

Coordinating Global Virtual Teams: Building Theory from a Case Study of Software Development

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Abstract. Global Virtual Teams (GVTs) enable organizations to operate across national, economic and social, and cultural boundaries. However, this form of teamwork presents issues for traditional project management coordination mechanisms. There is a significant body of research on these challenges. However, relatively little attention has been paid to the specific impact these issues may have on coordination mechanisms in GVTs. This paper seeks to address this gap by applying a theoretical model drawn from extant research to explore the coordination mechanisms used by a software development GVT in a Fortune 100 telecommunications manufacturer. The study employs a mixed methodology grounded theory approach to examine the effect that specific virtual team issues have on the effectiveness of team coordination mechanisms. It then develops a refined conceptual model to guide future research on GVTs involved in software development. The findings also inform practice on the problems encountered in ensuring the effective coordination of such teams.

Keywords: Global Virtual Teams, Coordination Mechanisms, Software Development, Project Management.

1 Introduction

The use of global virtual teams (GVTs) in software development (SD) has become standard practice for many organizations [1]. GVTs are a specific type of virtual team which are, typically, geographically, temporally and organizationally dispersed; they also tend to be culturally diverse in their constitution [2, 3, 4]. There has been extensive research into some aspects of virtual teams [37, 16]. However, there is relatively little empirical research on GVTs and associated team structures [16, 36] such as coordination mechanisms. Existing studies on GVTs and coordination mechanisms, for the most part, employ small, student teams and little focus has been given to long-term virtual teams [16] which limits the applicability to SD GVTs in practice. In addition, it is clear from extant research that the increased use of GVTs [5, 6, 7, 8, 9, 10, 11, 3] and the development of increasingly complex software artefacts have combined to bring new challenges to the SD environment [1, 5, 38]. In order to shed light on virtual team structures there is a clear need for new theory development. The

objective of this research study is to investigate the use of traditional coordination mechanisms in GVT SD projects and apply theory to explain the impact that specific GVT issues have on the effectiveness of such mechanisms. To facilitate this objective, a theoretical model and associated propositions will be developed from extant research findings. The resultant model will be used as a theoretical lens through which to study the phenomena and derive a set of hypotheses.

2 Towards a Theoretical Model for Studying the Coordination of Virtual Teams

2.1 Coordination Mechanisms

This study employs Sabherwal's [13] classification of coordination mechanisms as a foundation for a conceptualist theoretical model. While Sabherwal's study does concern itself with coordination mechanisms, its primary focus is on the relationship between client and vendor in outsourced SD projects and how coordination mechanisms evolve in the course of the relationship. Nevertheless, we argue that Sabherwal's synthesis of existing research on coordination in SD provides a useful foundation for theory building on GVTs. Four constructs are posited by Sabherwal as key mechanisms to coordinate teamwork in SD teams [14, 15]: these are (i) coordination by standards, (ii) coordination by plans, (iii) coordination by formal mutual adjustment and (iv) coordination by informal mutual adjustment. Coordination by standards refers to those mechanisms which are used to direct team members to uniform practice such as methodologies, codes of practice etc. Coordination by plans refers to any documentation which may be employed to coordinate and direct team members (schedules, project plans etc.). Coordination by formal mutual adjustment (FMA) are those mechanisms which require team members to interact in a pre-defined manner such as project meetings. In contrast, coordination by informal mutual adjustment (IMA) involves team members interacting in an informal manner through ad-hoc meetings, impromptu communications, or co-location.

2.2 Factors That Affect Global Virtual Teamwork

Several factors or issues have been identified as influencing project outcomes in GVTs viz. distance [16], time zones [7], leadership [9], language [5], knowledge sharing [11], culture [3] and trust [8]. Based on our extensive analysis of extant research, we selected five of these issues to study their impact on coordination mechanisms in a GVT. There is significant support in existing literature to suggest that Distance, Time Zones, Language, Culture and Trust impact the coordination of a GVT as well as influencing project outcomes [5, 16, 40]. While there are a number of other issues (such as leadership and knowledge sharing) that influence project outcomes they were excluded from the study, in order to focus on issues which have been identified as having a negative impact on coordination of GVTs. Hence, we propose the following constructs:

- Distance: Defined as the physical separation of team members across geographically dispersed project sites [17].

