute their own. That's how the game works; follow your own assignment and trust that the others do theirs. If they don't, the system would fall apart.

In sum, all three knowledge flow capabilities in football involved ways of turning tacit managerial knowledge to explicit player knowledge. Knowledge flow was possible by codifying managerial knowledge into scripts. In addition, coaches stressed the importance of simplifying knowledge by divorcing the overall logic for each play from the overall game plan before transmitting the knowledge to players. Finally, the emphasis on individual roles furthered the importance of transmitting detailed explicit knowledge.

Knowledge flow in ice hockey

In ice hockey, similar to basketball, football and field hockey, players must 'read and react' to the situation on the ice with little direct input from coaches (Wolfe et al., 2005). Players must also know and adjust to their teammates' skills and actions, driving a flat teamwork structure. Our fieldwork suggests that a flat teamwork structure calls for a different set of managerial capabilities for knowledge flow.

General principles

The first knowledge flow capability that emerges from the analysis involved codifying general principles. Similar to American football, ice hockey had a codified playbook. However, this capability operated very differently; ice hockey's playbook was written with a higher level of abstraction in loosely defined and general terms (e.g., 'pressure for turnovers', 'when in doubt, play simple', 'be defensively minded'). At the core of the team's action was the team's system – a high-level guiding framework that established a collective mindset of a general game strategy that all players had to abide by.

This high-level system was operationalized with a brief playbook. In contrast to the American football playbook (containing anywhere from 50 to 80 pages of detailed plays in any given week), the ice hockey team used a short and concise playbook of 4–5 pages. This high-level framing of the game outlined general principles that remained relatively stable over the season, while still providing flexibility, as one coach explained:

There's a kind of skeleton of what we're going to do, but there are little adjustments we make throughout. But nothing set in stone. We try to stay away from right and wrong. If you have a rigid system that you have to be in a specific spot every time, is not as effective.

The focus on general principles allowed for creativity and empowerment. That is, the players themselves often decided the process of how to play; what mattered according to the coach was the outcome of their effort, as he explained:

We don't care how you do it. If you can carry it into the defensive zone, that is fine. If he has to dump it, that's fine. But the end result has to be that the puck gets deep. So there is a lot of different ways to achieve the end result.

At times, coaches used players themselves to further the understanding of the general principles to the rest of the team, as one coach noted, 'Sitting around the locker room. A couple of times this year I came in and said "hey, Josh, what are you going to do tonight to help us win?" And he said, "have good gaps, and finish my checks"'. Thus, general principles provided boundary conditions in which players exercised freedom to approach situations on the ice.

Exemplifying

The use of general principles meant that much of the knowledge transmission remained tacit. In order to understand high-level, general principles, players had to understand the context in which they would adopt and execute said principles. Coaches noted that conveying this tacit knowledge was challenging, however. In order to increase understanding, coaches used a capability that we refer to as exemplifying, whereby coaches had discussions with players while looking at video clips, conceptual drawings and highlights of key learning situations, to further drive understanding among players. One coach explained:

If we see a player, anytime it is a great hockey play, we're going to show it. Whether it is a Gustav, whether it's Josh or whatever, John, our fourth line. We want to encourage those types of plays, so if we see one, we are going to show it.

Another coach noted the importance of reinforcing tacit principles through discussion as soon as possible after a play:

A guy will come to the bench and I'll say 'hey Nick that was great! We talked about that during practice, when to pressure and when not to pressure. That time he had his back to you and you saw you could jump him and you did pressure, and you forced a turnover – great job!' I'll say 'here's what I was talking about'. And I will show the exact same clip. So then it sinks in and it reinforces.

Frequent, exemplifying discussions following key events allowed players on the team to develop a better understanding about execution in a specific situation, while at the same time conveying how to use the team's general principles.

Experiential learning

Experiential learning was our final, and related, knowledge flow capability uncovered in this fieldwork. Experiential learning was a capability whereby the coaching staff used their managerial knowledge to set up purposeful experiential learning situations to try to transmit desired tacit knowledge to the players. In addition to explaining and discussing how to problem solve (i.e., exemplifying), an element of doing as a transmission capability was salient in this fieldwork. In American football, the highly standardized and repetitive drills the coaching staff designed and the players strictly followed reinforce the scripts. In contrast, ice hockey coaches transmitted tacit knowledge by developing drills

that gave players experience in a variety of situations. These drills were critical to develop judgement through experience, as one coach explained: ‘It is not cookie-cutter, you know. There is a lot of freelancing that goes on during the game within the system’. Another coach further elaborated:

It’s key to not give them a sheet of what we’re doing. It’s reinforcing hockey sense [tacit knowledge], making plays, having the guts to make plays during practice. So most of our drills and the small games we do we are trying to encourage guys to make plays.

In contrast to football players, who had clear roles and responsibilities for each play, ice hockey coaches created space for players to develop tacit understanding of game situations through trial and error. These learning episodes, within the given parameters of the system, seemed vital for ice hockey players to develop their own solutions and skills to play.

