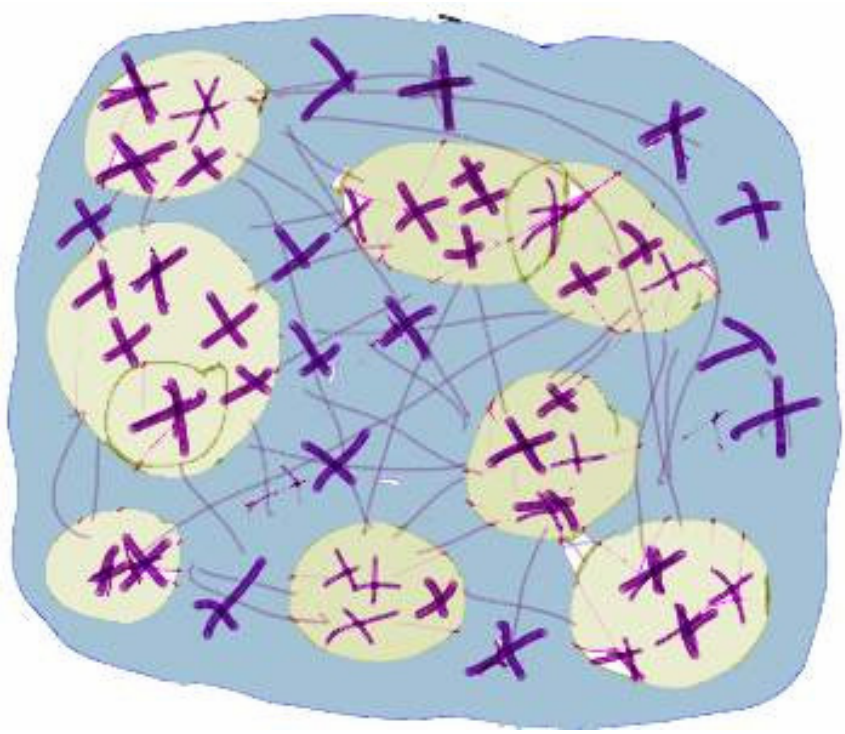

Ontological uncertainty and semantic uncertainty in global network organizations

Stephen Fox

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Abstract

In the literature, management of uncertainty is argued to be a central feature of effective project management. Global network organizations can involve people with different genders, personality types, cultures, first languages, social concerns, and/or work experiences. Such differences can lead to ontological uncertainty and semantic uncertainty. Ontological uncertainty involves different parties in the same interactions having different conceptualizations about what kinds of entities inhabit their world; what kinds of interactions these entities have; how the entities and their interactions change as a result of these interactions. Semantic uncertainty involves different participants in the same interactions giving different meanings to the same term, phrase and/or actions. Ontological uncertainty and semantic uncertainty can lead to intractable misunderstandings between people. In this VTT Working Paper, findings are reported from a study investigating manifestations ontological uncertainty and semantic uncertainty in global network organizations. The study built upon that reported in VTT Working Paper 67 (2006). In this study, conceptual factors and linguistic factors related to these types of uncertainty were further investigated. In addition, presentational factors related to these types of uncertainty were investigated for the first time. Then, characteristics of network organization communications were examined. Next, twenty-three documented cases were analysed. Consideration of findings from the case analyses suggests that costly unintended consequences, ranging from project delays to project abandonment, can arise from ontological uncertainty and semantic uncertainty. Further, consideration of findings suggests conceptual factors are much more important than presentational factors and linguistic factors in these types of uncertainty. Furthermore, findings suggest that global network organization communications can be complex, and involve much uncertainty, even though they involve only relatively few parties. Recommendations for minimizing ontological uncertainty and semantic uncertainty are discussed, and summarized in two templates.

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Preface

Both the International Project Management Association (IPMA) and the Project Management Institute (PMI) stress the significance of uncertainty in projects, programmes and portfolios. Moreover, management of uncertainty is argued to be a central feature of effective project management in the literature (e.g. Chapman and Ward, 2003; Jaafari, 2001; Perminova et al., 2008). The network is a prevalent organizational form in large global projects. However, differences between uncertainty in network organizations and uncertainty in other types of organizational forms are not highlighted in IPMA's Competence Baseline Version 3.0 (2006) or PMI's A Guide to the Project Management Body of Knowledge 3rd Edition (2004). One of the reasons that these differences are important is because they could affect the emergence and distribution of ontological uncertainty and semantic uncertainty. Ontological uncertainty involves different parties in the same interactions having different conceptualizations about what kinds of entities inhabit their world; what kinds of interactions these entities have; how the entities and their interaction modes change as a result of these interactions. Semantic uncertainty involves different participants to the same interactions giving different meanings to the same term, phrase and/or concepts (Lane and Maxfield, 2004). Ontological uncertainty and semantic uncertainty can lead to intractable misunderstandings between people. This, in turn, can lead to people taking unintended actions that lead to costly unintended consequences ranging from project delays to project abandonment.

In this VTT Working Paper, findings are reported from a study investigating ontological uncertainty and semantic uncertainty in global network organizations. The study built upon that reported in VTT Working Paper 67 (2006). In this study, conceptual factors and linguistic factors that relate to ontological uncertainty and semantic uncertainty were further investigated. In addition, presentational factors that relate to these types of uncertainty were investigated for the first time. Then, characteristics of network organization communications were examined. Next, twenty-three documented cases were analysed. This working paper is a VTT (Technical Research Centre of Finland) contribution to the Global Project Strategies 2 research project. The Global Project Strategies 2 (GPS2) research project began on 1st April 2007 and ended on 31st March 2009. Other participants in the GPS2 project have been Helsinki University of Technology; Helsinki School of Economics; Tekes – Finnish Funding Agency for Technology and Innovation and the following companies: Foster Wheeler, Nokia Siemens Networks, Outotec, Synocus.

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1. Introduction

In this section, the background of the research is described. Further, research goal and research method are outlined. Subsequently, the structure of the paper is set out.

1.1 Background

Both the International Project Management Association (IPMA) and the Project Management Institute (PMI) stress the significance of uncertainty in projects, programmes and portfolios. Moreover, management of uncertainty is argued to be a central feature of effective project management in the literature (e.g. Chapman and Ward, 2003; Jaafari, 2001; Perminova et al., 2008). The network is a prevalent organizational form in large global projects. However, differences between network organizations and other types of organizational forms are not highlighted in IPMA's Competence Baseline Version 3.0 (2006) or PMI's A Guide to the Project Management Body of Knowledge 3rd Edition (2004). One of the reasons that these differences are important is because they could affect the emergence and distribution of ontological uncertainty and semantic uncertainty. Ontological uncertainty involves people's conceptualizations about what kinds of entities inhabit their world; what kinds of interactions these entities have; how the entities and their interaction modes change as a result of these interactions. Ontological uncertainty exists when similarities and differences between different people's ontologies are not certain. Semantic uncertainty exists when similarities and differences between the meanings given by different people to the same terms, phrases and/or concepts are not certain (Lane and Maxfield, 2004).

It is through communication that human beings express ontology and semantics. However, if communication involves vagueness and ambiguity, similarities and differences can be uncertain despite extensive communication. This is because vagueness and ambiguity in communication can camouflage ontological uncertainties and/or semantic uncertainties. Vagueness involves borderline cases, the meaning of which cannot be determined in any context. By contrast, ambiguity involves the existence of at least two specific meanings that make sense in a particular context. Vagueness and ambiguity are rooted within people's conceptualizations, as well as expressed in their spoken and written language (Merricks, 2001). When vagueness and/or ambiguity exist in communication, different people can use the same terms and phrases but mean different things – without those differences being apparent to others. Further, a concept, such as democracy for example, can be discussed in great detail using common terms and phrases but continue to involve very different ontology for different people. Moreover, similarities and differences between their ontologies can remain uncertain.

It is important to note that intractable disagreements may arise even when there is ontological certainty and/or semantic certainty. For example, the leaders of different countries may have opposing ontology regarding democracy. Their ontologies, and the differences between them, may be clearly defined in their political writings, and they may disagree until the end of their days about what democracy is and what it means in practice. Achieving ontological certainty and semantic certainty may not lead to agreement, but it does enable parties to be certain about where they stand in relation to each other and to their objectives. By contrast, ontological uncertainty and semantic uncertainty can lead to misunderstandings. These misunderstandings can be intractable when ontological uncertainty and/or semantic uncertainty persist. Misunderstandings can be defined as interpretations that distort the intent or content of communications (Larkey, 1996). Misunderstanding can lead to the recipients of communications taking unintended actions that lead to costly unintended consequences ranging from project delays to project abandonment. Vagueness and ambiguity are explained in more detail in the following two paragraphs.

Within etymology, the origin of "vague" has been defined as being Middle French, from the Latin "vagus", which means wandering, rambling, vacillating (Harper, 2001). Within cognitive science, it has been argued that vagueness arises whenever a concept or word admits borderline cases of application (Varzi, 2006). Vague expressions, for example, include "tall" and "heap" (Smith and Keefe, 1999). Consider, for example, the question of how many grains of sand are required to make a heap of sand. Two grains of sand do not make a heap of sand, but two million grains of sand do make a heap of sand. In between, however, there are many quantities of sand which may, or may not, make a heap of sand. These borderline cases are indeterminate. In other words, a heap of sand may exist, or may not exist, and statements about whether a heap of sand exists are neither true nor false. Within philosophy also, vagueness is defined as the possession of borderline cases. Further, it is argued that no amount of conceptual analysis or empirical investigation can settle borderline cases (Sorensen, 2006). Within logic, vagueness presents a challenge to classical logic that assumes every statement is either true or false. Several alternative logics of vagueness have been proposed. In particular, vagueness is contrasted with precision, and truth-values other than true and false are admitted. Further, it is argued that it can be intrinsically impossible to say if an expression does, or does not, apply. Furthermore, borderline cases are defined as being those objects within a term's field of application about which it is intrinsically impossible to say if the term does or does not apply (Bergmann, 2008). Within law, vagueness leads to indeterminacies in application. For example, courts of law can find terms such as "unreasonable", "objectionable", "frequent intemperance" and "habitual indolence" to be too vague to be enforceable. Moreover, it has been argued that vagueness is an underlying feature of law, and not merely a feature of legal language (Endicott, 2001). It is important to note that the borderlines of many concepts are indeterminate even among people who share the same

first language and national culture. Consider, for example, the concept that can be described by the term, “tall”. To say that the tallest buildings in the U.S. states of Vermont and Wyoming are “tall” buildings is neither true nor false because the borderlines of the concept “tall” are indeterminant. The tallest buildings in those U.S. states are less than 50 metres tall. By contrast, the tallest buildings in the U.S. states of New York and California are more than 300 meters tall (allaboutskyscrapers, 2007). This example illustrates that the indeterminate borderlines of the concept “tall” are not necessarily dependent on differences between first language and/or national culture. Furthermore, the indeterminate borderlines of one concept can overlap the indeterminate borderlines of another concept. For example, a gift can be defined as something of value given without the expectation of return. Another concept, bribe, is defined as the same thing given in the hope of influence or benefit (MacDonald, 2006).

Within etymology, the origin of “ambiguous” has been defined as the Latin ambiguus, which means having double meaning, shifting, changeable, doubtful (Harper, 2001). Within cognitive science, ambiguity is differentiated from the indeterminacy of vagueness. Rather, ambiguity is associated with the existence of more than one meaning (Tanenhouse and Sedivy, 1999). For example, the word cool has at least three potential meanings in the following description: the project managers looked cool as they stood in the shade wearing their stylish suits, despite the sudden sound of an unexpected explosion nearby. Three potential meanings of cool are: neither warm nor cold (in the shade); fashionable (stylish suits); calm self-control (despite the nearby explosion). Within philosophy also, ambiguity is associated with the existence of multiple meanings (Sorensen, 2006). The question is, which meaning is the correct meaning in the particular context? For example, a word, such as cool, can be said to be ambiguous if it has at least two specific meanings that make sense in context. Within logic also, ambiguity is associated with the existence of more than one meaning and as a result, more than one interpretation (Bergmann, 2008). Within law, an ambiguity exists when a contract is susceptible to two or more interpretations, each of which is found to be consistent with the contract language. There are two categories of ambiguity in law: patent and latent (Cornelison, 2001). A patent ambiguity occurs because of inconsistency or errors in the language of written document. By contrast, latent ambiguity exists when the language used clearly has one meaning but some extrinsic fact or evidence creates a need for interpretation or a choice among two or more possible meanings. For example, in the case, *Raffles v. Wichelhaus*, 159 Eng. Rep. 375 (Ex. 1864), a contract was made to sell 125 bales of cotton that were to arrive on a ship called Peerless that sailed from Bombay, India. Unknown to the parties to the contract, two ships of the same name were to arrive from the same port during different months of the same year. This extraneous fact necessitated the interpretation of an otherwise clear and definite term of the contract (Linzer, 1995). A summary of the views on vagueness and ambiguity from different disciplines are provided in Table 1.

Vagueness and ambiguity can involve conceptual factors, presentational factors, and/or linguistic factors. These factors are described in section 2 of this working paper.

Table 1. Vagueness and ambiguity defined in different disciplines.

	Vagueness	**Ambiguity**
Etymology	Wandering, rambling, vacillating	Double meaning, shifting, changeable, doubtful
Cognitive science	Concept or word admits borderline cases of application that are indeterminate	Existence of more than one meaning
Philosophy	Borderline cases that no amount of conceptual analysis or empirical investigation can settle	At least two specific meanings that make sense in a particular context
Logic	Truth-values other than true and false are admitted. Borderline cases are those cases in which it is intrinsically impossible to say that a term does or does not apply	Existing of more than one meaning and, as a result, more than one interpretation
Law	Vagueness is an underlying feature of law and courts find some terms to be too vague to be enforceable	Patent ambiguity occurs because of the use of obscure of ambiguous language Latent ambiguity exists when some extrinsic fact creates a need for choice among two or more possible meanings.

The importance of communication to the success of projects has been recognized for some years (Pinto and Pinto, 1991; Pinto and Slevin, 1987; Posner, 1998; Ammeter and Dukerich, 2002; White and Fortune, 2002). Further, the International Project Management Association (IPMA) and the Project Management Institute (PMI) stress the importance of communication to the success of projects, programmes and portfolios. Nonetheless, extant project management literature does not include comprehensive and detailed consideration of vagueness and ambiguity in communication. Indeed, the extant project management literature provides little analysis of:

- global networks as an organizational form
- the characteristics of communication within global network organizations
- communication vagueness / ambiguity within global network organizations.

An overview of these shortcomings is provided in the following three paragraphs. More detailed discussion is provided in the third section of this working paper.

Network organizations are comprised of collections of organizations along with the linkages that tie them to each other, often organized around a focal organization. The relationships of network organizations are often global in scope and reach (Monge and Fulk, 1999). The typical objective of a global network organization is to bring together the resources controlled by the different organizations to create a new and stronger organization that is better equipped for a particular type of challenge. Findings from previous studies by others suggest that the network is a prevalent organizational form in large global projects. In particular, large global projects are characterized by multiple organizations seeking success with different objectives. These multiple organizations include different types of firms, public organizations, government authorities, political decision-making bodies, and even multiple owners that all represent their own, potentially controversial and conflicting, objectives concerning a project (Kharbanda and Stallworthy 1983, Morris and Hough 1987, Kharbanda and Pinto 1996, Miller and Lessard 2000, 2001, Williams 2002, Flyvbjerg et al. 2003, Grün 2004). Accordingly, inter-organizational networks have been recognized as an important topic (e.g. Cova et al., 2002; Cova and Salle, 2000). However, there is limited understanding of network dynamics in multi-organization, multi-project contexts (Skaates and Tikkanen, 2002; Söderlund, 2004). Moreover, the content of both IPMA's Competence Baseline Version 3.0 (2006) and PMI's A Guide to the Project Management Body of Knowledge 3rd Edition (2004) does not include network dynamics.