- Time zones: Defined as the time difference(s) between the project sites [18].
- Language: Conceptualized as the difficulties arising when the GVT’s working language is not the native language team members across all project sites [8].
- Culture: GVT coordination will be affected by the fact that team members may possess diverse ethnic, national, and organizational backgrounds [19].
- Trust: Defined as the willingness to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trusting party, irrespective of the ability to monitor or control that trusted party [20]

Though it is widely assumed that these constructs influence project outcomes through their effects on project team coordination mechanisms, there is a paucity of supporting evidence in the literature. In the next four sections, we draw on extant research on GVTs and project team coordination to theorize on the relationships between the proposed constructs and the effectiveness of different types of coordination mechanisms in GVTs (see Figure 1). Several theoretical propositions are then offered; these describe and explain the posited relationships.

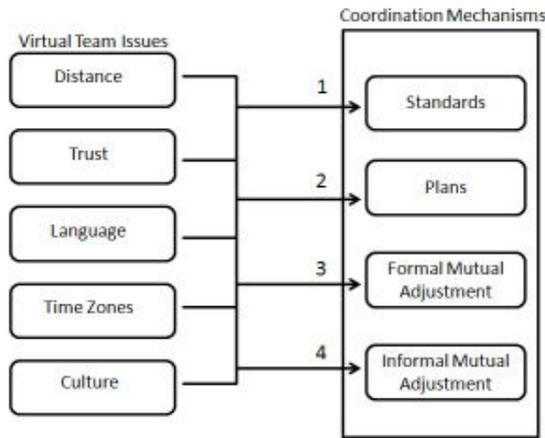


Fig. 1. Theoretical Propositions

The constructs of distance, time zones, language, trust and culture are generally viewed as having a negative impact on a virtual team’s ability to successfully interact and complete a SD project. The issues that arise from these factors create obstacles for the coordination of teamwork in particular [21]. There is general agreement that team coordination is a key activity in producing successful outcomes for project teams [22, 23].

As indicated, Standards, Plans, FMA and IMA are categories of coordination mechanism employed in SD teams [13]. Standards are typically established at the outset of a project, communicated to the SD team and, because they are typically determined at corporate level, they tend to be altered only in exceptional circumstances.

Plans are typically project specific and are formulated before the commencement of a project and communicated to the entire virtual team; because they are project-based, they may be subject to ongoing modification throughout the life cycle of a project. Unlike Standards and Plans, both FMA and IMA depend on a high degree of team member interaction and communication to be effective as a coordination mechanism. Scheduled weekly meetings, status calls and shared calendars are examples of FMA while IMA is exemplified by casual face-to-face meetings, ad-hoc phone calls or emails. Existing literature suggests that these four types of coordination mechanism are not immune from virtual team issues and experience a negative impact in terms of their effectiveness (Table 1).

Table 1. GVT issues on Coordination Mechanisms (from extant literature)

	Distance	Trust	Time Zones	Language	Culture
Standards	7, 10	24	16	25	21, 24
Plans	7, 16	2, 5	7, 41	6, 10	3, 24
Formal Mutual Adjustment (FMA)	26	2	5, 24, 41	5, 41	3, 41
Informal Mutual Adjustment (IMA)	16, 26	2, 5	21	5, 8	3, 27

However, there is a paucity of research which specifically looks at the impact of GVT issues on specific coordination mechanisms. While a number of studies point to the issue of coordination in GVTs [42], few studies focus specifically on coordination itself or its associated mechanisms. In addition, existing literature on GVTs is limited in its treatment. For example, while there are a number of GVT-based studies which focus on SD, the majority are concerned with short-term projects [2, 5, 10, 24, 28], operating over a relatively small number of geographical locations [2, 5, 7, 24]. Few studies look at GVT projects that span longer time periods, which are argued to be the norm for such initiatives [3]. In addition, a number of existing studies into GVTs employ simulated virtual team projects using university students [21, 24]. While such studies may contribute to theory building, we argue that their findings are not generalisable to industry contexts and thus may be irrelevant to practitioners. There is, therefore, a need to look specifically at industry GVTs (with relatively large teams, dispersed over multiple geographical locations) involved in long-term SD projects of 12 months or more and to identify the specific impact of GVT issues on coordination mechanisms. Given the foregoing observations, we posit the following propositions:

Proposition 1: The effectiveness of Standards is impacted by distance, trust, language, time zones and culture.

