



# A Conceptual Framework for Coordination in Global Virtual Teams

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## ABSTRACT

*Global Virtual Teams (GVT) are proliferating in today's work environment. While team diversity and space-time dispersion in GVT allow a range of benefits, they can also pose coordination challenges. However, the study of coordination in GVT has received little attention. This paper develops a framework of GVT coordination by conceptually studying the effect of GVT structure on different types of coordination and the impact of coordination on GVT outcomes. It describes the types of coordination that are required to manage specific GVT structures. Certain forms of coordination e.g., structural coordination and language and culture coordination, are required for specific types of task interdependencies. Team member characteristics bring into play different types of coordination e.g., language and culture coordination, role coordination, relational coordination, and temporal coordination. Collaborative technology accessibility characteristics can affect media coordination. Our conceptual framework also shows the interrelationships among different types of GVT coordination. Two important higher level forms of coordination i.e., task coordination and relational coordination, are likely to affect task-related outcomes and team-related outcomes respectively. The framework can provide a basis for future empirical studies on GVT coordination.*

## INTRODUCTION

Groups of geographically dispersed people who carry out interdependent tasks and communicate mainly through collaborative technologies are proliferating in today's work environment (Saunders 2000). Such Global Virtual Teams (GVT) can offer a number of benefits to organizations including increasing team members' productivity, reducing cycle time, and integration of diverse knowledge. While team diversity and space-time dispersion in GVT allow a range of benefits, they can also pose challenges to the development of effective teamwork. For example, communication barriers may arise from team diversity and feedback delays in communication media (Dube and Pare 2001).

The fundamental activity to achieve effective teamwork is coordination (Zigurs et al. 2002). While coordination in traditional teams and other settings has been well studied in a number of disciplines (Malone and Crowston 1994; Wooldridge 2002) as a means for planning, supervision and control, coordination in GVT presents more complex challenges and has received little attention (Zigurs et al. 2002). The limited studies of GVT coordination (e.g., Montoya-Weiss et al. 2001; Wang et al. 2001) have addressed certain aspects such as temporal and role coordination. However, as much as these studies contribute pieces towards the overall puzzle of GVT coordination, there are still plenty of missing pieces. For instance, under what circumstances do GVT need different types of coordination? What are the interdependencies be-

tween different types of coordination? How do the different types of coordination affect effectiveness of teamwork?

In this study, we attempt to conceptually investigate the phenomenon of GVT coordination by studying the effect of GVT structure on different types of coordination and the impact of coordination on GVT outcomes. The goal is to develop an overall framework of coordination in GVT that could be empirically validated through future work.

## CONCEPTUAL BACKGROUND

### GVT Structure

From the definition of GVT we can identify three important structural elements in GVT i.e., task interdependencies, team members, and collaborative technology.

### Task Interdependencies

Task interdependencies are the extent to which members are dependent upon one another to perform their job. Four types of interdependencies have been identified i.e., *pooled*, *sequential*, *reciprocal* and *team* (Van de Ven et al. 1976). In pooled interdependence tasks, each member completes their task independently before aggregation. In sequential interdependence tasks, some tasks depend on the completion of others before beginning (Malone and Crowston 1994). While sequential interdependence tasks flow only in one direction, reciprocal interdependence tasks flow in a "back and forth" manner. In team interdependence tasks, there is no measurable temporal lapse in the flow of the work between team members, as there is in the other task interdependencies. All members will concurrently diagnose, problem-solve, and collaborate as a group to deal with the task. The different types of interdependencies require different kinds of interaction among team members and consequently are likely to need different forms of coordination.

### Team Members

Three important attributes of GVT members distinct from traditional teams are *geographic dispersion*, *category memberships*, and *diverse contexts* (Cramton 2001). In addition, GVT are typically *assembled on an as-needed basis* (Jarvenpaa et al. 1998). For the study of coordination, *team size* is also an important characteristic to be considered (Van de Ven et al. 1976).

Each of these attributes can add complexity to GVT coordination. For instance, if remote others are seen as belonging to categories different and less attractive than oneself, it can destruct group cohesion. Thus category memberships require coordination to prevent this kind of group destruction. Team context can be described as each member's situation, such as the differences across sites in deadlines for deliverables,

evaluation criteria, and the timing of breaks (Cramton 2001). For example, if members have different break times, coordination is required to ensure that teamwork can flow smoothly.