In particular, these two guides do not refer to research that has investigated the characteristics of network organization communication. Rather, the terminology of communication models dating from the 1940s is used. Within these models, communication is an information transmission problem based on variations of four fundamental elements: sender (or source), message, channel (or medium), receiver (e.g. Shannon and Weaver, 1948). These models have been criticized for decades (e.g. Cherry, 1978; Rapoport, 1956). Overall these models and their derivatives focus more on message-making as process, rather than on what a message means and how it creates shared meaning. In particular, transmission models give little consideration to intentions, context, relationships, and media involved in a communication. These limitations are recognized to some extent in project management literature (e.g. Mooz et al., 2002), and some reference is made to later models which sought to add consideration of meaning and interpretation to earlier communication models (e.g. Berlo, 1960; Osgood and Schramm, 1954). However, there is little consideration in project management literature of more recent models of communication that focus upon how shared meaning is created (e.g. Barwise et al., 1991; Clark and Schaefer, 1989; Clark, 1996; Grice, 1981). Moreover, there is little consideration of research investigating the characteristics of network organization communication. Such research has identified that interorganizational relationships are highly communication intensive (Rockart, 1998) and that global network organizations depend on sophisticated

communication linkages (Monge and Fulk, 1999) This is in contrast to traditional organizational forms which were developed to minimize and simplify communication needs (Cheney et al., 2004).

It is recognized that communication problems can have negative effects on project performance (e.g. Loosemore and Lee, 2002; Trajkovski and Loosemore, 2006). However, extant project management literature does not provide a comprehensive and detailed analysis of vagueness and ambiguity. In particular, insights into how the characteristics of network organizations can affect the emergence or propagation of vagueness and ambiguity are not provided. Table 2 below provides a summary of the current shortcomings of extant project management literature.

Table 2 . Extant project management literature.

Topic	**Extant project management literature**
Global network organizations (GNO)	Emphasis on one-firm one-project context
Characteristics of communication in GNOs	Emphasis on transmission models
Vagueness / ambiguity in GNO communications	Emphasis on information distribution

Within extant project management literature, language and culture are identified as being potential sources of communication challenges that can have a negative affect on project outcomes (e.g. English, 2002). Moreover, some consideration is given to the various components of language and culture (e.g. Loosemore and Muslmani, 1999). However, a comprehensive and detailed analysis of vagueness and ambiguity in communication has not yet been provided. Further, the terms vagueness and ambiguity have not been used and clarified. Rather, terms such as communication barriers and communication problems have been used.

The following four figures offer a preliminary model of how vagueness and/or ambiguity can compromise the validity and/or reliability of communications. Figure 1 below illustrates a communication in which all of the recipients (R) have the same understanding of the content of the message communicated to them, and the understanding of the recipients is that intended by the senders (S). For communication to be successful, all receivers must understand the message that all senders *intended* to send, and *both* the senders and receivers must *agree* that the receiver has understood the message (Clark and Wilkes, 1986). The reliability of communications will be compromised if communications are understood differently by different recipients. The validity of communications will be compromised if communications do not address the issues that they are intended to address.

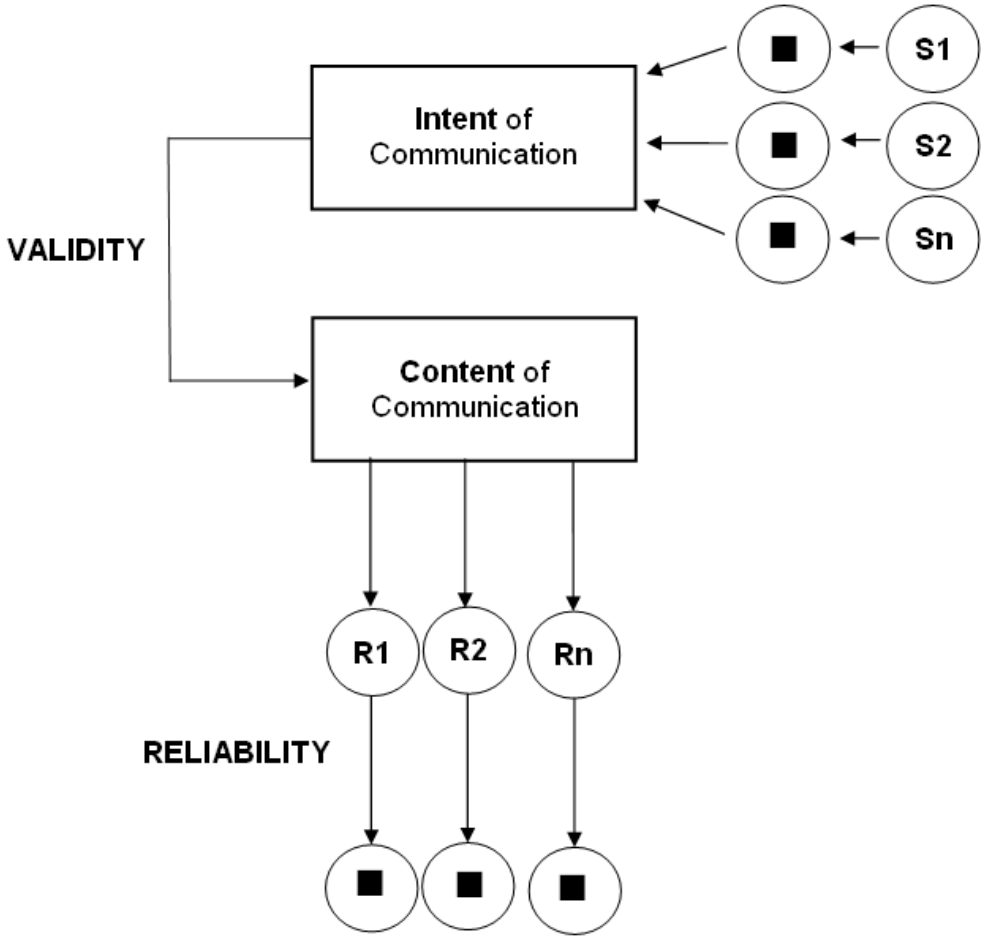


Figure 1. Validity and reliability.

Global network organizations can bring people together who were previously unknown to one another. Moreover, global network organizations can involve people who have different genders, personality types, cultures, first languages, social concerns and/or work experiences. Such differences can lead to ambiguity and/or vagueness in communications. These need to be addressed because they can threaten validity and/or reliability. Figure 2 illustrates all recipients (R) having a different understanding of the same message communicated to them.

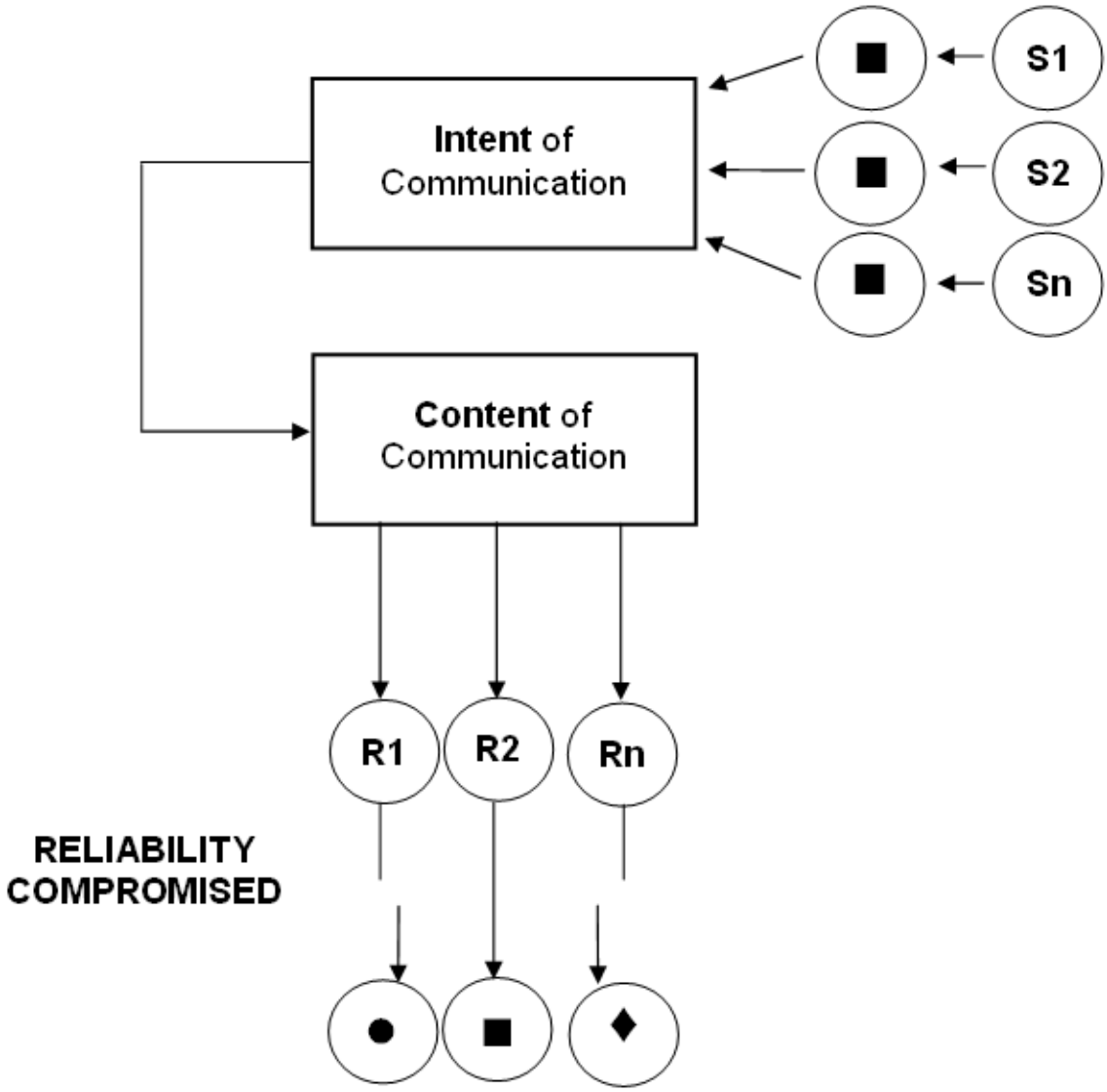


Figure 2. Reliability compromised.

*V*agueness *and ambiguity* in communications can be described under three different headings: conceptual, presentational *and linguistic*. Here, the term, conceptual, encompasses the different frames of reference which can be drawn upon by different people involved in the same communications. *Here, the term, presentational, encompasses the different settings and styles that can be preferred by different people involved in the same communications.* Here, the term, linguistic, encompasses the different characters, sentence structures etc., which can be used by different people involved in the same communications. Figure 3 illustrates all recipients having the same understanding of the information communicated to them, but that is not the understanding which the senders intended them to have.

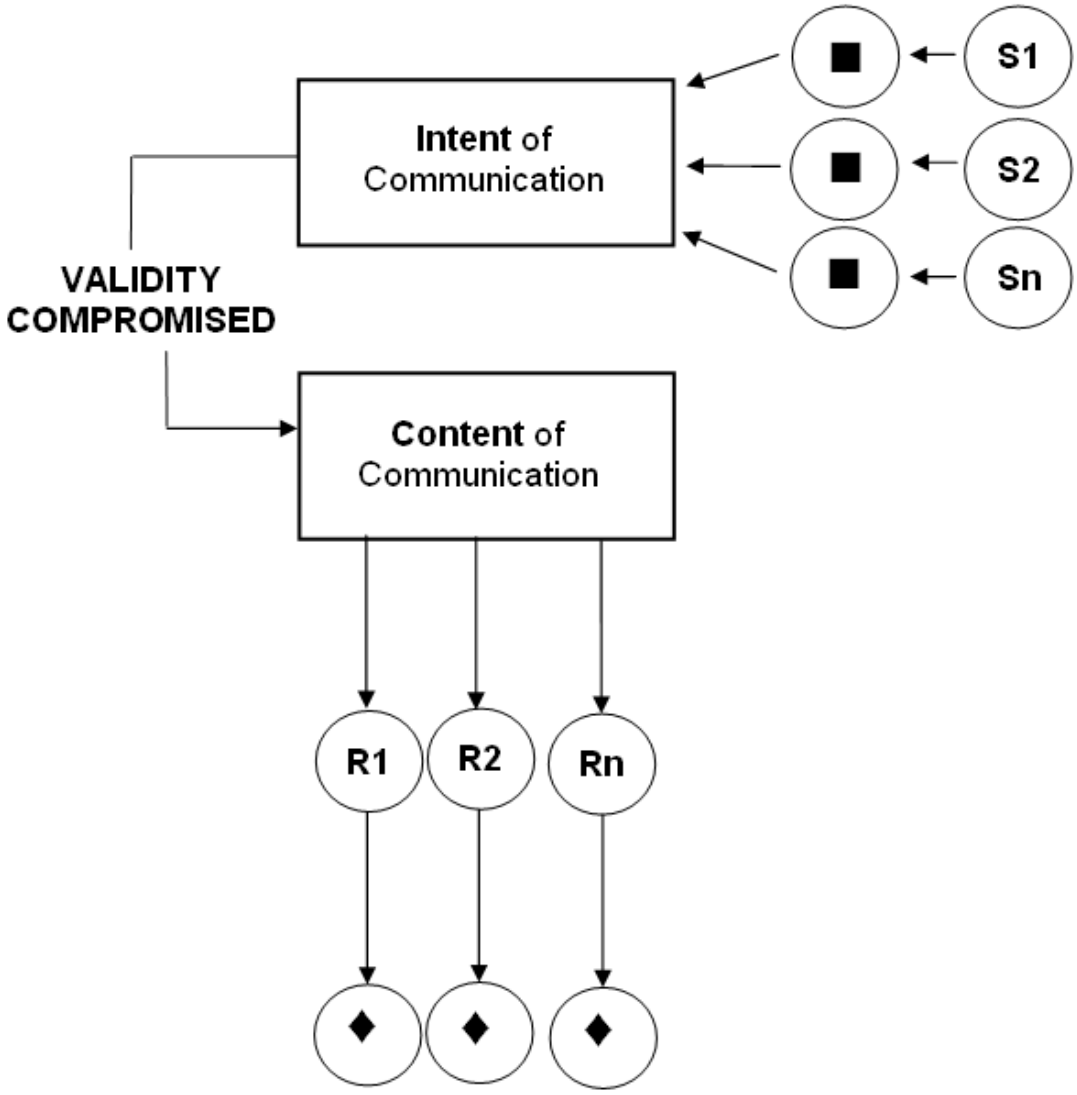


Figure 3. Validity compromised.

Figure 4 illustrates that validity and reliability will both be compromised when the senders of a communication have different intentions for the communication.

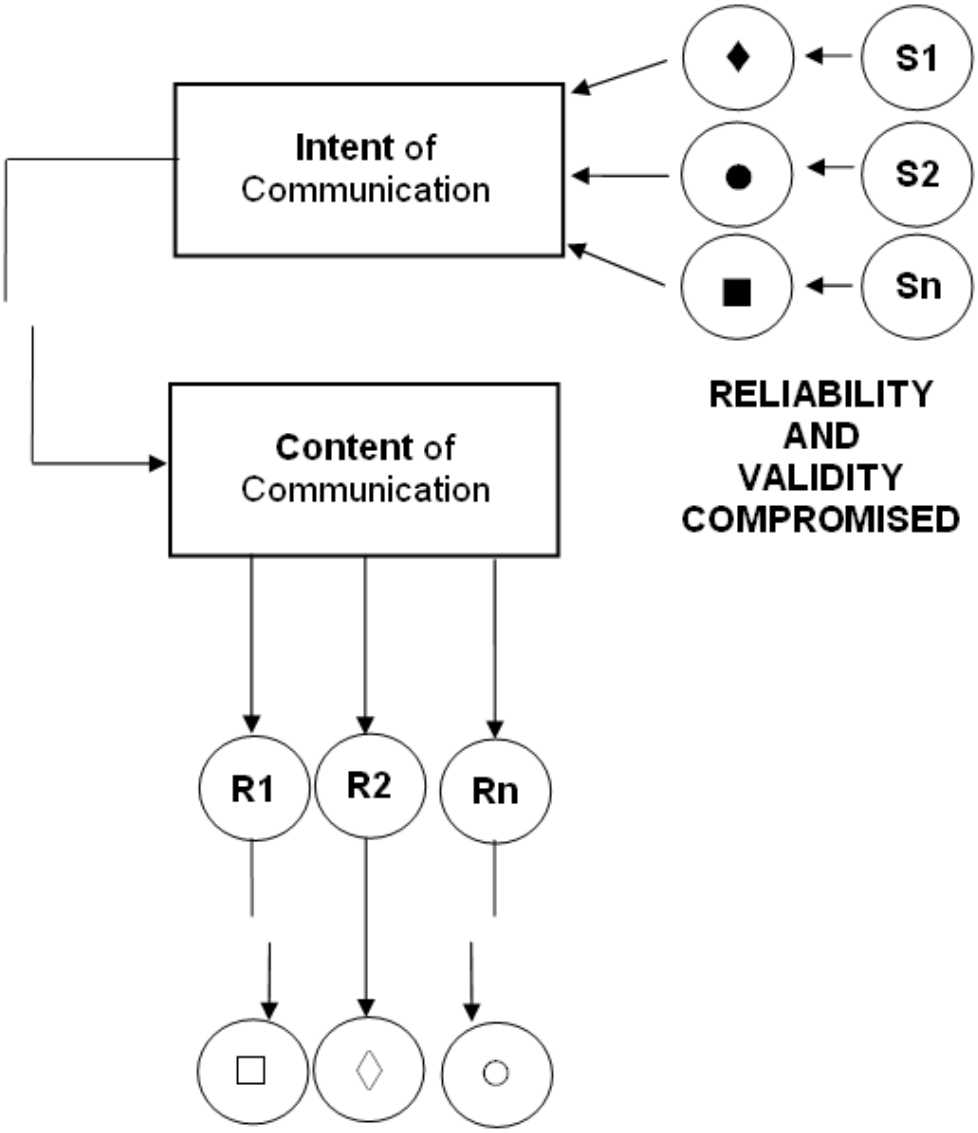


Figure 4. Validity and reliability compromised.