Proposition 2: The effectiveness of Plans is impacted by distance, trust, language, time zones and culture.

Proposition 3: The effectiveness of Formal Mutual Adjustment is impacted by distance, trust, language, time zones and culture

Proposition 4: The effectiveness of Informal Mutual Adjustment is impacted by distance, trust, language, time zones and culture

The independent and dependant constructs described above are presented in the conceptual model presented in Figure 1: the relationships between these constructs are presented as the above propositions.

3 Research Method

The objective of this research study is to investigate the use of traditional coordination mechanisms in virtual SD projects and to explore the impact that GVT issues such as distance, trust, language, culture and time zones have their effectiveness. As an initial step in theory building, a conceptual model (based on extant research) with associated propositions was presented in the previous section. Following the specification of the propositions, the next step in theory building is to determine empirical indicators and subsequently produce hypotheses for empirical testing [29]. We now describe the research design on which this study is based. A 'single' case study research approach was selected as the most appropriate vehicle for theory building and refinement [30, 31, 32]. Case studies are particularly well suited to IS research [33]. In addition, case research, which emphasizes the understanding of empirical data in natural settings, is a suitable method for studying IS issues and practices [31]. A single case study is viewed as being a potentially rich and valid source of data and is a particularly good fit for the purpose of exploring relationships between variables in context [32].

The case organization is a Fortune 100 telecommunications company with approximately 66,000 staff worldwide. The organization was purposively chosen for study on the basis of its predominant use of GVTs for software development. Out of several possible ongoing software development projects, one specific project was selected for study. The specific software development project was also purposefully selected, as it met several important criteria. That is it possessed a GVT that operated over, several geographically dispersed project locations with multiple time zones—also, the team was culturally diverse. The project focused on the SD of a network operations and maintenance interface for 3G technology. The project had a planned 18 month duration with team members located in six geographical locations—the USA, Ireland India, Israel, Malaysia and China. There were upwards of 48 team members working on the software project in different locations at any point in time. The development team was split into a number of distinct development functions; requirements engineering, systems engineering, software test, development, customer support, deployment, quality control, project management etc. Team sub-units in different geographical locations had distinct responsibilities viz. Israel (development), USA (development), Malaysia (development/test), China (development/test), India (development) and Ireland (project management/development). Data collection was conducted over a twelve-month period and concluded towards the end of the project development cycle during the software testing and implementation phases. Ten interviewees were purposively selected using the key informant approach in order to gather data from a wide variety of team members. Thus, respondents were selected from all project sites (excluding Malaysia) and those participating in the study performed a range of project roles within the team (project manager, development manager, software developer, system engineer, test team leader, software tester). An interview guide was used to structure interviews [34]. Follow-up interviews, emails

and phone calls were used to clarify and refine issues which emerged from primary interview transcripts. The study utilised concepts from a priori theory in formulating the interview guide and in specifying 'seed categories' to inform the content analysis [35]. Opening coding and axial coding were used to determine hypotheses about the relationships between the categories identified. This process continued in an iterative manner, and resulted in the modification of categories and relationships. Selective Coding was undertaken to identify the relationships between categories (constructs) using hypothesized conditions, context, strategies and consequences. A context rating scale [39] combined with frequency counts were used to attribute a high, moderate or low impact to identified hypotheses. Discriminate sampling [35] was used to select data to examine strong and weak connections between categories. The issues of validity, reliability, and objectivity [32] were addressed through: (a) Prolonged engagement and persistent observation; (b) triangulation techniques, which were extensively used to provide insights into events, relationships, etc. between data sets; (c) a data analysis approach based on rigorous coding and the use of memos, which together provided an audit trail; and, finally, (d) member checks were also employed as the findings were presented to team members for subsequent feedback [34].