In sum, three knowledge flow capabilities in ice hockey emerged as methods that coaches used to transmit knowledge to players in a flat teamwork structure. The first capability involved conveying general principles (in contrast to specific scripts) to understand the overall system. Second, coaches transmitted tacit knowledge by focusing on illustrative examples to drive tacit understanding of the game among players. Third, experiential learning episodes further transmitted tacit knowledge, which allowed players to better understand, process and create their own solutions.

Discussion

Organizational research has identified teamwork structure as a key factor that dictates many organizational activities (Du et al., 2007; Szulanski, 1996; Tan & Libby, 1997). Research specifically on sport management that accounts for teamwork structure is limited, however. Existing research has examined the role of structure across different units of analysis, including team and franchise development (Mansfield & Killick, 2012), and club team and youth development (Relvas et al., 2010). We add to this limited research by drawing on knowledge management and contingency research to build grounded theory for two sets of knowledge flow capabilities that coaches adopt in different teamwork structures. Specifically, first, our findings suggest that the nature of knowledge flowing from coaches to players is contingent upon tall or flat teamwork settings. Second, managerial capabilities for knowledge flow appear to operate differently in tall and flat teamwork structures. That is, coaches in a tall teamwork setting emphasized capabilities to turn tacit managerial knowledge into explicit player knowledge. In contrast, coaches in a flat teamwork structure relied greatly on capabilities to transmit tacit knowledge to their players. Based on our findings and extant research, we will next elaborate and develop testable propositions to explain why and how knowledge flows in tall and flat teamwork structures.

Towards a grounded theory of knowledge flow

This study raises theoretical contributions for research on knowledge as a dynamic entity. A funding pillar of the knowledge management field is the tacit–explicit knowledge distinction (Polanyi, 1966). Nonaka and Takeuchi (1995) suggest that tacit and explicit knowledge operate on two ends of the same spectrum (i.e., tacit to explicit), and that the

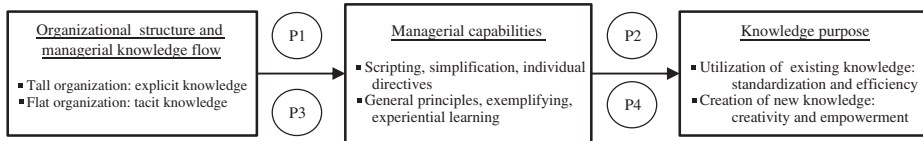


Figure 3. Theoretical framework: a contingency approach for managerial capabilities for downward knowledge flow.

nature of the knowledge itself oscillates between these opposing states. Furthermore, they point out that while knowledge flow is necessary for new knowledge to emerge, a dynamic process transforms knowledge, altering shape between tacit and explicit knowledge. The assumption is that knowledge transformation is not only important, but necessary, for building new knowledge (Lam, 2000). While our study supports Nonaka and Takeuchi's central thesis, we further add to this research stream by emphasizing the contingency factor of the team's work structure. That is, the findings reported here suggest that the relative importance of tacit and explicit knowledge flows vary in different teamwork structures; the underlying reasons rest on either the need for utilizing existing knowledge given by coaches or the need for learning and creating new knowledge among players. Figure 3 outlines our grounded theoretical model.

Specifically, our findings suggest that turning knowledge from tacit managerial knowledge to explicit non-managerial knowledge is more salient in a tall teamwork structure. The challenge in this type of teamwork is to transform managerial knowledge into principles, standards and rules for players. For example, a football player's role generally involved processing, understanding and utilizing explicit knowledge to carry out a pre-determined assignment. The knowledge flow capabilities that coaches use were designed to maximize understanding and reduce chances of errors that would otherwise undermine efficiency. Similar principles can be found in research using a metaphor of mechanistic operations (Bunderson & Boumgarden, 2010; Burns & Stalker, 1961; Erhardt, 2011).

Furthermore, given the high division of labour and the size of the team, knowledge flow required detailed directives in explicit, declarative knowledge protocols to promote conformity to rules (Heckscher & Adler, 2006; Mohammed & Dumville, 2001). Using American football as an example of tall teamwork structures, we would expect similar patterns in other sport contexts with a high division of labour (i.e., Formula One racing), narrow job descriptions, highly formalized and repetitive routines and requiring declarative knowledge focusing on technical directives. Thus, the first propositions state:

Proposition 1: In a tall teamwork structure, managerial capabilities for knowledge flow emphasize turning tacit managerial knowledge into explicit player knowledge.

Proposition 2: In a tall teamwork structure, managerial capabilities for knowledge flow are designed to transmit fixed principles for standardization and efficient utilization of explicit knowledge to players.

In a flat teamwork structure, our fieldwork suggests an emphasis on transmitting tacit knowledge from coaches to players. Much of this essential knowledge is experiential and intuition-based intended for problem solving (Leybourne & Sadler-Smith, 2006). The logic behind this type of knowledge flow is that each player must know how to approach

a variety of problems with less coaching oversight and less rigid operating procedures, which involves more tacit understanding of the game.