**Collaborative Technology**

GVT members' characteristics necessitate collaborative technologies to support teamwork. Collaborative technologies that GVT rely on have *accessibility characteristics* such as availability, reliability, and access speed (Carlson and Davis 1998). Since GVT members may have different accessibility to media that may disrupt their online collaboration, it is important for GVT to coordinate the usage of collaborative technology with respect to the differences in member's technology accessibility.

**Coordination in GVT**

To effectively accomplish their task and to develop members as a team, GVT need to coordinate the three important elements i.e., task interdependencies, team members, and collaborative technology. Eight types of coordination in GVT have been identified (Zigurs et al. 2002) as described below.

*Structural coordination* is structure that limits individual behavior by determining who has access to what information, who must make which decisions, and who must report what to whom (Carley 2001). Since GVT members may come from different organizations, *value and norms coordination* can be defined as managing the diversity of members' organizational practices and behavior (Hofstede 1991). *Language and culture coordination* involves managing symbolic communication and collective programming of members' minds (Grant 1996; Hofstede 1991). As every individual belongs to a number of different groups and categories at the same time, members unavoidably carry several layers of mental programming within themselves, corresponding to different levels of culture. For example, a member can carry mental programming of his nation, ethnicity, and organization. Since organizational culture falls in the domain of value and norms coordination, we define language and culture coordination as the coordination of diversity of member's national culture and linguistic background.

*Role coordination* can be defined as managing a dynamic set of recurring behaviors, both expected and enacted, within a particular group context. Task-related and socio-emotional roles are two important elements of effective groups (Zigurs and Kozar 1994). *Temporal coordination* is a process structure imposed to intervene and direct the pattern, timing, and content of communication in a group (Montoya-Weiss et al. 2001). *Media coordination* means being able to communicate over diverse types of channels using media of different characteristics (Zigurs et al. 2002).

*Task coordination* is the act of sequencing or synchronizing interrelated activities among members (Wang et al. 2001). While task coordination concerns task-related aspects, relational coordination is concerned with human-related aspects of GVT. *Relational coordination* therefore refers to managing the socio-emotional aspects of human communication (Zigurs et al. 2002). Both task and relational coordination appear as higher levels of coordination in our framework because they are affected by the other types of coordination.

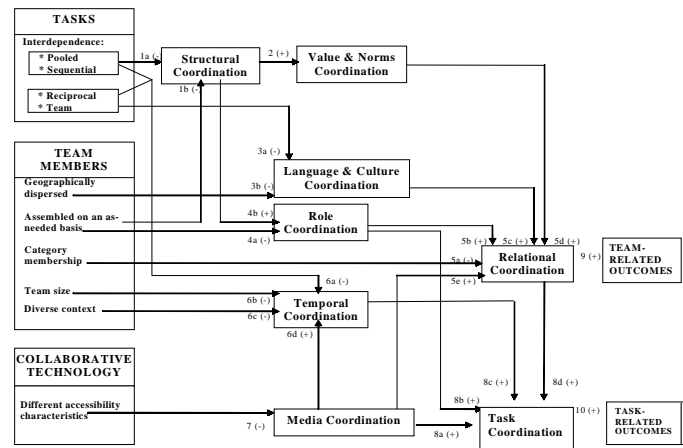
**GVT Outcomes**

Two outcomes are defined for teams, namely *task-related outcomes* and *team-related outcomes* (Pinsonneault and Kraemer 1989). Task-related outcomes are quality, breadth and consistency of team performance over time. Team-related outcomes focus on members' satisfaction and willingness to work with GVT in the future. These two outcomes comprehensively cover the main aim of coordination i.e., to get the work done and develop members as a team (Zigurs et al. 2002).

**FRAMEWORK FOR ANALYZING COORDINATION IN GVT**

Figure 1 shows the proposed framework for analyzing coordination in GVT. Each relationship in the figure is described below.