4 Case Study Analysis

This section presents the findings of the case study. From the analysis of the data we were able to (i) identify empirical indicators for virtual team issues (Table 1); (ii) identify empirical indicators for coordination mechanisms (Table 2) and (iii) illustrate how the effectiveness of coordination mechanisms is impacted by virtual team issues (distance, time zones, language, culture and trust). All coordination mechanisms identified in the case organization were mapped to categories highlighted by existing research; hence, we find support for our conceptual model (see Table 2).

4.1 Coordination Mechanisms Employed within the Case Organisation

A range of coordination mechanisms were used by the virtual team. Exemplars of Standards employed as coordination mechanisms were: an explicitly defined software development lifecycle; an extensive repository of document templates; and code inspections. Exemplars of Plans were: a project plan that included a software configuration plan (SCM); a quality control plan for the project, and a project Gantt chart. Exemplars of FMA included weekly, pre-scheduled conference calls; local weekly site meetings and use of mail aliases and shared calendars. Exemplars of IMA included ad-hoc phone calls between team members; unscheduled emails between team members and ad-hoc conversations between co-located team members.

4.2 The Impact of Virtual Team Issues on the Effectiveness of Standards

The conceptual model (Figure 1) proposes that the effectiveness of Standards is impacted by GVT issues which include Distance, Time Zones, Language, Culture and Trust. However, the findings indicate that some virtual team issues have a greater impact than others on specific coordination mechanisms. The analysis of case study data revealed that Standards are impacted by language, physical distance, and team

member trust but time zones and cultural differences appear to have no perceived impact on Standards. Language had the greatest negative impact on the use of project documentation such as bug reports and templates. A project manager explained that in a number of instances documents had to be reviewed and they had to work out what the non-native language speaking member meant before rewriting the document for general consumption. Team members also reported the creation of additional documentation which acted as guidelines for members across different project sites. The test team leader created a set of documents for his team which detailed how to write an email, ask a question etc. He described this as “documents to show how to use documents”.

In relation to Distance, the moderately negative impact is observed in the instance of project sites diverging in terms of development processes and forming distinct methodologies. A development manager was particularly concerned about this divergence. He explained “when you have teams in different geographic regions you may have different kinds of standards and therefore some non-uniformity in terms of the quality”. In relation to project documentation and Standards, team members expressed high levels of distrust with members at other sites. When documentation was not updated in a timely fashion, it decreased the confidence the members had in the documentation and thus decreased its usefulness as a coordination mechanism. However, case study analysis found no support for Culture and Time Zones having an impact on the effectiveness of Standards. We can therefore continue the theory building process by specifying three hypotheses:

H1: Distance has a moderately negative impact on the effectiveness of Standards

H2: Trust has a highly negative impact on the effectiveness of Standards

H3: Language has a highly negative impact on the effectiveness of Standards

4.3 The Impact of Virtual Team Issues on the Effectiveness of Plans

The case study data revealed that Plans are greatly impacted by Distance, Time Zones, Culture and team member Trust. The data analysis revealed, however, that Language appeared to have no impact on Plans. The impact of Distance on Plans was evident in the need of team members at different project locations to maintain local project schedules as well as feeding into one global project schedule. In addition, project estimates were required from each project location. This meant that the project team spent a lot of time “going around in circles”. Culture was perceived as having a highly negative impact on the effectiveness of Plans as a coordination mechanism with some team members observing that those with different cultural backgrounds in other sites tended to avoid saying ‘no’ to work requests. This behaviour had serious ramifications for the project schedule and completion, due to inadvertent over-commitment through an inability to say ‘no’. A project manager provided an example of members in another location agreeing to a task even though they knew from the outset it was not feasible with the given schedule. The project manager perceived this as being a “cultural issue” as members in the other project sites would “generally say no to work which was not feasible straightaway”.