When validity and/or reliability are compromised, a communication can be misunderstood. Misunderstandings can be defined as interpretations that distort the intent or content of communications (Larkey, 1996). Misunderstanding can lead to the recipients of communications taking unintended actions that lead to unintended consequences. The well known picture shown on the next page illustrates how a broad range of unintended consequences can arise. Following on from unintended actions that lead to unintended consequences can be many more consequences that do not add value such as rework, delays and contractual disputes.

what marketing suggested

what management approved

as designed by engineering

what was manufactured

as maintenance installed it

what the customer wanted

Figure 5. Unintended consequences.

Also recipients can pass on their misunderstandings of one communication through many communications to others. Hence, the consequences of the validity and/or reliability of communications being compromised can be far reaching. As illustrated by the diagrams represented in Figure 6 below (Muller-Prothmann et al., 2005), a misunderstanding arising from one communication can spread across a network organization, leading to many unintended actions with many unintended consequences. The circles in the diagrams can be thought of as nodes, and the lines as linkages. Nodes in global network organizations can be people, teams, firms, public organizations, government authorities, or other bodies. The links in global network organizations are various coordination mechanisms.

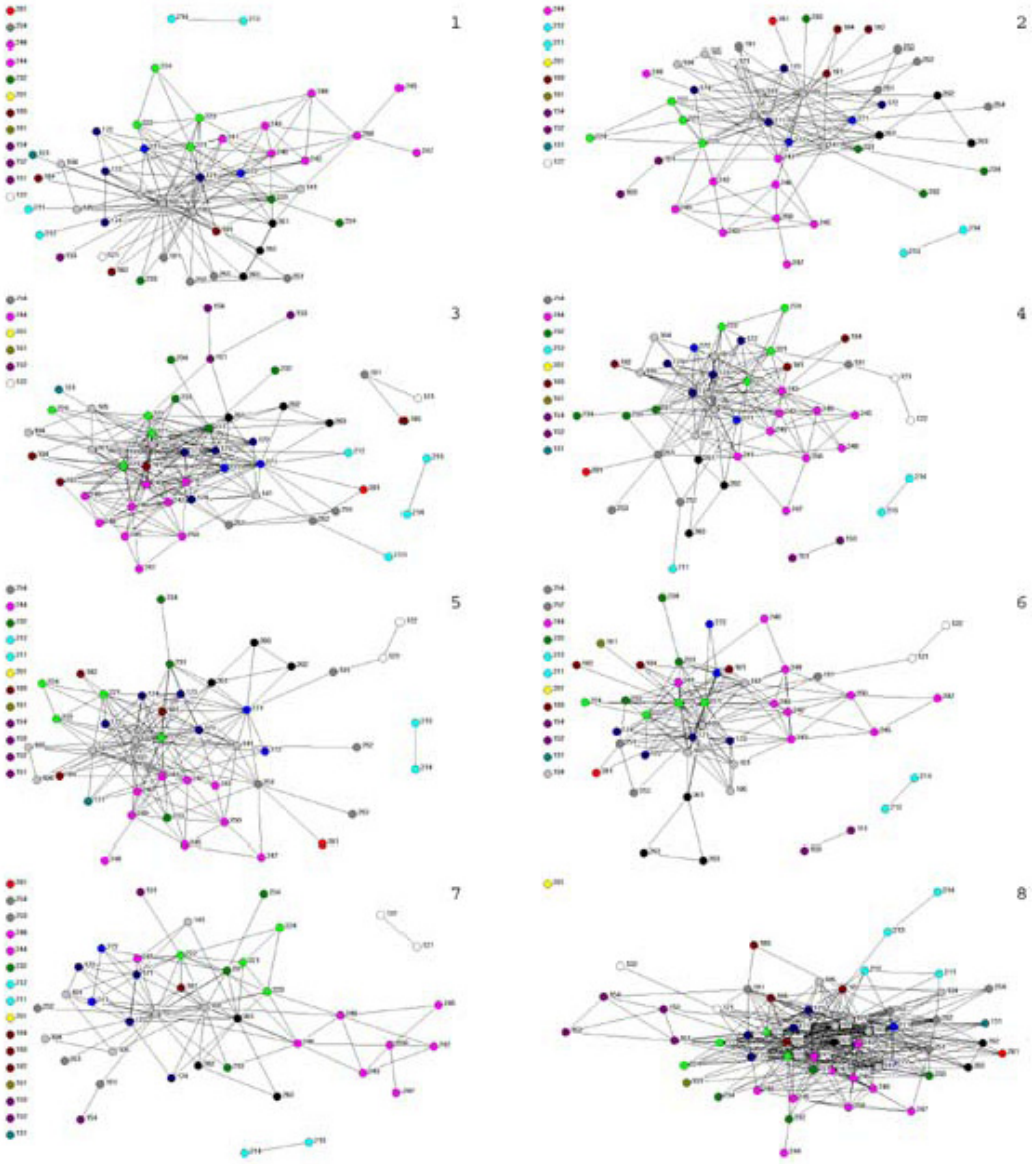


Figure 6. Communication networks.

Communication in interorganizational networks often cross traditional functional boundaries and hierarchical layers. Thus, information flows are potentially faster and more economical. However, the information exchanged is more complex. In addition to receiving information more quickly, current ICTs allow their users to modify, enhance, or manipulate the received information in numerous ways (Monge and Fulk, 1999). As a consequence the quality of communication exchanges becomes the most central concern in interorganizational relationships.

1.2 Research goal

The goal of the research reported in this VTT working paper was to further understanding of ontological uncertainty and semantic uncertainty.

1.3 Research method

The study built upon that reported in VTT Working Paper 67 (2006). In this study, conceptual factors and linguistic factors related to ontological uncertainty and semantic uncertainty were further investigated. In addition, presentational factors related to these types of uncertainty were investigated for the first time. Then, characteristics of network organization communications were examined. Next, twenty-three documented cases were analysed in order to explore ontological uncertainty and semantic uncertainty in global network organizations. In conclusion, tentative conclusions were drawn from the findings of the case analyses.

1.4 Research reporting

The remainder of this working paper comprises a further four sections. In the next section, conceptual, presentational, and linguistic factors related to ontological uncertainty and semantic uncertainty are described. Characteristics of global network organization communications are discussed in section three. The analyses of cases are reported in section four. In the final section, the principal findings from the research are stated and directions for future research are defined. Recommendations for minimizing ontological uncertainty and semantic uncertainty are summarized in two templates at the end of section 4.

2. Conceptual, presentational, linguistic factors

Communications can include data, information, and/or knowledge. These are often defined in relation to each other in a hierarchy comprising steps such as the following: data, information, knowledge, understanding, wisdom and enlightenment. In this type of hierarchy, data are elements of information without context. Then, information is the result of processing, manipulating data in ways that add to the knowledge of the person receiving it. In other words, information adds sense to data. Information is descriptive and can be presented in a wide variety of forms including text, images and sounds. Information provides answers to the types of questions that begin with words such as the following: who, what, when, where, how many. Knowledge is instructive, rather than descriptive, and can provide answers to questions that begin with words such as the following: how, how to. Understanding is generative, gives rise to creative insights and requires intuition. Wisdom is valuative, requires empathy and is normative. Enlightenment is transcendent and involves reaching new levels of consciousness.

Literature review and discussions with experts in ontology, visual communication and translation led to the identification of three principal sources of vagueness and ambiguity that can occur in communications. These sources can be described under the following three headings: conceptual; presentational; linguistic. Here, the term conceptual encompasses different frames of references used by speakers of different languages. It is important to note that concepts exist in the mind as abstract entities independent of the terms used to express them. Moreover, the boundaries of concepts can be indistinct. Here, the term presentational encompasses different contexts and styles which can affect communications. Here, the term linguistic refers to different symbols, characters, sentence structures etc., which are used by speakers of different languages. Each of these categories can include a number of types of ambiguity and/or vagueness. Twelve sources are listed below and described in the following sub-sections.

- conceptual: all languages (Ca);
- conceptual: language families (Cf);
- conceptual: more than one language (Cm);
- conceptual: one language (Co);
- presentational: composition (Pc);
- presentational: situation (Ps);
- presentational: behaviour (Pb);
- presentational: media (Pm);
- linguistic: lexical (Ll);
- linguistic: syntactic (Lsy);
- linguistic: semantic (Lse);
- linguistic: phonological (Lp).

2.1 Conceptual

Conceptual: across all languages (Ca) Democracy, honor, and liberty are examples of concepts which can be vague across all languages. Each person's own borderlines for such concepts depend each person's own ontology. Perhaps more mundanely, the vagueness of a potentially less contentious term like, mature, can have important consequences. For example, making the formulation of habitat maps by botanist a highly subjective process that diverges from ecological realities (Elith et al., 2002). Further, courts can find concepts such as "explicit" and "objectionable" to be too vague to be enforceable. Hence, vagueness is a possible legal defense against by-laws and other types of regulations. The legal principle is that delegated power cannot be used more broadly than the delegator intended. Therefore, a regulation may not be so vague as to regulate areas beyond what the law allows. Any such regulation would be "void for vagueness" and unenforceable. This principle is sometimes used to strike down municipal by-laws that forbid "explicit" or "objectionable" contents from being sold in a certain city; courts often find such expressions to be too vague, giving municipal inspectors discretion beyond what the law allows. Void for vagueness is a legal concept in American constitutional law, whereby a civil statute or, more commonly, a criminal statute is adjudged unconstitutional when it is so vague that persons "of common intelligence must necessarily guess at its meaning and differ as to its application," as the United States Supreme Court articulated in Connally v General Construction Co., 269 US 385, 391 (1926). A statute is void for vagueness when: 1) it is unclear what persons fall within its scope, 2) what conduct is forbidden, and/or 3) what punishment may be imposed. Due process requires that a law be reasonably definite as to what persons and conduct are covered as well as the punishment for any violation (Chemerinsky, 2002). Building Information Models, is an example of technological concepts which are vague across all languages (CAa). In one article, for example, the terms Building Information Models and Product Modelling are used to describe the same technology (Anteroinen, 2005). The term Building Information Models is a noun, while the term, Product Modelling can be a verb. Building Information Models (BIMs) are computer-interpretable information models of buildings and/or built environments (Goldberg, 2004). A computer-interpretable model can be described as digital objects and their relationships. A digital object being, a single "container" of computer code that combines data (properties) and behaviour (methods). The introduction of BIMs is intended to make it much easier to repeatedly create, simulate and analyze alternative solutions for the design, construction and operation of buildings.

Ca can be identified by making reference to papers and/or articles. If a concept is referred to by more than one term in papers and/or articles published in the same one year period, Ca may exist. The existence of Ca can be further investigated by making enquiries with the authors of papers and/or articles. Such authors may be able provide

insights into a concept's origin which is equivalent across all languages and/or point to an emerging pattern of terminology. For example, a Glossary on Building Product Modelling (Karstila, 2004) includes the statement, "Note: Recently, also the term Building Information Model (BIM) has been used as a synonym for building product model". Discussions with Karstila and other experts, revealed agreement that the term building product model was becoming less widely used. Discussions also revealed agreement that the term product model describes a concept which underlies Building Information Models.

In an effort to eliminate Ca, communications should include specific examples which are relevant to project participants own particular experience. For example, the term, Building Information Model, can be replaced by the names of each specific software product which individual participants have used. If project participants do not have prior experience they should be shown explanatory images such as screen shots of relevant software packages in use.

Conceptual: across language families (Cf) The term, 4D, introduces an example of concepts which can be vague across language families (Cf). Visual 4D models are intended to communicate the spatial and temporal, (four dimensional) aspects of construction schedules more effectively than traditional planning tools such as bar charts and network diagrams. A review is provided by Heesom and Mahdjoubi (2004). The conceptualization of time and space is an important example of conceptual vagueness across different language families (Whorf, 1939; Nunez & Sweetser, 2006). In particular, past, present and future actions are clearly distinguished by speakers of the English language. For example, when saying, "I will see the person", "I see the person", "I saw the person". By contrast, the present and future tenses are seldom so clearly distinguished by speakers of the Finnish language. In particular, a question using the present tense in Finnish may be interpreted as covering also the future tense. Such differences can be specific to families of languages, rather than specific to individual languages. For example, the English language is a member of the Indo-European family of languages. Finnish is a member of the Ural-Altaic family of languages. Studies suggest that the spatio-temporal mental models formed by native Finnish speakers differ from those formed by native speakers of Indo-European languages (Stromnes, 1974). The conceptualization of time can become important when research questions concern the evaluation of processes where time is a critical factor.

Cf can be identified by finding out what language families project participants' languages belong to. Then, by finding out what are the reported differences between those language families. Next, by assessing the relevance of those differences to the communication to be prepared. Information about language families is readily available and widely reported (e.g. Davies, 2006; Highfield, 2006). Preparation time can be

reduced and understanding can be increased by seeking advice from relevant scholars before delving into the scientific literature. Also, input should be sought from native speakers who are experts in the thing to be evaluated. However, it is important to note that experts in, for example, 4D analyses, may be unaware that their native languages belong to a language family which conceptualizes time in a different way to the language families of project participants. Accordingly, those preparing communications should obtain background information before such seeking input from experts who are not language scholars.

In an effort to eliminate Cf, concepts should be broken down into elements. For example, rather than making broad statements about 4D analyses of Building Information Models, specific statements should be made about particular types of analyses. Different conceptual links between different statements and different language families should be defined before communications are prepared. For example, speakers of different language families might have different analyses priorities, such as how far into the future analyses should be carried out.

Conceptual: across more than one language (Cm) Word equivalents do not always exist in different languages and this may be due the lack of equivalent concepts (Wierzbicka, 1992). For example, there is no word equivalent for “fair” in Japanese (Kidder and Miller, 1991). Also, mistranslations can happen when one word represents several concepts in the source language, while in the target language each of the same concepts is symbolized by a different word. This difficulty led to Michelangelo carving little horns on the head of his statute of Moses. The Latin translator of the Bible encountered the phrase which in Hebrew means “and rays glowed from Moses’ face”. Since in Hebrew “rays” and “horns” are referred to by the same word (“karnayim”), the translator selected the Latin word for “horns” and mistranslated the sentence as “horns grew on Moses’ head” (Fram-Cohen, 1985).

The word, benefit, provides an example of conceptual ambiguity across more than one language (Cm). The one English language word, benefit, has two translations in the Finnish language. These are “hyöty” and “etu”. The corresponding adjectives, “hyödyllinen” and “edullinen” correspond to the English language words, useful and advantageous. The exact terminology, conceptual ambiguity across more than one language, was not found during literature review. However, literature review revealed interest in the extent of conceptual ambiguity across languages (Lucy, 1997; Nisbett, 2003) Further, the emic-etic issue is a topic of interest in cross-cultural research (Brislin, 1980). Researchers with an emic perspective seek to develop an understanding of how concepts are understood in one specific culture. That culture may, or may not, be defined by geographical boundaries of one specific country. Researchers with an etic perspective are concerned with developing an understanding of how concepts are

understood across cultures. It has been suggested that concepts can be unique to one culture, comparable across cultures, or overlapping (Church & Katibak, 1988).