Figure 1: Framework for Analyzing Coordination in GVT



**Structural Coordination**

Pooled and sequential interdependence tasks need impersonal modes of coordination (Van de Ven et al. 1976), which can be achieved through well-established organizational structure (Carley 2001; Malone and Crowston 1994). Therefore, the higher the degree of pooled or sequential interdependencies, the more difficult it is for GVT to achieve effective structural coordination. Further, the more a GVT is assembled on an as-needed basis, the more its structure emerges and changes as the project evolves (Zigurs et al. 2002). Accordingly, effective structure in GVT cannot be assumed. Rather, members have to develop the level of coordination necessary to manage its structure. Thus, we can infer that:

*Proposition 1a:* The degree of pooled or sequential interdependence tasks negatively affects the effectiveness of GVT structural coordination

*Proposition 1b:* The extent to which GVT members are assembled on an as-needed basis negatively affects the effectiveness of GVT structural coordination

**Value and Norms Coordination**

Pooled interdependence tasks need to be coordinated with formal or informal rules whereas sequential interdependence tasks can be effectively coordinated by plans (Grant 1996; Van de Ven et al. 1976). Rules and plans can also be regarded as part of an organization's values and norms (Hofstede 1991). Since values and norms are variants of impersonal coordination modes (Van de Ven et al. 1976), which are achievable through structural coordination, we propose that:

*Proposition 2:* The effectiveness of GVT structural coordination positively affects the effectiveness of its value and norms coordination

**Language and Culture Coordination**

In contrast with pooled and sequential interdependence tasks, reciprocal and team interdependence tasks can be effectively coordinated by personal modes of coordination (Grant 1996; Van de Ven et al. 1976) that are communication-intensive. The existence of common language is fundamental to communication-intensive coordination. Therefore, the higher the degree of reciprocal and team interdependencies, the more difficult it is for GVT to achieve effective language and culture coordination.

In geographically dispersed teams, various communication barriers can arise. For example, it is difficult to fully participate in a teleconference when one does not speak the language fluently (Dube and Pare 2001). Cultural distance (Kogut and Singh 1988) may also introduce coordination problems in GVT. For instance, a decision made in one country may elicit an unexpected reaction from team members in another country (Cramton 2001). The greater the degree of geographic dispersion, the more difficult it may be to achieve effective language and culture coordination. Hence, we can infer that:

*Proposition 3a:* The degree of reciprocal and team interdependence tasks negatively affects the effectiveness of GVT language and culture coordination

*Proposition 3b:* The extent of geographical dispersion of GVT members negatively affects the effectiveness of GVT language and culture coordination

### Role Coordination

To the extent that GVT are assembled on an as-needed basis, there may not be specified positions and roles in the GVT. In such situations, GVT members may experience difficulty in correctly identifying the roles they need to assume (Zigurs and Kozar 1994). However, when the team achieves effective structural coordination, it will be clear who must make which decisions and who must report what to whom (Carley 2001). Thus, we propose that:

*Proposition 4a:* The extent to which GVT members are assembled on an as-needed basis negatively affects the effectiveness of role coordination

*Proposition 4b:* The effectiveness of GVT structural coordination positively affects the effectiveness of its role coordination

### Relational Coordination

Relations are often defined by early and persistent attributions that people make about others. Category membership is a mechanism GVT members use to establish perceptions about other members (Cramton 2001). However, when people communicate with others that they do not know well through electronic media, they often “over-attribute” on the basis of a few social cues they glean. Moreover, members tend to generalize their negative social perceptions to the locational subgroup to which their teammates belong, which can be destructive to relationship building (Cramton 2001). Hence, we propose that:

*Proposition 5a:* Category membership negatively affects the effectiveness of GVT relational coordination

Four forms of coordination may affect GVT relational coordination. First, the effectiveness of socio-emotional roles coordination (e.g., gatekeeper, motivator, mediator, and tension-releaser) supports the socio-emotional climate of the team (Zigurs and Kozar 1994). Value and norms, and language and culture coordination that govern not only the performance of interdependent tasks, but also the communication among members (Malone and Crowston, 1994) can positively affect relational coordination. Finally, effective GVT relational coordination may also be achieved through media coordination. As members develop experience communicating with others using a particular media, they may develop knowledge bases to communicate effectively in various situational contexts through the media (Carlson and Zmud 1999). This knowledge can eventually help develop richer relationships with communication partners. Thus, we infer that,

*Proposition 5b:* The effectiveness of GVT role coordination positively affects the effectiveness of its relational coordination

*Proposition 5c:* The effectiveness of GVT language and culture coordination positively affects the effectiveness of its relational coordination

*Proposition 5d:* The effectiveness of GVT value and norms coordination positively affects the effectiveness of its relational coordination

*Proposition 5e:* The effectiveness of GVT media coordination positively affects the effectiveness of its relational coordination

### Temporal Coordination

While moving up the hierarchy of task interdependencies from pooled to sequential to reciprocal and finally team interdependence, more member interaction is needed (Van de Ven et al. 1976). The more the interaction needed, the more difficult it is for the team to effectively coordinate its timing.