Furthermore, coaches provided overall guidelines in terms of general outcome expectations, leaving players to exercise their freedom to achieve the desired outcome through hands-on learning by doing. Encouraging different interpretations was critical for creating new knowledge, and the most successful ice hockey players could leverage tacit knowledge to create ‘something out of nothing’ in creative ways that added value to the team without coaching involvement. As such, much of the knowledge flowing from coaches to players was tacit. Using ice hockey as an example of a flat teamwork structure, we would expect similar patterns in other sport contexts where job descriptions are general and difficult to define with precision, and where the process of how to solve a given problem is uncertain and is part of empowered work. The second set of propositions thus states:

Proposition 3: In a flat teamwork structure, managerial capabilities for knowledge flow to players emphasize tacit knowledge.

Proposition 4: In a flat teamwork structure, managerial capabilities for knowledge flow are designed to transmit dynamic principles for empowered knowledge creation to players.

Contributions to practice

In spite of a great deal of academic attention on the role of knowledge in organizational success (e.g., [Grant, 1996](#); [Rivière & Walter, 2013](#)) and the importance of building learning teams and organizations ([Carlile & Rebentisch, 2003](#)), research on knowledge management has offered little suggestions to coaches about how to transmit their knowledge to players. This research outlines the idea that coaches deal with different types of knowledge, yet, some form of knowledge must flow downwards to the players in order to operate as an effective unit. Specifically, the findings presented here suggest that coaches need to consider the nature of the game in which they are operating before transmitting knowledge to their team members. Using one type of knowledge flow capability fosters more compliance and control, which may be desirable in tall teamwork structures to engage in routine or task-specific work. These findings represent new and exciting research opportunities in the field of organizational innovation ([Erhardt et al., 2009](#); [Heckscher & Martin-Rios, 2013](#); [Parga, Martin-Rios & Criado, 2013](#)).

For coaches in flat teamwork structures, this research, supported by existing research ([Gibson & Vermeulen, 2003](#)), suggests that coaches must transform their tacit managerial knowledge into tacit procedures and codified principles to guide players in experimentation and reflective communication. Conveying tacit knowledge requires efforts by coaches to foster discussions with team members to signal the importance of that knowledge and to provide opportunities to apply these discussions by practising in safe learning climates ([Edmondson, 1999](#)).

Generalizability to other sport context

Our study also has applications for sport management research and practice worth noting. Based on a contingency argument, this study suggests that flow of tacit knowledge is essential during decentralized decision-making in order to respond to new challenges and find new alternative solutions (i.e., creativity logic). Alternatively, the flow of explicit

knowledge supports a more centralized decision-making work structure to respond to formal guidelines and policies, which operate in a stable context in order to maximize current operations (i.e., efficiency logic). The creativity and efficiency patterns apply more broadly to sport organizations and franchises. For example, Mansfield and Killick (2012), in their study on franchise expansion of the women's netball in the UK, noted how decentralized and empowered teams in an immature league were able to adopt idiosyncratic tactics to expand and increase the visibility of elite netball across the UK and globally. However, as the league matured, the league became increasingly centralized, and teams found themselves having to adjust to more formalized regulations and policies, which increased work specializations within the team. Applying our findings, it implies that tacit and explicit knowledge flow would operate differently as the league moved from immaturity towards maturity.

Limitations and future research

There are several limitations with this study worth noting that may serve as starting points for additional research. For example, this paper does not explore the notion of hybrid forms of teamwork. Whereas tall and flat teamwork structures clearly occupy the ends of the continuum of teamwork structure, teams generally develop over time and organizational scholars have used various notions to describe them, including ambidextrous (Duncan, 1976) or soft bureaucracy (Courpasson, 2000) structures, which provides unique contexts for studying coach–player knowledge flow capabilities.

Another limitation worth noting is our focus on downward knowledge flow. While this focus is narrow in scope, this specificity also serves as a central contribution to current research, in contrast to research that explores knowledge flow more generally without distinguishing between directions of knowledge flow or actors (Wang & Noe, 2010). Additionally, although this paper theorizes why this knowledge flow occurs from coaches to players, this research does not take into account the degree to which knowledge flow happens at each layer. Instead of investigating all coaches and all players in the aggregate, an alternative approach is to examine the different layers of players and coaches that exist. For instance, most likely a captain of team, much like a boundary spanner (Gittell, Seidner, & Wimbush, 2010), needs to know more about the overall game than other players, and thus is likely managed by different managerial capabilities for knowledge flow. Along similar lines, the role of transferring tacit and explicit knowledge between members of the team is an important avenue worth exploring. During one of our interviews, one of the coaches stated the idiom that 'It's impossible to fake experience' implying that experience (i.e., tacit knowledge) must be learnt through actual experience. While some of our fieldwork supports this notion, an important research avenue would be to examine knowledge flow between more experienced members and inexperienced members (i.e., between head coaches and assistant coaches, and between senior players and junior players), and whether the capabilities change contingent upon level of experience.

To conclude, this study sets out to further understand and explain how knowledge flows from coaches to their team members in different types of teamwork. These findings described in some depth how knowledge flow occurs. However, this paper only begins to unpack the underpinnings of this process and we hope that our framework offered in this study will be a helpful point of departure for future studies.

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