Table 2. Indicators for GVT Issues (Language, Trust, Distance, Time Zones and Culture)

Construct	Indicator
Language	Team members think that others: <ol style="list-style-type: none"> i. have a poor command of the working language ii. write the working language poorly iii. comprehend the project working language poorly
Trust	Team members do not understand others accents Team members assume that other team members: <ol style="list-style-type: none"> i. do not lie ii. do not withhold information iii. will do their work to the best of their abilities iv. will complete their work even if they are not physically present to monitor work
Distance	Team members cannot: <ol style="list-style-type: none"> i. meet face-to-face in the same room regularly or not at all ii. cannot monitor other team members work Team members do not have direct access to all team resources Team members operate in different countries
Time Zones	Team members : <ol style="list-style-type: none"> i. cannot work a full day together ii. access to other team members and project sites is limited iii. meetings will occur at irregular hours to facilitate different team locations iv. experience a 24/48 hour delay can occur for queries across project locations v. in some project locations must work irregular hours to facilitate other project locations vi. operate across multiple time zones All team members cannot attend one joint project meeting
Culture	Team members: <ol style="list-style-type: none"> i. perceive others as having different work and social etiquette to their own ii. have different vacation time, religious holidays, public holidays across different project locations iii. use different phrasing (slang) and employ language differently across project locations iv. perceive others as having preference for specific electronic communication

The case data indicated that operating in different Time Zones had a highly negative impact on effectiveness of Plans as coordination mechanisms. The project manager explained the problems associated with receiving estimates, or addressing project plan issues that needed to be answered quickly, but being unable to act because key team members were not available as their site was off-line. A Technical Architect on the team echoed this view, explaining that on occasions when the team was under pressure to get something done quickly, they encountered problems because that work was dependent on tasks being completed by members in different geographical locations. If those sites had a holiday period, which was often the case, team members

were not available to take action. The negative impact of Trust on Plans was also in evidence. The development manager commented that it was difficult to trust any team members due to a number of project issues which another project site had been slow to bring to light. The data also revealed that in the initial stages of work relationships team members would require other dispersed members to “prove themselves”. It was also apparent that team members would heavily monitor others at related project sites. The less physical contact members had with others the more rigorous they would be in the conduct of this activity. We therefore continue theory building by specifying four hypotheses:

H4: Distance has a moderately negative impact on the effectiveness of Plans

H5: Trust has a highly negative impact on the effectiveness of Plans

H6: Time Zones have a highly negative impact on the effectiveness of Plans

H7: Culture has a highly negative impact on the effectiveness of Plans

4.4 The Impact of Virtual Team Issues on the Effectiveness of Formal Mutual Adjustment

The analysis of the case data confirmed that the effectiveness of Formal Mutual Adjustment (FMA) was impacted by Language, Time Zones, Trust, Culture and Distance. However, the level of impact differs. While Culture and Trust impacted the effectiveness of FMA mechanisms, Distance, Time Zones and Language had a greater perceived impact. Distance negatively impacted on the effectiveness of FMA by the physical separation of team members. An example of related communication problems was reported by a Development Manager who noticed during one project conference that a key participant had “gone quiet”. Both he and his colleagues could not tell if this developer had left the call or was silent through disagreement. It took longer to work out that this team member was dissatisfied with aspects of the project. Another issue was the high usage of conference calls. A software engineer stated that large-scale conference call meetings could not focus on specific technical issues and missed many related project problems “unless they were glaringly obvious”. To resolve this issue, she often ended up having to call team members one-to-one in order to resolve specific technical items. Time Zones were also revealed as having a highly negative impact on the effectiveness of FMA as a coordination mechanism. A development manager illustrated this through an example of team members at two sites taking project conference calls at 10:30 pm (local time) in order to facilitate members based in other project sites, due to the size of the communication window. A systems engineer echoed this by stating that “usually one team or the other has to pay for it with very early morning meetings or late night-time meetings”. In relation to these working hours, team members were concerned about overly long days and the inability to perform their work at optimum levels. Language was found to have a highly negative impact on the effectiveness of FMA. For example, a software engineer stated that “even though everyone speaks the same language in meetings, phone calls...words and context are often confused and it is harder to get the message across”.