Cm can be identified by seeking advice from bilinguals. Prior to this reference could be made to dictionaries. For example, in one English to Finnish dictionary the Finnish words, "vahinko", "haitta" and "tappio" are listed for the English word, disbenefit (Hurme et al., 2000a). Making reference to the same publisher's Finnish to English dictionary (Hurme et al., 2000b) the word, disbenefit is not listed for any of the three Finnish words. Thus, reference to the Finnish to English dictionary suggests that the word, disbenefit, does not have a Finnish language equivalent. In this way, ambiguity across more than one language can be identified. However, it is important to note that reference to dictionaries is at best a starting point. Dictionaries are not adequate tools to determine the actual usage of terms (Gile, 1995).

In an effort to eliminate Cm, communications should be made as specific as possible, in this case, about particular types of disbenefits which might arise from 4D analyses of Building Information Models. For example, one disbenefit might be personnel losing their own visualization capabilities if they are continually provided with computer visualizations. Also, alternative words or phrases to disbenefit could be considered. These could be "negative side effects" or "negative unintended consequences".

Conceptual: across one language (Co) The word, net, introduces an example of conceptual ambiguity across one language (CAo). This is because the Finnish word, "nettohyöty" may refer either to benefits minus costs or to the benefits in comparison to the baseline situation. This type of conceptual ambiguity is widely recognized. In particular, conceptual ambiguity across one language can increase when one language is the native language of speakers in many different geographical areas. The Spanish language, for example, is the native language of speakers in several South American countries. It has been argued that questionnaires written in Spanish of Spain would need to be adapted for use in Argentina (Wild et al., 2005). Similarly, French is the native language of many people in living in Belgium, Canada, Switzerland and some parts of Africa. Examples of conceptual ambiguity across British English and American English are widely reported (BBC, 2003).

Conceptual ambiguity across one language can be identified by seeking advice from relevant experts who are native speakers of participants' and/or researchers' native languages. These experts need not be bilingual. Again, dictionaries may be referred to but only as starting point before discussions with relevant experts. For example, when considering the Finnish word, "nettohyöty", a Finnish financial dictionary could be referred to before seeking clarification from Finnish accountants or economists. If research is to be carried in different countries where the same language is the native

language (e.g. UK and USA), alternative dictionaries such as Oxford and Webster could be referred to before seeking advice from relevant experts who can be monolingual. In an effort to eliminate Co, words which have recognized ambiguities should not be used.

2.2 Presentational

Presentational: due to composition (Pc) Communications can be composed of different types of data, information, and/or knowledge: all of which can be styled and organized in different ways ranging from simple text to complicated diagrams. Compositional vagueness and/or ambiguity can arise when style and/or organization of the elements of a communication can be interpreted in different ways by different people. With regard to the composition of written text and spoken words, style and organization should be congruent with the dominant function of a communication. For example, it has been argued that communication among peers may serve either formal-organizational functions such as communication focused on task accomplishment, or psychological-individual functions such as communication that meets need for affiliation (Jablin, 2001). Table 3 below shows six different functions, each with an example of a congruent style and organization (Jakobson, 1960; Chandler, 2001).

Table 3. Function, style and organization.

Function	Example
Imparting information	It's raining.
Expressing feelings or attitudes	It's bloody pissing down again!
Influencing behaviour	Wait here till it stops raining!
Establishing or maintaining social relationships	Nasty weather again, isn't it?
Referring to the nature of the interaction (e.g. genre)	This is the weather forecast.
Foregrounding textual features	It droppeth as the gentle rain from heaven.

Different people can have different perceptions of the function of a communication and/or different opinions about what composition style and organization are appropriate. For example, different people of different cultures, genders and personality types can have different perceptions about which function should be dominant in a particular situation and hence should most influence the character of a message. Moreover, different people may favour one of the three different primary message design logics (O'Keefe, 1988) summarized in Table 4 below.

Table 4. Message design logics.

Message design logic	Definition	Examples
Expressive	Simply expressing thoughts and feelings, with no attempt to adapt to situational or relational constraints	"I want that report done by tomorrow or else!" "I really, really, REALLY want that report tomorrow!"
Conventional	Adapting message to shared conventions or norms for communication	""Would you please have the report ready by tomorrow?" "As your supervisor, I'm going to have to ask you to have the report ready for tomorrow."
Rhetorical	Reframing or redefining the situation to avoid threats to identities and relationships	"I know getting the report in by tomorrow is as important to you as it is to me." "How about we plan to celebrate getting that report completed tomorrow afternoon?"

Moreover, different people can have radically different opinions about what information should be included, and should not be included, in a communication about the same subject. This may be the case, even when people share the same cultures, genders, and personality types (Gibbs, 2004). Although it has been said that everyone is entitled to their own opinions but not their own facts (Moynihan in Morrison, 2004), the content of communication can be composed of information that is based on opinions that senders and recipients may not agree upon.

As well as written text and spoken words, communications can include combinations of static images, animated graphics, sounds effects etc. The layout of a visual presentation can comprise a background colour, white space, font size, font colour etc. Thus it is important to note that peoples' perception of colour can depend upon their languages and cultures (e.g. Roberson et al., 2004). A striking example is the different associations made with the colours black and white in different parts of the world. Death is symbolized by black in many Western cultures, but by white in many Eastern cultures. Another example is the different associations made with the colour red. In China red is auspicious, while red can be associated with aggression, error and warning in the United States of America. Differences of perception can extend beyond particular colours to general tones. Responses during one study showed that Asians viewed bright colours much less favourably than Europeans and North Americans (Simon, 2001). Furthermore, differences of perception can encompass sounds: with Asians having a particular preference for sound effects (Evers, 2001). Moreover, there can be very different perceptions of effects in one organization with people of similar cultures. For example, chairman of the Joint Chiefs of Staff, General Hugh Shelton, put a ban on

embellishments such as sound effects on slide presentations in the U.S. military when information was judged to be lost in "bells and whistles" (Jaffe, 2000).

Symbols can also have different associations, or even no associations, in different parts of the world. For example, the act of buying cannot be symbolized effectively by a shopping cart icon in countries where shopping carts are not widely used (Becker and Mottay, 2001). More broadly, the organization of elements of communications can also be perceived differently in different parts of the world. For example, Marcus and Gould (2000) suggest that differences between individualist and collectivist cultural values may influence the importance given to individuals versus products when they are shown together in single pictures. Furthermore, differences between high power distance and low power distance cultural values may influence the importance given to the positioning of people and artefacts within pictures. The characteristics of cultures with high power distance include many hierarchical levels and autocratic leadership. By contrast, low power distance cultures are characterized by flat organizational structures, consultative management style, and the expectation of egalitarianism (Hofstede, 1980). Hence, a picture of a company director behind a desk in an office may be viewed favorably by people who value a high power distance. By contrast, a picture of company director mixing with staff maybe viewed more favorably by people who value low power distance.

More broadly, it has been argued that communications which have an indirect and cyclical organization may be regarded more favourably in societies which have indirect and cyclical approaches to their conversations and writing styles (Wurtz, 2005). Similarly, Hall and Hall (1990) proposed that communications can be considered in terms of message speed. In particular, communications that can be quickly and easily decoded and acted upon, such as headlines and television advertisements, can be categorized as fast messages. While communications that take more time and effort to decode and act upon, such as poetry and television documentaries, can be categorized as slow messages. Hall and Hall (1990) argued that fast message sent to people who are geared to a slow format will usually miss the target. This argument is congruent with the notion that the perception of time is culture-specific. In particular, perceptions of time can be placed along a continuum between monochronic / sequential (Hall, 1976; Trompenaars, 1993) and polychronic / synchronic (Hall, 1976; Trompenaars, 1993). In other words, time can be conceived of as a line of sequential events passing at regular intervals or conceived of as cyclical and repetitive, compressing past, present and future by what these have in common: seasons and rhythms. The perception of time is particularly relevant to communications made via websites where complicated navigational schema can increase the amount of time and effort required to access information.

Potential ambiguity and/or vagueness arising from different perceptions about the function of a communication, and/or different opinions about what composition is appropriate for a particular function, can be identified through reference to studies concerning information design. Potential ambiguities arising different perceptions of colour can be identified through reference to studies concerning colour symbolism. Potential ambiguity and/or vagueness arising from the availability and meaning of symbols for use as icons etc., can be identified through reference to literature concerning the use of symbols in marketing, advertising, public relations etc., in different countries and cultures. Reference to studies concerning alternative designs for global websites can facilitate identification of other potential ambiguities which may arise from compositional issues such as schema and sound effects. This is because the design of websites encompasses a very broad range of compositional challenges from traditional layout issues to innovative combinations of the latest technologies for navigation, animation, sound etc. Ambiguity and/or vagueness arising from composition can be eliminated by giving consideration to potential differences between perceptions of style and organization among the different peoples who will be presented to. Differences may arise from language, culture, gender, and/or personality type. Further, fundamental principles for presentation should be adhered to. For example, "visual representation of evidence should be governed by principles of reasoning about quantitative evidence. For information displays, design reasoning must correspond to scientific reasoning. Clear and precise seeing becomes as one with clear and precise thinking" (Tufte, 1997, p. 53). Whenever possible, neither a colour, nor a sound, nor a symbol, nor a schema should be used unless it will be perceived to be useful by all of the parties involved in a communication.

Presentational: due to situation (Ps) Different parties can have very different understandings of the same situation (Ball, 1972) For example, different people can have very different communication goals for the same situation (Clark and Delia, 1979). Goals can be *instrumental* (e.g. persuading, instructing, gathering information etc.), *identity* (e.g. presenting oneself in a desired way and/or treating others as if they certain kinds of people), *relationship* (e.g. reflect what one thinks of a relationship and/or how one wants to shape a relationship). Identity communication goals and relational communication goals can be closely intertwined when *legitimation* is sought for valued identities in relationships (McCall and Simmons, 1978). One of the factors that stimulate relationship development is the exchange of legitimation. For example, the identity one wants to convey, such as competent professional, is closely connected to the kind of relationship established with others. The reverse is also true. Relationships are based on perceived identities. People throughout global network organizations all construct, perform, and negotiate identities and relationships. In order to converse and work cooperatively, communicators can negotiate shared definitions of the situation, including shared definitions of identities and relationships. That is, while each

participant has a subjectivity point of view, they need to achieve *intersubjectivity* – a mutually understood view of the situation.

The situations in which communications are made include time, location as well as the relationships between the parties involved (Hall, 2000). Relationships, like other meanings, are situated, fluid and dynamic. The similarity-attraction theory (Berscheid and Walster, 1978; Byrne, 1971) proposes that people seek out and are attracted to groups of people who are similar to themselves. Observed in social interactions (Blau, 1977; McPherson and Smith-Lovin,1987) similarity-attraction has been found to apply to business settings (Lefkowitz, 1994). Interpersonal similarity has been found to enhance communication between parties, encourage trusting relationships, and contribute to interpersonal bounding between individuals (Kanter, 1977; Lincoln and Miller, 1979) as well as facilitate interaction (Ibarra, 1992). Similarly, the theory of homophily, defined by Lazarsfeld and Merton (1964), is that most human communication will occur between a source and a receiver who are alike (i.e. homophilous and have a common frame of reference). Homophily is the degree to which individuals in a dyad are congruent or similar in certain attributes, such as demographic variables, beliefs and values (Touchey, 1974). Gabriel Tarde (1903) also noted that social relations are generally between individuals who resemble each other in occupation and education. Hetrophily is the degree to which pairs of individuals are different in certain attributes. Thus, hetrophily is the opposite of homophily. Rogers and Bhowmik (1971) mentioned that homophily occurs frequently because communication is more effective when source and receiver are homophilous because individuals enjoy the comfort of interacting with others who are similar. By contrast, interacting with those who are markedly different from us requires more effort to make communication effective. Heterophilous communication between dissimilar individuals may also cause cognitive dissonance because an individual is exposed to messages that are inconsistent with existing beliefs, resulting in an uncomfortable psychological state. The theory of homophily is supported by research findings which indicate that sellers are more comfortable approaching customers similar to themselves (Futrell, 1997) and buyers appear to be more comfortable dealing with sales representatives similar to themselves (Manning and Reece, 1998). Similarly, research by Smith (1998) found that same-gender sales dyads reported greater trust and satisfaction with the relationship. However, the theories of homophily and similarity-attraction theory should not be considered to be universally applicable. For example, while research from the USA suggests that gender may have no impact resulting from meetings between male purchasing agents and female sales representatives, a study in Pakistan found that male buyers prefer working with female salespeople (Sojka et al., 2001). Thus, different people can have different notions about when it is appropriate and when it is inappropriate for women and men to be involved in the same communication situation.

Another issue to consider is that high context communication draws upon the relationships between the parties involved. There can be different types of relationships including adversarial, helping, social, and professional. Relationships can also be at different stages including new acquaintance and sibling bond. Moreover, relationships can involve a variety of *relationship dialectics* including connection vs. automony, openness vs. closedness, novelty vs. predictability, equality vs. inequality, instrumentality vs. affection, and impartiality vs. favoritism (Baxter and Montgomery, 2000; Bridge and Baxter, 1992; Zorn, 1995). The closer the relationships, the more the high context the communication tends to be, drawing upon the shared knowledge of the parties involved. High context communication has been identified as being indirect, reserved, understated, ambiguous and maintaining of harmony. By contrast, low context communication has been identified as direct, open, dramatic, precise, and based on feelings (Gudykunst et al., 1996). High context communications are prevalent among some nationalities while low context communications are prevalent among other nationalities. Such differences can lead to different preferences for the parties to be involved in communications. For example, when chosing a third-party to act as a mediator, Americans prefer a stranger whereas Chinese prefer a person with ties to both disputing parties (Morris and Fu, 2000). The term, communicator reward valence, has been introduced to describe the sum of the positive and negative attributes that the person brings to the encounter plus the potential that s/he has to reward or punish in the future (Burgoon et al., 1995). In other words, what a person can do FOR another, and what a person can do TO another.

Other differences between culture values, such as individualism versus collectivism and high power distance versus low power distance (Hofstede, 1980) can also lead to different preferences for the parties involved in communications. In particular, individuals in collectivistic cultures tend to be interdependent with others and will usually have built a network of deep-rooted relationships. The characteristics of cultures with high power distance include many hierarchical levels and autocratic leadership. In high context, high power distance, collectivist cultures, the concept of face is particularly important. Face is lost when the individuals, either through their actions or that of people closely related to him, fail to meet essential requirements placed upon them by virtue of the social position which they occupy (Ho, 1976). Concern for face becomes salient in particular social contexts, such as those involving an audience of subordinates (Ho, 1994). It has been argued that communications from the United States of America to North Korea have been unsuccessful because of American insensitivity, and Korea sensitivity, to the concept of face. In particular, American communications have been so direct, open and undeferential as to cause offense to Koreans (LaMoshi, 2003). Not least because American communications have had a global audience of people including many who may be considered to be subordinate by the leader of North Korea.

More generally, different people may have different concerns about the level of porousness in a situation. In other words, what is the likelihood that the information presented in this situation to these people will reappear elsewhere. When unexpected recording or gossip lead to replication of information in another context, there can be significant social consequences. When assessing porousness and other situational information, people rely on previous experiences and categorizations. They compare the current situation to previous situations and subsequent events to determine what assumptions can be made. While these assumptions may be inaccurate, they provide the necessary framework for people to quickly determine how best present themselves (Boyd, 2002).