*Proposition 6a:* Higher degree of task interdependencies negatively affects the effectiveness of temporal coordination

Temporal coordination problems can amplify with the growing size of the team. When communication is voluminous, senders and receivers unwittingly may differ in what they find most salient and fail to fulfill their distant partners’ expectations. Hence, we deduce that,

*Proposition 6b:* Team size negatively affects the effectiveness of temporal coordination

Further, GVT members often have difficulty gathering and remembering information about the context within which their distant partners work. They either fail to communicate important information about their own contexts and constraints to their remote partners (Cramton, 2001) or they inform about their contexts and constraints but due to ineffective media coordination, the message may be delayed or even lost. Therefore,

*Proposition 6c:* Context diversity negatively affects the effectiveness of temporal coordination

*Proposition 6d:* The effectiveness of GVT media coordination positively affects the effectiveness of its temporal coordination

### Media Coordination

Since GVT members may have different accessibility characteristics, even if the team is able to match the collaborative technologies features with the task requirements, some members may not be able to use the appropriate medium. For example some members with relatively high access speeds may agree to communicate using video-conference while others may not. Thus, we deduce that:

*Proposition 7:* Diversity of collaborative technologies’ accessibility characteristics negatively affects the effectiveness of media coordination

### Task Coordination

Although the understanding of how and when to use which collaborative technology is not always obvious and requires considerable trial and error (Dube and Pare 2001), once the team achieves effective media coordination, its task coordination process will be easier. Task coordination problems may also arise from the assignment of tasks to team members (Crowston 1997). Such problems, however, will not happen if GVT has effective task-related role coordination. In many cases, personal relationships may be the key mechanism for task coordination (Kraut et al. 1999) e.g., without trust, some members may keep important data from the others which may then pose a serious problem in sequencing or synchronizing interrelated tasks. Besides media, role, and relational coordination, the effectiveness of temporal coordination can also determine task coordination effectiveness. In ineffective temporal coordination, members are more likely to work from different definitions of the situation, which handicaps collaboration (Cramton 2001), reduces members’ ability to contribute effectively, and increases the likelihood of ineffective task coordination. Thus, we can deduce that:

*Proposition 8a:* The effectiveness of GVT media coordination positively affects the effectiveness of its task coordination

*Proposition 8b:* The effectiveness of GVT role coordination positively affects the effectiveness of its task coordination

*Proposition 8c:* The effectiveness of GVT temporal coordination positively affects the effectiveness of its task coordination

*Proposition 8d:* The effectiveness of GVT relational coordination positively affects the effectiveness of its task coordination

### Team-Related Outcomes

Since trust is one of the most important elements of relational coordination and trust relates to satisfaction (Zigurs et al. 2002), there may exist a relationship between effectiveness of GVT relational coordination and members’ satisfaction and willingness to work again with GVT in the future. Hence, we propose that:

*Proposition 9:* The effectiveness of GVT relational coordination positively affects team-related outcomes

### Task-Related Outcomes

GVT are assembled to perform interdependence tasks and produce results. The key aspect of interdependence is that the outcome for any party is fundamentally entwined with the action of and outcomes for other players (Child and McGrath 2001). Therefore, to produce high outcome quality and breadth and consistent performance over time, effective task coordination is necessary for GVT. Thus, we propose that:

*Proposition 10:* The effectiveness of GVT task coordination positively affects task-related outcomes

## SUMMARY

Our conceptual framework shows that the types of GVT coordination proposed by Zigers et al. (2002) are interrelated with each other. However, whether or not to consider all types of coordination for effective teamwork depends on the structural elements of the team. Certain forms of coordination e.g., structural coordination and language and culture coordination, are required for specific types of task interdependencies. Team member characteristics bring into play different types of coordination e.g., language and culture coordination, role coordination, relational coordination, and temporal coordination. Collaborative technology accessibility characteristics can affect media coordination. Two important higher level forms of coordination i.e., task coordination and relational coordination, are likely to affect task-related outcomes and team-related outcomes respectively.

This study contributes to the limited literature about coordination in GVT. Particularly, we develop an overall view of coordination in GVT starting from the GVT structure through the interrelated coordination processes to GVT outcomes. Future work can study in more detail about each type of GVT coordination to examine their appropriate coordination mechanisms and test the robustness and validity of the proposed framework.

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