Table 3. Indicators for Coordination Mechanisms (Standards, Plans, FMA and IMA)

Construct	Indicator
Standards	<ul style="list-style-type: none"> • Team members follow the organization defined development process • Team members use designated templates to create documentation at each phase of the development project • Team members pass project documentation from one sub-team to another (requirements engineering, software engineering, software test etc.) • Team members review documentation to ensure consistency across the team • Team members use a set of guidelines to author an email • Team members conduct different project phases in parallel with other project phases • Team members use designated synchronization points to ensure the defined development process is being adhered to
Plans	<ul style="list-style-type: none"> • The team authors and maintains a project plan for the project • The team authors and maintains a software configuration management (SCM) plan for the project • The team authors and maintains a quality control plan for the project • The team calculates and publishes project estimates for the project • The team authors and maintains a requirements document • The team authors and maintains a Gantt Chart for the project
Formal Mutual Adjustment (FMA)	<ul style="list-style-type: none"> • Team members participate in a weekly scheduled project conference call • Team members participate in scheduled, weekly status calls • Team members at local sites attend weekly, scheduled site meetings • Team members participate in weekly, scheduled meetings for their functional area (development, test, project management etc.) • Team members maintain and share calendars • Team members author, send and/or receive emails via mail aliases
Informal Mutual Adjustment (IMA)	<ul style="list-style-type: none"> • Team members make and receive ad-hoc phone calls from other team members • Team members author, send and/or receive instant messages to other team members • Team members author, send and/or receive ad-hoc emails from other team members • Team members make and receive ad-hoc mobile phone calls from other team members • Team members at local project sites hold face-to-face conversations with other local team members

A project manager at one site commented on the type of communication problems that arose between team members from different geographical locations and cultures viz. where the project working language is not the first or native language, team members do not contribute to conference calls. “People who can write reasonably legible emails, they might not speak the same. Accent and pronunciation make it

difficult to understand what they are actually saying” (Senior Software Engineer). Culture was also observed to have an impact on the effectiveness of FMA. The test team leader, for example, stated that other sites reported that team members at his site “don’t say anything. They just listen. They do not provide any active feedback!” Whereas, this could be ascribed to language difficulties, another Senior Software Engineer explained that “cultural differences have implications on how people communicate”. Trust was also found to impact the effectiveness of FMA. Team members at the sites studied argued that it took a longer period of time to build trust with team members in other project sites as opposed to co-located team members. Once trust was established, however, it could be eroded or lost when colleagues at other sites did not respond to emails, instant messages or phone calls in a timely fashion. The absence of face-to-face contact made it more difficult to rebuild trust. These findings suggest five further hypotheses:

H8: Distance has a highly negative impact on the effectiveness of FMA

H9: Trust has a moderately negative impact on the effectiveness of FMA

H10: Language has a highly negative impact on the effectiveness of FMA

H11: Time zones have a highly negative impact on the effectiveness of FMA

H12: Culture has a moderately negative impact on the effectiveness of FMA

4.5 The Impact of Virtual Team Issues on the Effectiveness of Informal Mutual Adjustment

Data from the case supported the proposition that Informal Mutual Adjustment (IMA) is significantly impacted by issues of Distance, Culture, Time Zones, Language and Trust. Distance and Time Zones have the greatest impact on IMA with other factors having a relatively lesser impact. The effectiveness of IMA is significantly impeded by Distance as team members cannot have ad-hoc, face-to-face meetings. Close face-to-face and ad-hoc interaction tends to be replaced by less effective communication mechanisms such as emails, instant messages etc. Operating in different Time Zones minimized opportunities for problem-solving interactions between team members across project locations. The Senior Development Manager on the project explained that “You could find that an issue is raised by the test team who are located in two locations. Team members, located in three separate sites should reply. They reply asking for clarification so you are back into another 24 hours”. Language was also revealed as having a moderately negative impact on the effectiveness of IMA. For example, IMA among team members was negatively affected due to the lack of fluency by those whose native tongue was not the working language. Trust was also revealed as having an impact on the effectiveness of IMA. A software developer explained that trust was difficult to build because she could not engage with colleagues face-to-face and quickly resolve issues. She was entirely dependent on the team member answering their phone, replying to her emails, or using Instant Messenger. viz. “In a virtual team everyone is isolated -we are all outsiders to other sites so trust is there but it is harder to build”. Thus, as indicated previously, it was perceived that team members took longer to build trust with team members in other locations. Culture was found to have a negligible influence on IMA. However, one developer felt that team members in some locations acted deferentially in their interactions with

him, he stated: “There is no need to be apologetic. If you made a mistake, you made a mistake. There is no need to beg my leave to do something”. We therefore conclude our theory building process by presenting five more hypotheses:

- H13: Distance has a highly negative impact on the effectiveness of IMA
- H14: Trust has a moderately negative impact on the effectiveness of IMA
- H15: Language has a moderately negative impact on the effectiveness of IMA
- H16: Time zones have a highly negative impact on the effectiveness of IMA
- H17: Culture has a low negative impact on the effectiveness of IMA

In conclusion, the case study data allowed us to (i) refine our theoretical propositions, (ii) define empirical measures for our constructs (Table 1 and Table 2), and (iii) represent this paper’s theoretical model with accompanying hypotheses (see Figure 2).