Information about potential ambiguity and/or vagueness arising different perceptions of the same communication situation can be identified through reference to studies concerning topics such as conflict resolution and behavior; buyer-seller dyads etc. However, it is important to undertake situation-specific assessments of: potential differences in parties' goals; potential hetrophily among the parties to be involved in a communication situation; potential differences in the parties' perceptions of what are appropriate roles for different types of people; different parties' relationship dialectics; different parties' potential perceptions of the social context of the situation; and factors that could affect the perceived and the actual porousness of the situation. Throughout, it is important to take into consideration stereotypical assumptions about potential parties involved in a communication situation. For example, research on social stereotypes has shown that feminine behaviour is often stereotyped as being tactful, gentle, loquacious, and aware of the feelings of others. While masculine behaviour is stereotyped as aggressive, independent, unemotional, logical and competitive (Doyle, 1985). Feminine stereotypes, it is claimed, are associated with "a people-centered approach" (Rigg and Sparrow, 1994, p. 9). Similarly, gender traits are attributed by Hofstede to his MAS cultural dimension, where men are assertive and women are nuturing (p. 261). Other social-psychological research on stereotypes tends to support these notions. For example, it was found that the probability of a trait being attributed to a man or woman is significantly different (Deaux, 1984). Wherever possible, a communication situation should involve parties who display congruence in those attributes most important to effective communication. Also, an allocation of roles that will be perceived as totally inappropriate by one or more parties should not take place. Further, the social context should be harmonized with the intention of the communication, and the routes through which the content of the communication might reappear should be proactively controlled. For example, the type and number of participants in an audience should be selected to ensure that concerns about face and porousness are not a concern. Generally, efforts can be made to eliminate potential ambiguity and/or vagueness in communication situations by limiting factors which can act to magnify differences of perception based on culture. For example, the influence of culture on perception can

increase when people anticipate that they will have to explain why they have made a decision (Briley et al., 2000). Other magnifying factors include attentional load, time pressure, ambient noise and reminders of prior cultural learning (Chiu et al., 2000). For example, an American may be more likely to speak in a direct, open, dramatic, and precise way based on feelings if that American has to speak in a noisey space, when late for an appointment, while trying to send an Email, having just watched a John Wayne movie (Chang, 2001).

Presentational: due to behaviour (Pb) Communication related behaviour can be grouped into the following seven categories: kinesics, vocalics, physical appearance, haptics, proxemics, chronemics, artifacts (Cicca et al., 2003). The term kinesics includes messages sent by the body including body movement, facial expressions, gait, gaze, gestures and posture. In particular, gaze and eye contact can contribute to assessments of trustworthiness. Further, how people posture their bodies when seated or standing can communicate how people are experiencing their environments. Vocalics refer to the non-verbal elements of the voice, such as people's "tone of voice" or the volume of the voice when they speak. Vocalics can lead to: How you say what you say being more important than what you say. The term prosody is used in connection with vocalics. Prosody emcompasses vocal cues other than words including volume, rate, pitch, inflection, pausing. Prosody can indicate syntax and turn-taking in conversational interactions. Prosody may reflect the underlying attitudes and/or emotional state of a speaker; whether an utterance is a statement, a question, or a command; whether the speaker is being ironic or sarcastic; emphasis, contrast and focus; and other elements of language. It is important to note that prosody may vary from language to language. In Japanese, for example, much of what a speaker feels about what they are saying, and which would require prosody to convey in English, is contained within the language. An particularly important aspect of vocalics is silence. Sometimes people are unable to speak (Von Glinow et al., 2004) because they are emotionally upset or overjoyed and, as a result, unable to put thoughts or feelings into words (Edwards, 1986). The term physical appearance encompasses manipulable cues related to the body including clothing, cosmetics, fragrance and hairstyle. For example, clothing can indicate occupational status with a project director wearing a pressed business suit and a project labourer wearing dirty overalls. Other aspects of physical appearance such as cosmetics, jewelry and length of hair can be much more ambiguous. All together these can indicate how liberal or conservative the views of a person maybe. The term haptics encompasses cues such as frequency, intensity, and type of touch. The skin is the body's largest organ and people can take in a variety of stimuli through the skin. People differ, however, in their willingness to touch and be touched. There are many taboos associated with this form of communication. The term proxemics encompasses spatial cues including interpersonal distance, territoriality, and other spacing relationships. It has been proposed that people have four proxemic zones: intimate distance; personal distance;

social distance; and public distance. Also, distance can include physical objects. For example, two people can communicate with each other with furniture such as an office desk between them. Another two people may communicate with each in the same office without sitting each side of a desk. The term chronemics encompasses the use of time as a messaging system including punctuality, amount of time spent with other parties and waiting time. The term artifacts encompasses manipulable objects in the environment, such as furniture, art, pets or other possessions, that may reflect messages from the designer or user. For example, people with equal financial resources and organizational status may choose to arrive for a meeting in very different cars. One project director may choose to drive and be seen in a sports car while another project director of equal means and standing may choose to be seen in family car. All together, combinations of communication related behaviour can lead to a person's words communicating one thing, a person's body communicating another thing, and a person's appearance communicating something else. Thus, communication related behaviour can result in ambiguity and/or vagueness within communications. For example, different people may have different understandings of a project manager speaking very serious words about an accident while having a non-serious demeanour (i.e. jolly) and wearing non-serious clothing (i.e. brightly coloured casual). In this document, this is referred to as intrinsic communication behaviour ambiguities.

Expectancy violation theory (EVT) suggests that people hold expectations for communication behaviour (Burgoon et al., 1995). For example, socio-linguistic researchers argue that men and women have different social norms for conversational interaction, to such an extent that they even form "distinct speech communities" (Coates 1986, p.117). Discourse is characterised by patterns of speech that are sex specific (Preisler, 1987). Male patterns of communication tend to be based on the notion of a social hierarchy. Female patterns, on the other hand, tend to be network orientated (Tannen, 1990). In general, although intimacy and independence are shared needs of both genders, women focus more on creating intimacy while men focus more on asserting independence and seeking respect. In this view of gender difference, women's discourse tends to be more tentative and socially orientated in contrast to men, who tend to be more categorical (Preisler, 1987). Furthermore, women show a proclivity to highlight cooperation in their discourse while men tend to be competitive (Coates, 1986). As a result, men's conversation often has a hidden agenda of achieving and maintaining social standing. For men, discourse tends to be a struggle to preserve independence. By contrast, women's communication is inclined toward seeking and confirming intimacy, support and consensus. These differences are also evident in problem solving communications where men tend to use discourse to solve the problem while women use it to show empathy (Tannen, 1990), solidarity, and mutual support (Coates, 1986). Such gender-based distinctions have been supported by many case studies (Johnson, 1993; Tannen, 1994). Expectations deal with the actual behaviour of

the parties involved in communication. Expectations can be the result of cultural learning and/or they can be the result of norms that develop over time in a particular relationship, such as parent and child, teacher and student, employer and employee. Expectations are not absolute. Rather, there is a range of acceptable behaviours in any communication event. However, when behaviour is perceived as out of the range of acceptable actions, a violation occurs. Within EVT, the result of such violations can be referred to as arousals. When parties are aroused in this manner, their attention diverts from the original purpose of the interaction to the unexpected behaviour. Expectancy violation theory suggests that violations of expectations can either be perceived as positive or negative depending upon the interpretation of the violation and the communicator reward valence. That is the sum of the positive and negative attributes that the person brings to the encounter plus the potential that s/he has to reward or punish in the future (Burgoon et al., 1995). Expectancy violation theory cannot be used to generate specific predictions. Not least because most interaction between people is extremely complex and there are many contingency conditions to consider within the theory. Accordingly, the theory is undergoing development and has been reformulated by Burgoon and her colleagues as a new theory known as Interaction Adaption Theory. Nonetheless, EVT provides a useful conceptual framework for potential ambiguity and/or vagueness arising from communication related behaviour among people with different expectations arising from different cultural learning and/or different experiences within similar types of relationships. In this document, this is referred to as extrinsic communication behaviour ambiguities.

It has been argued that individuals' participation in particular networks of relationships influence how they interpret communications (Gumperz and Gumperz, 1996). In particular, it has been argued that contextualization conventions are developed through individuals' interaction experiences with their particular networks of relationships. Contextualization conventions include behavioural aspects such as space, touch, gestures, facial expressions, use of time (Duffey, 2000). Interpretive complexity can be caused by contextualization conventions because they are generally used habitually and therefore are outside of people's awareness; and are more likely to be similar among those inside (rather than outside) people's networks of relationships (Von Glinow et al., 2002); yet are generally relied upon to interprete others' (including outsiders') way of speaking (Gumperz and Gumperz, 1996). An example of an important nonverbal contextualization convention is the use of head nodding. Among U.S. Americans head nodding generally indicates agreement with what has been said (Von Glinow et al., 2004). By contrast, among Swedish people head nodding may indicate only that listeners heard what was being said, not that they agreed (Kanter and Corn, 1994). Von Glinow et al., (2004) propose that individuals tend to use multiple contextualization conventions at any given time, embedding one within another. For example, when

someone says, I am dead serious, while using the nonverbal eye wink. They describe such multiple conventions as polycontextual.

In order to identify potential ambiguity and/or vagueness, a situation-specific assessment should be carried out in which intrinsic factors that can be set beforehand are considered. These include physical appearance, chronemics and artifacts. Intrinsic ambiguities that can arise during communication should also be assessed. These include kinesics, prosody, haptics and proxemics. Furthermore, potential extrinsic ambiguities arising from cultural and relationship expectations need to be assessed. Assessments can be supported by reference to up-to-date sources describing the latest developments and established practice in different societies' etiquettes and protocols. Such sources can provide details of how to minimize both intrinsic and extrinsic communication ambiguities. For example, different cultures have differing norms regarding acceptable and unacceptable behaviours: with what could be considered a gesture of affection in one culture being seen as offensive and inappropriate in another. Hence, distinct cultural expectations and the possible impact of violations must be taken into consideration (Burgoon and Hale, 1988). Similarly, businesses, professions and industries can have different rules and regulations regarding communication related behaviour. Accordingly up to date sources such as induction manuals and codes of practices should be referred to. Potential ambiguities can be eliminated by, for example, aligning physical appearance and artifacts with expectations; ensuring that all parties perceptions of time are taken into consideration; ensuring that expectations for kinesics, prosody, haptics and proxemics are all respected.

Presentational: due to media (Pm) can arise from differences in users' cultures, genders and/or personality types, as well as conflicts between task requirements and social concerns. There can be conflicts between task requirements and social concerns, for example, when a task such as turning down a long-serving member of personnel for a promotion would be well served by a "rich" medium such as a face-to-face meeting, but the task is socially unpleasant. As a result, a "leaner" medium such as an Email is used instead. By contrast, a manager may use face-to-face meetings to convey straightforward routine information in order to maintain working relationships. Social concerns can change as, for example, superior-subordinate relationships progress from *stranger* phase, to *acquaintance* phase, to *maturity* phase (Graen and Uhl-Bien, 1995). Also, social concerns can change as superiors develop friendships with some subordinates (Bridge and Baxter, 1992). Similarly, social concerns among peers can change over time (Sias and Cahill, 1998). More generally, social concerns can change as people respond to the ebbs and flows of the dialectical tensions in their relationships. Different interpretations with computer-mediated communications (e.g. the lack of an email reply) can influence dialectical tensions. Different interpretations are more likely when team members have different contextual knowledge of each other's

circumstances, such as knowing that it is a holiday in a particular country when the email was sent and/or that it is not customary in the email receiver's experience to when not explicitly asked to do so (Crampton, 2002; Von Glinow et al., 2004).

With regard to differences arising from culture, one study (Straub, 1994) examined differences in e-mail usage and choice among knowledge workers in different cultures. For example, a person from a high context culture may not take an Email message seriously, or even be offended by the choice of media, if that person would expect such a message to be communicated in a face-to-face meeting. However, an organizations adoption of new communications technologies may enable telecommuting and reduce possibilities for face-to-face encounters. More generally, notions about Western cultural imperialism (Kim, 1998) and media imperialism (Staubhaar, 1991) can lead to new media being perceived unfavourably in outside of Western countries. Further the specific capabilities of individual media can lead to unfavourable perceptions. For example, cultural conservatives in India have railed against Short Messaging Service (SMS) claiming SMS breaks down their cultural etiquette and marital traditions. They argue that SMS encourages dating among teenagers by allowing them to bypass societal protocols concerning supervised dating (The Register, 2002). More generally, different media can have different speeds. With regard to the speed of media, people from different cultures can have different perceptions of time including different perceptions about speed of response etc (Hall and Hall, 1990).

With regard to gender differences, a study by Gilroy and Desai (1986) found that female college students had significantly higher computer anxiety than male students. There is some evidence that such gender differences could hold across cultures (Lowe and Krahn, 1989, p. 175), and it has been suggested that "the computer culture is uncomfortable for girls and women" (Frankel, 1990, p. 38). One study (Gefen and Straub, 1997) found that gender differences in discourse, in general, were reflected in gender differences in perceived social presence of email. Further, the findings of the study supported previous observations that noted men's relative tendency to feel more at ease with computers. Gender differences may lie more in initial expectations for performance rather than actual use. Nonetheless, socio-linguistic literature indicates that, to some extent, women and men mean and understand similar messages quite differently. Moreover, gender differences in oral discourse can appear in other forms of communication. One study found that matching media richness to task equivocality only resulted in better performance for all female teams. It was argued that this was because females are more sensitive to non-verbal communication and more affected by its absence in computer-mediated communication (CMC). For remaining teams, using richer face-to-face (FTF) communication did not improve performance to a greater extent for more equivocal than less equivocal tasks (Dennis et al., 1999). Another study

(Peter and Valkenburg, 2006) found boys were found to perceive internet communication as more reciprocal than girls do.

Furthermore, the same media can be perceived differently by people with different personality traits. For example, one study (Peter and Valkenburg, 2006) found that younger, more socially anxious and more lonely adolescents more value the controllability of internet communication and perceive it as broader, deeper and more reciprocal than older, less socially anxious and less lonely adolescents. Further, the greater the adolescents' need for affiliation, the more often they regard internet communication as deeper than face-to-face communication. This finding supports the notion that no one media can be regarded as being the "richest".

More generally, different people can have different perceptions of the medium's symbol variety. There is nothing inherently important about the symbol variety of a medium. However, if the medium does not provide a particular symbol when it is needed, then it interferes with work and individuals can become dissatisfied. In particular, different parties have different perceptions about the need for symbols. In situations, where individuals cannot or are less comfortable conveying their opinions directly symbols may become important. Results from one experiment (Byron and Baldridge, 2007) found that receivers' personalities influenced their perceptions of the email sender both directly and indirectly through perceptions of nonverbal cues. The results support notions that the meaning of nonverbal cues is contextually bound and that receivers' personalities influence perceptions of both non-verbal cues and senders. Cues can include the use or non-use of terms such as Dear, Regards, Hi etc. One investigation found that language style has a significant impact on impression formation in CMC groups. Generally, it was found that a powerful language style in a CMC group is perceived as more credible, attractive, and persuasive than users of a less powerful language style. Also, it was found that contrasting language styles caused perceptions to be more extreme than if users shared a common language style (Adkins and Brashers, 1995). The importance of the parallelism facilitated by a medium depends upon the number of participants. Ambiguity can arise, for example, from different people's perceptions of whether or not they should be included in distribution lists.

Rehearsability enables the sender to compose a message with the exact meaning that s/he intends. Reprocessability enables the receiver to repeatedly process the message to ensure s/he accurately understands the message as delivered (which may or may not be the message the sender intended to send), and most importantly, enables deliberation. However, media which offer high rehearsability and high reprocessability (physical mail, electronic mail, asychronous groupware) tend to facilitate lower feedback. As a result, people who place importance upon rehearsability and reprocessability may have negative perceptions of media such as face-to-face which offer high feedback, and vice

versa. Such negative perceptions may be aggravated if people believe that their organization is encouraging or imposing the use of media they consider inappropriate for their task requirements due to ceremonial conformity (Meyer and Rowan, 1977).

In order to identify potential ambiguity, an assessment of parties' social concerns, cultures, genders and personality types should be carried out. The results of this assessment should be compared and contrasted to the requirements of the communication task. There are many studies in different disciplines which are carried out to investigate the affects of social concerns, cultures, genders, and/or personality type on media choices and communication performance. Findings can be referred to publications dealing with topics such as business communication; computer-mediated communication; group processes and inter-group relations; language and social psychology; management communication; new media and society. Potential sources of ambiguity can be eliminated by ensuring that media choices are aligned with parties' social concerns, cultures, genders and/or personality types. Where alignment is not possible, it is important to consider how non-alignment could limit communication and address those limitations. For example, by using additional media for some parties.

2.3 Linguistic

Linguistic: due to lexical issues (Ll) Lexical ambiguity can arise when a lexical entry allows a word more than one possible meaning. For example, the use of the word, yes, generally indicates agreement with a communication among U.S. Americans. By contrast, among Japanese, yes, can mean agreement, it can mean, I hear you; it can mean, maybe, or it can mean, no – a phenomenon that can lead to frustration during negotiations (Hodgson et al., 2000). It is important to distinguish between conceptual: across one language and linguistic: due to lexical issues. The word, net, has the potential to introduce both. As described above, the Finnish word, "nettohyöty" introduces ambiguity within a concept across one language. However, "nettohyöty" is not a homonym. By contrast, one colloquialism for the Internet is, the net. For example, in phrases such as, "surfing the net". Hence, some readers of and/or listeners to the phrase, *"the net benefits from 4D analyses of Building Information Models",* could understand that benefits from collaborative 4D analyses which have been enabled by the Internet are being referred to. Thus, the word, net, is a homonym.

In an effort to eliminate Ll, lexical issues can be dealt with in every language separately by native speakers. Potential ambiguities from homonyms, heteronyms and Capitonyms should be investigated and eliminated. It is important to note that it is possible for homonyms to have quite opposite meanings. For example, the word, sanction, can mean to approve and can also mean to punish. Heteronyms (sometimes called heterophones)

can be described as words which are spelt the same but have different meanings. For example, desert (abandon) and desert (arid region). Capitonyms are words that are spelt the same but have different meanings when capitalized. For example, polish (to make shiny) and Polish (from Poland). Again, dictionaries could be referred to before seeking advice from relevant experts who can be monolingual.

Linguistic: due to syntactic issues (Lsy) Syntactic ambiguity can arise from sentences which may be parsed in more than one way. Parsing may involve different readers and/or listeners breaking up a question into different chunks and attributing different meanings to those individual chunks and, as a result, the whole question. Consider, for example, *the net benefits,* as one possible chunk of the phrase, *"the net benefits from 4D analyses of Building Information Models"*. Another reader or listener might break up communications into other chunks including, *net benefits*. Associations with the Internet could be less likely without the word, *the*, in a chunk including *net benefits*. During literature review, structural ambiguity was identified as an alternative term to syntactic ambiguity. Further, punctuation ambiguity was identified as a factor which contributes to syntactic ambiguity.

In an effort to eliminate Lsy, syntactic issues can be dealt with in every language separately by native speakers. In addition, advice may be sought from language scholars who have knowledge of how readers and/or listeners tend to break up questions into chunks. Also, reference should be made to Plain Language guides (e.g. http://www.plainlanguage.gov; http://www.clearest.co.uk). Generally, long sentences which require the stringing together of several chunks should be avoided.

Linguistic: due to semantic issues (Lse) Semantic ambiguity can arise if the same words in the same communications elicit either different cognitive states or different emotional states (Schaffer and Riordan, 2003). For example, the word, benefit, in the phrase "*the net benefits from 4D analyses of Building Information Models"* can be regarded as introducing bias. Consider, for example, a person whose continued employment depends on the continued use of Building Information Models may have an attitude that benefits should be emphasized. On the other hand, the overstatement of benefits from ICT investments is widely recognized (Hempell, 2003; Irani and Love, 2002; OECD, 2003). Thus, a company director may regard negatively communications including words such as benefits. However, possible alternative words such as, consequences, impacts, and affects may have slightly negative connotations. Accordingly, different cognitive states or different emotional states should be considered during the piloting of important communications. For example, in this case, by seeking a balanced piloting sample of people with different interests in a technology. Such a sample could include a people whose careers could be advanced in connection to the thing which will be evaluated and people whose careers could be thwarted.

Further, semantic ambiguity can arise when the meaning of a sentence could be determined only with the help of greater knowledge sources (Baker et al., 2001). In particular, idiomatic phrases, slang, euphemisms and proverbs which are in common use in one language may be difficult to translate into other languages (Small et al., 1999). Furthermore, idiomatic phrases may be specific to the sociolect of just one company or even different parts of the same company. For example, the directors of a company may have only occasional need to speak about Building Information Models, and may refer to them as, Building Information Models. By contrast, site personnel in the same company who use Building Information Models every day may refer to them as BIMs. When the terms, *Building Information Model* and *4D*, are used the meaning of the phrase, *"the net benefits from 4D analyses of Building Information Models"* must be determined with the help of greater knowledge sources. In an effort to eliminate Lse, idiomatic phrases which are in every day use in only one language should be avoided. The identification of such phrases could be accelerated through input from bilinguals. Further, the extent of sociolects should be given careful consideration. For example, the everyday word, opportunity, has a quite special meaning in the sociolect of risk management consultants. In that sociolect, opportunity can mean "a risk with a positive outcome" (Lesrisk, 2006). The identification of such meanings is difficult without input from specialists. There is no need for such specialist to be bilingual.

Linguistic: due to phonological issues (Lp) Phonological ambiguity can arise when a set of sounds can be interpreted in more than one way. Phonological ambiguity can be introduced by homophones. Phonological ambiguity is important in oral communication (Frost et al., 1990). In an effort to eliminate Lp, phonological issues can be dealt with in every language separately by native speakers. Potential ambiguities from heteronyms, homophones and Capitonyms should be investigated and eliminated. Capitonyms have different meanings and may, or may not, have different spellings. Potential ambiguities from blurring of words should also be identified and eliminated. For example, if two words, a parent, are blurred they could sound like one word, apparent. Global network organizations can involve many people from different parts of the world communicating in a common language, such as English, which is not their first language. They may speak the common language in a wide variety of accents which listeners are unfamiliar with. This could increase ambiguities arising from phonological issues.

3. Communication in Network Organizations

In this section, an overview is provided of: the characteristics of network organizations; network communication technologies; and established concepts in network organization communications.

3.1 Network organization characteristics

Network organizations are comprised of collections of organizations along with the linkages that tie them to each other. There are numerous variations on the network organizational form including joint partnerships, strategic alliances, cartels, research and development consortia, and large global projects. In the 1980s, it was identified that the plans of many organizations depended more and more upon the decisions of other organizations; that the problems facing organizations are bigger than they can solve alone; and that their attempts to manage environmental contingencies often create unanticipated problems (Gray, 1985). Further, it was identified that increased environmental complexity and turbulence lead to organizations expanding their boundary-spanning activities to include collaboration with other organizations. Interorganizational relationships have been established because organizations hope to reduce risk and uncertainty by linking up with other players in the market, and to improve their resource base, including both material resources and the information they use to guide their decisions and actions (Powell, 1987). More recently, it has been argued that interorganizational relationships can also help organizations to share important knowledge, so-called intellectual capital. This type of knowledge sharing can be termed c-commerce (collaborative commerce). This term refers to the development of interorganizational teamwork, where organizations open their internal information systems to other organizations and/or collaborate on the development of a new product (Rockart, 1998). Also, it has been observed that interorganizational relationships are used to build public confidence in the value of an organization's goods and/or services. For example, by linking well-known and respected organizations (Stuart, 2000). Further, it has been argued that relationships between organizations can be described as "access relationships" when they extend the reach of an individual organization (Stuart, 2000).

The network was determined to be an important organizational form during the 1990s. In particular, the network was asserted to be a distinct from two forms recognized in neoclassical economics: market and hierarchy (e.g. Powell, 1990). Postbureaucratic models were founded on the logic of networks: nodes and interconnectedness (e.g. Reich, 1991; Nohria and Eccles, 1992; Quinn, 1992). The traditional concept of the linear value chain was supplanted by the new notions of value networks or

"constellations" (e.g. Norman and Ramirez, 1993), and boundary-less organizations (Nohria and Berkley, 1994). Small and medium-sized firm networks drew interest as competitive resources in specific industries (e.g. Grabher, 1993). Traditional East Asian business networks such as Japanese *keiretsu*, Korean *chaebol*, Taiwanese family businesses were reported as examples of network enterprise systems (e.g. Castells, 1996). Further, global interconnections was reported to be a defining feature of globalization (e.g. Held et al., 1999). In the new millennium, so called virtual organizations comprising networks of organizations linked by sophisticated information and communication technologies have been reported (e.g. Camarinha-Matos et al., 2004).

Rather than being organized around market or hierarchial principles, network organizations are created out of complex webs of exchange and dependency relations among multiple organizations. Accordingly, the network organization becomes a supraorganization the primary function of which is to link many organizations together and coordinate their activities. Organizations come to share knowledge, goals, resources and finances, using with highly sophisticated communication technology (Monge and Fulk, 1999). The network ties can occur throughout the entire organization rather than only at the top, and separate organizations often give up some or all of their individual autonomy to become part of the new network organization. It has been observed that network organizations differ from their predecessors (functional, multidivisional, and matrix forms) in four important ways (Miles and Snow, 1992). First, rather than subsume all aspects of operations within a single hierarchical organization they attempt to create a set of relations and communication networks among several firms, each of which contributes to the value of the good or service. Second, networks are based upon a combination of market mechanisms and informal communication relations. Third, members of networks are often assumed to take a proactive role improving the final good or service, rather than merely fulfilling contractual obligations. Finally, a number of industries have sought to form network organizations along the lines of the Japanese keiretsu, which links together producers, suppliers, and financial institutions into fairly stable patterns of relations. It has been argued (Poole, 1999) that network organizations are constituted out of the six essential qualities listed below.

- Flexible, modular organizational structures which can be readily reconfigured as new projects, demands, or problems arise.
- Team-based work organization, which emphasizes autonomy and self-management.
- Relatively flat hierarchies and reliance on horizontal coordination among units and personnel.

- Use of intra- and inter-organizational markets to mediate transactions such as the assignment and hiring of personnel for projects and the formation of interorganizational networks.
- The use of information technology to integrate across organizational functions.
- Use of information technology to coordinate geographically dispersed units and members.

Although interorganizational relationships are established because organizations hope to reduce risk and uncertainty by linking up with other players in the market, risks and uncertainties arising from communication ambiguity and/or vagueness may be more likely to occur in global network organizations than any other type of organizational form due to characteristics such as those outlined above and listed below.

- Participants in global network organizations can have different objectives.
- Participants in global network organizations can be widely dispersed geographically.
- Communications in global network organizations cross traditional functional boundaries and hierarchical layers.
- Global network organizations are created out of complex webs of relations.
- Global project networks are highly communication intensive.
- Global network organizations are dependent on sophisticated communication linkages.
- Global network share knowledge using highly sophisticated information and communication technologies.

These characteristics can be contrasted to traditional organizational forms which were developed to minimize and simplify communication needs. Moreover, in traditional organizational forms, relationships between parties can develop into a state of maturity which is characterised by loyalty and support (Graen and Uhl-Bien, 1995). For example, in-group relationships can be developed in which superiors and subordinates can disagree with and challenge each other without damaging the relationship (Graen and Uhl-Bien, 1995). However, complex webs of interrelationships in global network organizations can thwart the development of mature relationships. Communication between peers may be less intimate and more cautious (Sias and Cahill, 1998) in global network organizations as may be less opportunity to develop mature relationships than within traditional organizational forms. This can be important because peers' expressed attitudes towards work can be more influential that that of supervisors (Jablin and Krone, 1994). The characteristics of global network organizations are related to different sources of ambiguity and/or vagueness in Table 5.

The summary provided in Table 5 indicates that communication ambiguity and/or vagueness may be much more likely to occur in global network organizations than in traditional organizational forms. In particular, it is very important to recognize that global network organizations are created out of complex webs of relations and involve complex interactions (Geraldi and Adlbrecht, 2007). Complex systems, for example, ecological systems and economic systems, interact non-linearly with their environment and their components have properties of self-organization which make them non-predictable beyond a certain temporal window. For example, a communication involving two parties may be overheard by several people depending on their geographical position and the volume of the communication. These people can be either authorized, unauthorized, interested or disinterested interlocutors. Neither the two parties, nor the overhearers, are able to know for certain who heard how much of the message. Moreover, they are unable to know how for certain the message has been interpreted and to what extent, if any, it will be referred to in subsequent communications. Four properties of complex systems are: non-determinism and non-tracability; limited functional decomposability; distributed nature of information and representation; emergence and self-organization (Pavard, 2002). These properties are described briefly in the next paragraph.

A complex system is fundamentally non-deterministic: it is impossible to anticipate precisely the behaviour of such systems even if the function of its constituents is known. A complex system has a dynamic structure. Thus, it may be impossible, to study its properties by decomposing it into functionally stable parts. Its permanent interaction with its environment and its properties of self-organization allow it to functionally restructure itself. A complex system has some functions that cannot be precisely localized. Also, relationships that exist within the elements of a complex system are short-range, non-linear and contain feedback loops (both positive and negative). A complex system comprises emergent properties which are not directly accessible (identifiable or anticipatory) from an understanding of its components. All together these properties can lead to cause and effect often being distant in time and space.

Table 5. Global network organizations and communication ambiguity/vagueness.

Category of source	Type of source	Global network organization characteristic
Conceptual	all languages	more likely to be involved in research, innovation etc., where concepts are vague across all languages
	language families	more likely to include parties whose first languages belong to different language families with different conceptualizations of the underlying concepts in human experience
	more than one language	more likely to include parties of different first languages with different conceptualizations of the same topic
	one language	more likely to include parties from different countries of origin who are native speakers of different forms of same language.
Presentational	composition	more likely to include parties with different perceptions about the function, logic, colour, sounds, symbols and schema of messages and their communication
	situation	more likely to include parties with different perceptions about what are the appropriate goals, roles, participants and porousness for a communication situation
	behaviour	more likely to include parties with different perceptions about what are the appropriate appearances, chronemics, artifacts, kinesics, prosody, haptics and proxemics for a communication
	media	more likely to include parties with different perceptions about the usefulness and ease of use of the same media
Linguistic	lexical	more likely to be involved in projects concerned with highly complicated goods and services, the description and processing of which can involve a huge variety of words
	syntactic	more likely to be involved in projects concerned with research topics, innovation goals, large capital investments etc., the description and processing of which can lead to long and complicated text.
	semantic	more likely to be involved in projects concerned with research topics, innovation goals, large capital investments etc., that lead to information which can elicit different cognitive / emotional states, and/or require greater knowledge sources.
	phonological	more likely to include parties who speak the same language with a very wide variety of accents which listeners are not familar with.

Moreover, findings from experimental studies suggest that human beings are not able to simulate mentally the dynamics of complex systems (Sterman, 2002). In particular, it is difficult to determine the mechanisms by which the behaviour of a complex system goes from order to chaos. The edge of chaos is the name given to the critical point of a

complex system, where a small change can either push the system into chaotic behaviour or lock the system into a fixed behaviour. When a complex system is at the edge of chaos it is in a state where change may occur easily and spontaneously. After a system has entered a chaotic state, it may self-organize into a higher level of complexity or it may disintegrate (Baker and Gollub, 1990). Hence, communication ambiguity and/or vagueness in global network organizations may be more likely to have far reaching consequences – as well as be more likely to occur.

3.2 Network communication technologies

The complexity of communications in global network organizations may be increased, rather than decreased by their dependency on sophisticated information and communication technologies (ICTs). This is because of the unpredictability of ICT selection and the unpredictability of ICT in use. For example, it has been argued that ICTs used by interorganizational virtual organizations needs to be standardized, in terms of products and interfaces, to enable stability and reliability in the relationship (Kasper-Fuehrer and Ashkanasy, 2001). However, global network organization participant's selection of ICTs may well not be based on objective criteria such as standardization. Rather, it has been argued that everything about the adoption and usage of media is social (Contractor and Eisenberg, 1990). In particular, it has been argued that ICTs may carry symbolic significance (Sitkin et al., 1992), depending on social norms of appropriateness in a particular setting or relationship (O'Sullivan, 2000). **The *social influence model* emphasizes that media choices are determined not only by objective task and media characteristic but also by past experience and the influence of others** (Fulk et al., 1990). Specifically that existing communication patterns in an organization along with interactions with peers and colleagues influence people's evaluation and use of new media. Perceptions about media use are exchanged and shared on a daily basis, but these perceptions are shaped also by social historical trends and the general attitude to technology and media in society. If project participants are able to choose which ICT to adopt, their choices will be shaped both by their work environment, educational background, family, and the expectations voiced by journalists etc. An example is provided by research which indicates that the most important factor in predicting Web site adoption and Web site design by organizations is what they see other organizations doing (Flannagin, 2000). This can be seen as a manifestation of ceremonial conformity This term refers to the propensity of organizations to adapt their structures to norms and expectations about their surroundings (Meyer and Rowan, 1977).