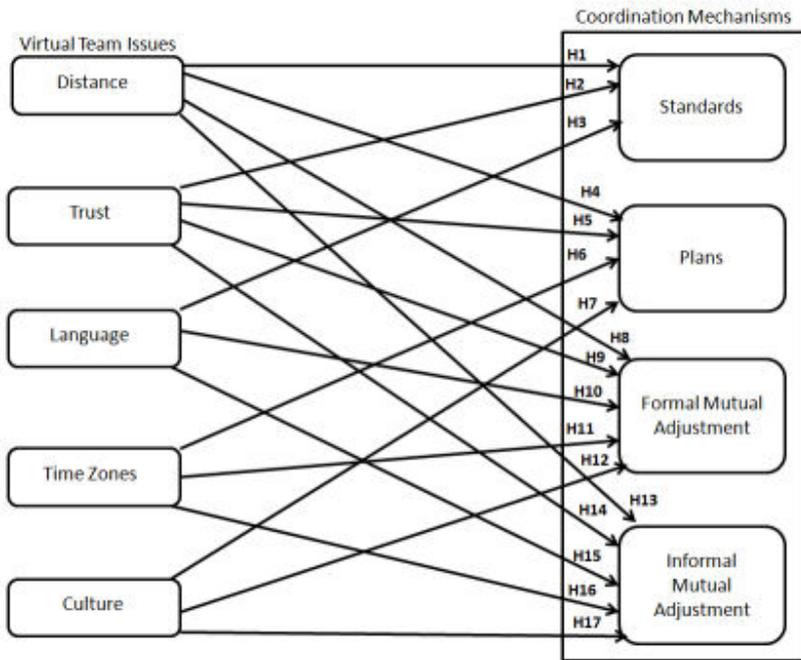


Fig. 2. Revised Theoretical Model (with associated hypotheses)

5 Summary and Conclusions

This paper has sought to contribute to a cumulative body of research on the Coordination Mechanisms employed in Global Virtual Teams (GVTs). The study focused on SD project in a multi-national telecommunications manufacturer that employed a GVT to develop a software sub-system for its 3G infrastructure product. Thus, the unit of analysis in this study provides unique insights into the complex nature of project management in a global context as it focuses on a long-term SD project. This has

implications for both theory and practice. The paper first presented a-priori theory based on prior research on project Coordination Mechanisms and extant research on the constructs of Distance, Time Zones, Language, Culture and Trust. This theory building activity resulting in (i) a bounded theory and (ii) the definition of constructs and their relationships in the form of propositions. We then employed the case study method to validate the propositions, refine the theory, and to derive empirical indicators for the constructs, and to specify hypotheses on the relationships between the constructs. This process resulted in a conceptual model of high empirical fidelity. In addition, we have shown that specific coordination mechanisms are more susceptible to the impact of GVT issues than traditional influences. The revised conceptual model presented in this paper may be employed in future research as lens through which to test the impact of virtual team issues on coordination mechanisms. While the “uptake” in the use of GVTs has increased, our understanding of the underlying team structures and processes is limited, as is our knowledge of the project management, coordination and control, of such initiatives. Thus, this study’s findings have a number of implications for practice. First, organizations looking to use GVTs for SD projects need to recognize the impact of the issues described herein on the effectiveness of coordination mechanisms. Second, organizations may need to review the coordination mechanisms employed in their GVTs. Considering the high level of task-interdependency associated with software development should a set of coordination mechanisms be tailored specifically for a global virtual team? If traditional coordination mechanisms are heavily impacted by issues such as those described, there are implications for controlling project outcomes.

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