Within the Technology Acceptance Model (TAM), **the effects of external variables** (e.g., system characteristics, development process, training) **on intention to use are**

mediated by perceived usefulness and perceived ease of use (Davis, 1989; Davis et al., 1989). TAM was developed from the social psychology theory of reasoned action (Ajzen & Fishbein, 1980; Fishbein and Ajzen, 1975) which was revised to form the theory of planned behaviour (Ajzen, 1991). According to TAM, perceived usefulness is also influenced by perceived ease of use because, other things being equal, the easier the system is to use the more useful it can be. Perceived ease of use is the extent to which a person believes that using a technology will be free of effort, and hence is a process expectancy. Perceived usefulness is the extent to which a person believes that using a technology will enhance her/his productivity, and hence is an outcome expectancy. Within TAM, the effect of perceived ease of use on behavioural intention to use is stronger in the earlier stages of learning and behaviour. Some empirical studies have found perceived usefulness to be a more important determinant of acceptance than perceived ease of use. While other studies have found perceived ease of use to be a more important determinant (Venkatesh, 1999). Originally dealing with Email and graphics, TAM has been extended to voice mail, word processors, spreadsheets, database management systems, and adaptive technology for the physically challenged. Overall, studies have found that TAM explains a substantial proportion of the variance (typically about 40 percent) in usage intentions and behaviour (Venkatesh, 1999; Venkatesh and Davis, 2000). Subsequently, experiences of use can lead to changes in perceptions (Carlson and Zmud, 1999).

Short et al. (1976), Daft and Lengel (1986) and Rice (1993) have argued that media differ in their capacity to carry data that is rich in information. The ***media richness theory*** (Daft and Lengel, 1986) could offer a general framework for identifying which media could prove most effective in what situations (Dennis and Kinney; 1998). Within media richness theory, task performance will be improved when task needs are matched to a medium's richness. There is no doubt that different media have different potentials to change understanding within a time frame. For example, one study (Becker-Beck et al., 2005) found that face-to-face, synchronous, and asynchronous text-based computer-mediated communication all differ on the performative level (types and functions of interactions) and the referential level (relations of concepts). Nonetheless, researchers have concluded that media choice is affected by factors beyond richness (King et al., 1992; Markus, 1994; Rice and Shook, 1990; Rice and Webster, 2000; Zmud et al., 1990). Indeed, there is considerable debate concerning the relative richness of different media. For example, it has been argued that the richness of media, in particular electronic media, may be partially socially defined (Fulk et al., 1987; Schmitz and Fulk, 1991). This means that group and organizational experiences and norms, as well as knowledge of sender (Sproull and Kiesler, 1986) can alter perceptions of media richness. Media that are lean to one group may be richer to another, and these perceptions may change over time (McGrath, 1993). However, there is research which

suggests that social factors may have only minor effects on media richness perceptions (Rice, 1993; Rice and Aydin, 1991; Rice et al., 1990).

Within the ***theory of media synchronicity*** (Dennis and Valacich, 1999; DeLuca and Valacich, 2006), it recognized that media are not monolithic. Rather, **it is possible for one medium to possess different levels of communication capability depending upon how it is configured and used**. For example, one electronic mail system may have a limited symbol variety (text only) while another has a much wider symbol variety (text, graphics and video). Dennis and Valacich (1999) argue that no one medium can be labelled as "richest". For example, written mail sometimes enables the use of tables and/or graphics. By contrast, it may not be possible to include tables and/or graphics in some face-to-face interactions. Further, they argue that ranking media in absolute terms is not practical. Rather, media possess many capabilities, each of which may be more or less important in a given situation. Hence, the "richest" medium is that which best provides the set of capabilities needed by the individual's task, and the social context. Dennis and Valacich (1999) conclude that choosing one single medium for any task may prove less effective than choosing a medium or set of media which a group uses at different times in performing a task depending on the current communication process.

For example, Chidambaram and Jones (1993) found that when audio-conferencing was augmented with computer support, it improved perceptions of communication effectiveness significantly without lowering the social presence of the medium. Further, in face-to-face meetings, introduction of computer support lowered social presence but did not decrease perceptions of communication effectiveness. Also, computer support had a clearly positive effect on the performance of both face-to-face and dispersed groups. Results from their study suggest that the addition of an electronic meeting system (EMS) to dispersed meetings can help off-set the negative aspects of audio-conferencing – "leanness" of the medium, inability to exchange "rich" information, and poor perceptions of channel. The merger of structured computer support (via an EMS) with the ability to exchange unstructured verbal messages (via audio-conferencing) provides a hybrid medium – one that blends the advantages of both media – capable of handling uncertainty reduction and equivocality reduction. Another study found that decision quality was greater in both FTF/CMC and CMC/FTF groups than in either CMC- and FTF-only groups (Olaniran, 1994). A summary of factors that contribute to the unpredictability of ICT selection is provided in Table 6. Table 6 also provides a summary of factors that contribute to the unpredictability of ICTs' in use. An overview of such factors is provided in the subsequent paragraphs.

Table 6. Unpredictability of ICT selection and use.

Topic	Factor
Unpredictable Selection	Influence of past experiences and other people
	Alternative perceptions of usefulness and ease of use
	Many different configuration options for same media
Unpredictable In Use	Different time available for users to learn to adapt their behaviours to a medium
	Different groups work together for different periods of time
	Reliability problems

One major contributory factor to unpredictability in use is that different ICT users have different time available to them to learn to adapt their behaviours to the social presence offered by different ICTs. Social presence can be described as the sense of human contact embodied in a medium. Social presence theory (Short et al., 1976) evolved from research about efficiency and satisfaction in the use of different communication media. Social presence is in this theory conceived to be a subjective quality of a medium and is not to be defined objectively. Short et al. (1976) regard social presence as a single dimension that represents a cognitive synthesis of several factors such as capacity to transmit information about facial expression, direction of looking, posture and non-verbal cues as they are perceived by the individual to be present in the medium. These factors affect the level of presence. In other words, the extent to which a medium is perceived as sociable, warm, sensitive, personal or intimate when it is used to interact with other people. Social presence varies between different media; it affects the nature of the interaction; and it interacts with the purpose of the interaction to influence the medium chosen by the individual who wishes to communicate. Social presence questionnaires are constructed around four dimensions that differentiate social presence: unsociable-sociable; insensitive-sensitive; impersonal-personal; cold-warm (Short et al., 1976). Schloerb (1995) has argued that subjective telepresence only exists when a person cannot distinguish between the real and the mediated environment. An exogenous social presence/information richness factor deriving from Hofstede (1980) work of dimensions of cultural differences among countries was added to TAM by Straub (1994). In this model, perceived social presence (SP) is combined with the information richness of the medium (IR).

The argument that ICTs need to enable the communication of as many non-verbal clues as possible in interorganizational virtual organizations (Kasper-Fuehrer and Ashkanasy, 2001) is consistent with the notion that when verbal and non-verbal symbols are removed there is a loss of social presence such that the people with whom one is

communicating become less like real people and more like objects. The essence of communication and language is symbols (Littlejohn, 1983). Symbol variety is the number of ways in which information can be communicated. There are at least four distinct ways in which symbol variety may affect the communication and understanding of messages. First, some information may be easier to convey in one format rather than another. Second verbal and nonverbal symbols enable senders to include information beyond the words themselves when the message is transmitted. Third, the cost to compose a message or to process an incoming message using some symbol set may impose a delay cost (Reinsch and Beswick, 1990) or a production cost (Clark and Brennan, 1991) that alters the way in which the sender creates messages or reduces the understanding of the receiver. Finally, the lack of verbal and non-verbal symbols can have significant effects on social perceptions (Williams, 1977).

The ***cues-filtered-out model*** has promoted an image of electronic media as impersonal, impoverishing interpersonal relations and reducing the quality of life. By contrast, proponents of electronic media emphasize how such media allow organizations to establish interactive links across organizational boundaries, facilitating open and responsive interactions with external and internal audiences (Rheingold, 1994). Further, it has been argued that virtual communities can bring about an increase in social capital and civic engagement around physically based communities (Blanchard and Horan, 1998). Generally, studies about the effects of new communication technologies have revealed contrasting experiences (Walther et al., 1994; Walther, 1996). **Although the technical features of electronic media can depersonalize communication by filtering out nonverbal cues, users <u>eventually</u> learn to adapt their behaviours to the medium and thus become more personal when they consider it to be necessary**. Indeed, there is evidence that computer-mediated communication has the potential to be used in ways that are important for relationship initiation, development and maintenance (O'Sullivan et al., 2004). The use of emoticons, symbols to communicate emotional intent, such as :-) and :-(in email messages is one example. Even in text messages (Walther et al., 2005), various emotional cues are often injected via the conventions of these emoticons and capitalized letters (Colon and Shapiro, 2002). Results from one experiment (Byron and Baldridge, 2007) found that receivers' personalities influenced their perceptions of the email sender both directly and indirectly through perceptions of nonverbal cues. The results support notions that the meaning of nonverbal cues is contextually bound and that receivers' personalities influence perceptions of both non-verbal cues and senders. Further, one investigation found that language style has a significant impact on impression formation in CMC groups. Generally, it was found that a powerful language style in a CMC group is perceived as more credible, attractive, and persuasive than users of a less powerful language style. Also, it was found that contrasting language styles caused perceptions to be more extreme than if users shared a common language style (Adkins and Brashers, 1995).

Walther points out that research on the impact of communication technology on interpersonal encounters and exchanges shows no consistent effects. For example, speakers may use a range of cues to signal ironic intent, including cues based on contrast with context, verbal and paralinguistic cues. Speakers also rely on cues provided by addressees regarding comprehension of irony. When such cues are unavailable, speakers may be less willing to use irony because of the risk of miscommunication, and addressees may be more likely to misinterpret irony. One study examined the production and comprehension of irony in multimodal (face-to-face) and unimodal (computer-mediated) conversations. Contrary to expectations, speakers in the computer condition used more irony than face-to-face speakers (Hancock, 2004). Comprehension of irony did not appear to differ across settings, although addressees in the computer condition provided less feedback (positive or negative) to their partners about their comprehension. One reason for the lack of consistent results may be that new communication technologies rarely replace existing media. Rather most media are complementary. In particular, new media may augment existing media without making them obsolete. Further, new communication technologies can be a blend of features from more than one medium. For example, email can be used to compose, send and receive messages that are similar to traditional written communications such as letters. When used in this way, e-mail messages may begin and end with terms such as Dear, Regards etc. On the other hand, e-mail can be used to compose, send and receive messages that are similar to traditional oral communications such as conversations. When used in this way, e-mail messages may begin and end without any terms such as Dear, Regards or even Hi.

The unpredictability of ICTs in use is unlikely to diminish. This is because there are an ever increasing number of ICTs with an ever increasing number of combination options. Not least through increasing audio, video and three-dimensionality in cyberspace facilitated by multi-media software and the World Wide Web (Soukup, 2000). Further, these options can be adapted for use by people in different situations who have different languages, cultures, genders, personalities, and social concerns (Barry and Fulmer, 2004). Studies suggest that interactions between different people in different situations using different media can be extremely varied. For example, finding from one study suggest that attitude change can be more difficult to achieve using computer-mediated communications than face-to-face communication – but only in some circumstances (Sassenberg and Boos, 2003). Studies investigating media in conflict management provide an interesting example of inconsistent and contradictory findings. In particular, literature focusing on negotiation and media evidences two contradictory perspectives. One of them asserted that negotiators are less integrative when interacting in a computer-mediated context. The other perspective affirmed that a barrier in the communication enhances integrativeness (Dorado et al., 2002). Findings from one study suggest that negative conflict management is significantly higher in computer-mediated

communication than in face-to-face for idea-generation tasks and intellective tasks, but not significantly higher for mixed-mode tasks. Further, this study suggests that positive conflict management decreases over time in CMC but not in FTF (Zornoza et al., 2002). Such findings support Dennis and Valacich's (1999) argument that **relationships between communication processes and media will change over time, and that relationships between communication processes and media will vary between established and newly formed groups**. For example, one study of CMC found that in new, unacquainted teams, seeing one's partner promotes affection and social attraction, but in long-term on-line groups, the same type of photograph dampens affinity (Walther et al., 2001). Findings from another study indicate that there was more process and relationship conflict in CMC groups compared to FTF groups on Day 1. However, this different disappeared on Days 2 and 3. There was no difference between CMC and FTF groups in the amount of task conflict expressed on any day (Hobman et al., 2002).

A much more consistent factor which contributes to the unpredictable performance of sophisticated ICTs is their unreliability (Charette, 2005). **The reliability problems of ICTs are widely publicized** through television and newspapers (e.g. BBC, 2003b). One notable example is that of a man shooting his laptop computer in frustration after it kept crashing. Subsquently, he hung his "dead" laptop on a wall as if it were a hunting trophy (BBC, 2003c). Reliability problems are not restricted to individuals or to organizations operating within small budgets. For example, share trading was suspended on the Tokyo Stock Exchange for more than four hours on Tuesday 1st November 2005 after an upgrade to its software system caused a breakdown (BBC, 2005a). A few weeks later, a malfunction in the Tokyo Stock Exchange system prevented a typing error from being corrected. The cost of this malfunction was over $200 million (BBC, 2005b). These problems at the Tokyo Stock Exchange illustrate that reliability can be a significant factor in the unpredictable performance of ICTs.

3.3 Network communication concepts

Having considered the complexity of communications in global network organizations, it might seem impossible to derive a model of global network communications (i.e. a representation simpler than reality) without losing all its relevant properties. Further, it might seem impossible to make abstractions of micro interactions in order to understand macro tendencies. However, in reality different levels of complexity exist. Indeed, Krackhardt (1994) identifies four potential constraints on communication and other networks. The first he calls the "Law of N-Squared" which notes that the number of potential links in a network organization increases geometrically with the number of people. In fact it grows so quickly that the number of people to which each person could be linked quickly exceeds everyone's communication capacity. The second constraint is

the “Law of Propinquity”, a rather consistent empirical finding that “the probability of two people communicating is inversely proportional to the distance between them”. The term, inversely proportional can be applied to a relationship in which one variable goes up as the other goes down. In other words, the more we meet and interact with people, the more likely we are to become friends with them. As we meet people we become familiar and find things we like about them. It is not so much ‘birds of a feather flock together’ as ‘birds who just happen to be near each other grow similar feathers’. Though numerous communication technologies have been designed to overcome this phenomenon, Krackhardt argues that the tendency remains and it is difficult for people to overcome. The third constraint he identifies is the “Iron Law of Oligarchy”, which is the tendency for groups and social systems, even fervently democratic ones, to end up under the control of a few people. Finally, Krackhardt (1994) notes the potential problem of overembeddedness. He observes that “People as a matter of habit and preference are likely to seek out their old standbys, the people they have grown to trust, the people they always go to and depend on, to deal with new problems, even though they may not be the ones best able to address these problems.”

Table 7. Constraints on network communications.

Constraint	Description
N-Squared	The number of people to which each person could be linked quickly exceeds everyone’s communication capacity
Propinquity	The probability of two people communicating remains inversely proportional to the distance between them
Oligarchy	The tendency for groups and social systems, even fervently democratic ones, to end up under the control of a few people
Overembeddedness	People seek out the people they have grown to trust to deal with new problems, even though they may not be the ones best able to address these problems

Further, network analysis has a long history in organizational communication studies, just as it has been used in a variety of other fields ranging from studies of political socialization to mental health. Network studies began in the 1940s and 1950s when social researchers asked school children to name “your best friend in this class”. Today, network analysis is sophisticated and combines examinations of the content of communications with the linkages between people (or nodes) in a system. Network analysis is useful for assessing the flow of communication in a group or organization, the strength of relationships, and the topics discussed. For example, when trying to influence a group of people to accept a major organizational change, a network analysis

can provide a sense of information flows in the organization, who the key opinion leaders or gatekeepers of information are, and who is outside the network and thus not privy to regular information updates.

Network concepts such as those listed in Table 8 can be useful to analyze the communication patterns with an organization (Albrecht and Bach, 1997; Monge and Contractor, 2001). Researchers have used these concepts to understand the structural and process features of groups and organizations.

Table 8. Key foci in network analysis.

Focus	Examples
Roles of individuals in networks	Group members; isolate; bridge, liaison, star, gate keeper
Dimensions of analysis for individuals	Centrality; connectedness; diversity; accessibility
Dimensions of analysis for dyads	Strength; symmetry; direction; stability; multiplexity; openness
Dimensions of analysis for whole networks	Size; hetrogenity; mode of communication; density; clustering

For example, Granovetter (1973) has argued that people typically value strong ties, but for some purposes we should value and cultivate weak ties. Weak ties people such as occasional acquaintances or friends of friends. The strength of weak ties relates to network density and strength. For example, weak ties are often the best source of leads when job seeking and innovation. Further, three important types of networks in organizations have been identified (Farace et al., 1977). First, there are production networks which exist primarily to accomplish work tasks. Second are innovation networks which emerge around the creation, development and diffusion of new ideas. Finally, maintenance networks exist to develop and maintain social relationships. These networks may, or may not, overlap. Often, however, there will be differences, sometimes subtle and sometimes obvious between such networks. Finding isolates, the bridges, and other network indicators can help us understand why a network is functioning well or not.

In its simplest form, network analysis is about joining the dots (Keefe, 2006). For example, network analysis has found that any two Americans are connected by only six intermediaries – or "degrees of separation", and that any two unrelated Web pages are separated by only 19 links. However, exhaustive network analysis requires the application of innovative algorithms to, for example, e-mail traffic. The research in this

working paper was not concerned with carrying out an exhaustive network analysis. Rather, the goal of research was to explore the nature of interrelationships between established concepts in network communications and sources of communication ambiguity and vagueness.

Whetten and Aldrich (1979) suggest that interorganizational relationships characterized by multiplex linkages (that is, connections between organizations on multiple dimensions) are more likely to be stable than those connected only by uniplex strands. In other words, interorganizational relationships are more stable the more the organizations in the relationship have to talk about. Generally, interorganizational relationships tend to be highly communication intensive (Rockart, 1998). Communications in global network organizations tend to be particularly intensive and dependent on sophisticated communication linkages between participant organizations (Monge and Fulk, 1999). It has been argued that there are two types of interorganizational linkages: material and information; and three levels of interorganizational linkages: institutional, representative, and personal (Eisenberg et al., 1985). Material refers to the flow of tangibles (money, goods, personnel); information refers to symbolic exchanges (data, ideas, goodwill). A summary of levels of interorganizational linkages is provided in Table 9 below.

Table 9. Interorganizational linkages.

Linkage	Description
Institutional	Exchanges between organizations without the involvement of specific roles or personalities
Representative	Official representative of one organization has contact with an official representative of another organization
Personal	An individual from one organization exchanges with an individual from another organization in a non-representative capacity

An institutional linkage refers to exchanges of information or materials between organizations without the involvement of specific organizational roles or personalities, for example routine data transfer between banks. A representative linkage is when an official representative of one organization has contact with an official representative of another organization, for example in a negotiation situation. A personal linkage takes place when an individual from one organization exchanges information or material with an individual from another organization in a non-representative capacity. Communications can be simplex, half-duplex, full duplex, or multiplex. Simplex refers to one-way communication. Half-duplex refers to two-way communication, but only in one direction at a time. This means that two parties must take turns in sending and

receiving. Full-duplex communication allows two parties to send and receive communications simultaneously. Multiplex communication allows more than two parties to send and receive simultaneously. Communication in interorganizational networks often cross traditional functional boundaries and hierarchical layers. Thus, information flows are potentially faster and more economical. However, the information exchanged is more complex. In addition to receiving information more quickly, current ICTs allow their users to modify, enhance, or manipulate the received information in numerous ways (Monge and Fulk, 1999). As a consequence the quality of communication exchanges becomes the most central concern in interorganizational relationships. As summarized in Table 10 below, interorganizational communication centers around three important issues: trust, identity and co-ordination.

Table 10. Three important issues.

Issue	Description
Trust	Trust within interorganizational networks involves goodwill, commitment and equity
Identity	The central, distinct and enduring dimensions of an organization; unfolding and stylized narratives about the "soul" or essence of the organization
Co-ordination	Interorganizational relationships require a strong commitment to cooperation to avoid confusion and ambiguity.

Trust is essential when organizations establish far-reaching interdependencies with other organizations (Williams, 2007) that include, for example, mutual access to each other's information, skills and resources. Research suggests that trust can lower transaction costs (Doney et al., 1998) and be an important factor in international projects (Diallo and Thuillier, 2005). Trust within interorganizational networks involves goodwill, commitment and equity. In other words, organizations need to trust that their partners enter the relationship with good intentions, that they are sincerely interested in contributing to the relationship, and that they motivated to deal fairly. It has been argued that trust in the goodwill of other parties is the cumulative product of repeated past interactions among parties through which they come to know themselves and evolve a common understanding of mutual commitments (Ring and Van de Ven, 1994).

Coordination is a major issue in network organizations because, in contrast to classical organization arrangement, interorganizational relationships typically have unclear lines of authority and control. As a consequence, processes of coordination in network organizations are potentially marked by confusion. Interorganizational relationships therefore require a strong commitment to cooperation (Eisenberg et al., 1985). While the motivation for organizations to enter relationships with other organizations is

frequently to become more flexible, the reality of network organizations is that activities must be monitored closely and coordinated precisely. Hence, many network firms have assigned key managers to operate across rather than within hierarchies, creating and assembling information skills, and resources from all parties (Snow et al., 1992). In particular, the task of organizing information across the network and communicating it in relevant ways to all parties becomes a highly important activity in all phases of the network's lifecyle.

Organizational identity is that which represents an organization, from inside the organization and/or from outside the organization. Organizational identity has been defined as being the central, distinct and enduring dimensions of an organization (Albert and Whetten, 1985); and as unfolding and stylized narratives about the "soul" or essence of the organization (Ashforth and Mael, 1996). The identity of individual organizations can be challenged when they enter into interorganizational relationships (Galaskiewicz, 1985). While transparency in transactions and decisions and open communication climate between parties in a global network organization generally facilitate trust, it is equally important that each participating organization has a clear sense of itself and its stakes in the relationship. There is a risk, for example, that one party absorbs the skills and activities of another party and abandons the network. To counteract such risks, organizations should enter networks with clearly defined identities and strategic cores so that each of the competencies and skills in the network are truly complementary; and each party is considered indispensable by the others (Håkansson and Snehota, 1989). The absorbing of one party's skills and activities by another party has been identified as a particular risk in so-called symbiotic network relationships. Ebers (1999) has argued that interorganizational relationships can be described as symbiotic and/or pooling. A summary of these types of relationships is provided in Table 11 below.

Table 11. Two types of relationships.

Issue	Description
Symbiotic	Organizations combine different yet complementary goods, services, resources or capabilities to form an entity that is qualitatively different from each of the participating organizations.
Pooling	Organizations bring similar resources and capabilities in order to realize economies of scale or to augment their existing quantitative presence and power in the marketplace

In symbiotic relationships the partners combine different yet complementary goods, services, resources or capabilities to form an entity that is qualitatively different from

each of the participating organizations. In pooling relationships, the collaborating organizations bring similar resources and capabilities in order to realize economies of scale or to augment their existing quantitative presence and power in the marketplace. While symbiotic relationships are established to exploit complementary differences and facilitate mutual learning, these very same processes potentially undermine such relationships. If, for example, one of the organizations learns faster or more effectively than other(s), the differences and mutual interdependencies that gave rise to the relationship in the first place may disappear and thus propel that organization to leave the relationship or, alternatively, to take over the other organization(s). As a consequence, organizations in symbiotic relationships may chose to be very strategic and selective in the way they disclose information to their partners. Indeed, such selectivity may be a prerequisite for organizations to retain their specific identity, and thus, survival within interorganizational relationships. Thus, interorganizational relationships are highly dynamic and often need to be revaluated and adjusted (Ebers, 1999). On the other hand, interorganizational relationships can be stable for other reasons. For example, interorganizational investments (such as specific computer software) may lock organizations together. Further, an organization may rely on multiple links if it does not have sufficient information to make new decisions on its own. Furthermore, personal relationships between individuals in an existing interorganizational relationship may prevent organizations from investigating possibilities for interorganizational relationships with others. Ebers (1999) argues that symbiotic interorganizational relationships are more stable if the relationship involves complex processes that organizations can not replicate on their own.

4. Case Analyses

In this section, twenty-three cases of notable problems during global projects (Orr, 2005) are referred to. The problems ranged from time delays and cost increases to projects being abandoned. In sub-section 4.1, descriptions of the cases are provided. Then, analysis of vagueness and ambiguity among the cases is presented in sub-section 4.2. Next, analysis of network organization communication among the cases is provided in sub-section 4.3. Subsequently, analysis of communication reliability and/or validity among the cases is presented in sub-section 4.3.

4.1 Individual cases

A short heading is provided for each case. The heading for each case offers a summary description and list (in brackets) of the main participants. Each case description concludes with a discussion of the type of ambiguity / vagueness, and the most notable type of network communication factor, involved.

Case 1: Communication of reporting conventions (U.S., Europe)

A U.S. property development company funded by U.S. investment sources entered several European countries in the 1990s with a strategy to develop real estate projects. Part of this strategy was to partner with experienced local property development firms in each country. Once involved with active projects, these local firms were expected to meet the U.S. reporting conventions. These conventions included how to format a pro-forma and how to put together a monthly report. However, on most occasions the local European partners were unfamiliar with these norms which had evolved in the distant U.S. marketplace, and they did understand what was being requested of them. Thus, the pro forma documents that they submitted to the U.S. parent tended to be inappropriate in format and/or substance. At times, this perceived incompliance created undue strain on relationships and caused delays in getting projects funded. Since it was out of the question to change the reporting conventions of the entire U.S. investment community, with its informal codes and expectations, the U.S. managers decided it was necessary to re-educate the European partners to prepare documents with the appropriate format and content. The first attempt in this effort was to provide the partners with digital document templates to modify or copy. However, in many cases, even with digital templates, the partners were still unable, or unwilling, to prepare acceptable pro-forma and other supporting documents. The next action, which was more costly, was to educate the European partners one-to-one. Eventually the European partners were able to adapt to the U.S. requirements with continued coaching and tutoring over a period of several months.

Case 1 can be said to have involved presentational ambiguity due to communication composition. In particular, the composition of the U.S. pro forma documents could be, and were, interpreted in more than one way by their various European partners. Coordination is a major issue in network organizations because, in contrast to classical organizational arrangements, network organization arrangements typically have unclear lines of authority and control. As a consequence, processes of coordination in network organizations are potentially marked by confusion and ambiguity. In this case, both the reliability and validity of communications from the U.S. property development company were compromised. Different European partners had different interpretations of the same pro forma documents and none of the European partners understood the intent of the U.S. pro forma documents. In this case, reliability and validity being compromised caused delays in getting projects funded.

Case 2: Communication of work instruction (Japan, US)

A Japanese company formed a joint venture with two U.S. companies. The Japanese supplied and installed modular box girder sections for a new suspension bridge in the U.S.A. The assembly process of installing deck sections involved loading the deck sections onto a barge, pulling them into position with a tugboat, hoisting them with a crane, and fastening them to suspenders at the connection points. One night, a few days before being ready to start hanging deck sections, the U.S. site manager joked sarcastically to the Japanese manager that it would be nice to have the first deck section ready to go for 9 am the next morning. When the U.S. site manager arrived at work the next day he found that the Japanese manager had mobilized a huge crew; had loaded up deck sections; and four tugs out on the water under the bridge and ready to go for 9am. However, installation could not begin for another three days. Accordingly, the tug boats had to be called in by the Japanese manager. The U.S. manager resolved that he would not give the Japanese company any compensation for putting four tugs out on the water, because he had only made a joke during casual conversation and he had made no formal instruction. The Japanese did not protest much but did mumble about compensation while seeming confused about what had happened.

Case 2 can be said to have involved presentational ambiguity due to communication behaviour. In particular, the U.S. manager thought that his communicate could be understood to be joke, rather than an instruction, due to his use of prosody. However, prosody may vary from language to language. In Japanese, much of what a speaker feels about what they are saying, and which would require prosody to convey in English, is contained within the language. Hence, the Japanese manager did not interpret the intended humour in what the U.S. manager said. Further, the relationship between the U.S. manager and Japanese manager was official rather than non-official. Hence, the Japanese manager may not have considered joking about a serious matter to be probable. Within network organization communications their relationship could be

described as representative, rather than personal, linkage. The validity of the U.S. manager's communication was clearly compromised in this case. As a result, the Japanese contractor incurred unproductive costs. Communication reliability is not relevant to this case because only two parties were involved.

Case 3: Communication of work agreement (Turkey, U.S.)

A U.S. contractor was responsible for the foundation engineering on a large dam on project in Turkey. The U.S. contractor became concerned because there were caves under where the dam would be built. Accordingly, it was necessary for the U.S. contractor to drive adits further back into the rock in order to explore its strength. Adits are horizontal excavations into the side of a hill or mountain. When the U.S. contractor spoke with the Turkish director, to tell him that the adits needed to be extend, which would cost a lot of money, he nodded his head, and his deputies nodded their heads. Yet, when the U.S. contractor would go out the next day and start blasting the adits, the Turkish personnel would say, stop!, what are you doing, why are you doing this? The U.S. contractor would respond by saying, we talked about it yesterday, and you agreed to do it. The rejoinder of the Turkish personnel was, we never agreed to that yesterday. Subsequently, there were several meetings, discussions, and negotiations that were intended to sort out the misunderstanding, but ended up being ineffective, with recurring communication problems and delays to the project. Eventually, the U.S. contractor found out that when the Turkish personnel nodded their heads, they were indicating that they were following what was being said, not that they agreed. Subsequently, negotiations went smoothly and there were no further delays to the project.

Case 3 can be said to have involved presentational ambiguity due to communication behaviour. In particular, head nodding was interpreted in more than one way. Among U.S. Americans head nodding generally indicates agreement with what has been said. By contrast, among many other peoples, for example Swedish, head nodding may indicate only that listeners heard what was being said, not that they agreed. With regard to network organization communications, the U.S. company may have been able to learn more Turkish communication behaviour if they had establish some personal linkages among the Turkish people. In this case, the validity of the Turkish participants' communication was clearly compromised. As a result, there were delays to the project. Communication reliability is not relevant to this case because only two parties were involved.

Case 4: Communication of quality requirements (China, U.S.)

A U.S. contractor managing the construction of a soccer stadium in China demanded international quality standards. As a result, the U.S. contractor found it necessary to repeatedly reject steel trusses after they had been hoisted. Due to these quality control

issues, there was a lot of tension and anxiety in the relationship between the Chinese steel truss supplier and the U.S. project management team. In one heated exchange, a U.S. project manager informed the contracts manager of the Chinese supplier that a defective truss that had been hoisted into position would have to be taken down or the supplier's contract would be terminated. However, the U.S. contractor's Chinese translator was told by the supplier that the particular truss had been hoisted because that day was an important day, not a festival, but an important day in the Chinese calendar for bringing good luck. Accordingly, the Chinese supplier's contracts manager said he just wanted to get the truss up in the air to get good luck in the relationship. After realizing the misunderstanding, the U.S. project manager allowed the particular truss to stay in the air for few days before it was lowered. Moreover, the contract of the Chinese supplier – that would have taken weeks to replace – was not terminated.

Case 4 can be said to have involved presentational ambiguity due to communication behaviour. In particular, presentational ambiguity can arise from manipulation of objects in the environment that may reflect messages from the user. The Chinese supplier's contracts manager hoisting of the defective truss was interpreted in a different way to that intended. The misunderstanding was resolved when a person who could be described as liaison, within network organization communications, clarified the intention behind the action of the Chinese contracts manager. In this case, the validity of the Chinese contract's manager's communication was clearly compromised. As a result, there was some unproductive management effort in the project. Communication reliability is not relevant to this case because only two parties were involved. This case illustrates that communication behaviour extends far beyond gestures that are limited to people themselves. The hoisting of the defective truss can be likened to the raising of a flag in the midst of a battle. However, it was not considered to be a flag of truce by the U.S. contractor.

<u>Case 5</u>: Communication of work instructions (Malaysia, China, India, Canada)

A Canadian led joint-venture (JV) worked with local government affiliated contractors on a light-rail transit project in Malaysia. The JV project team included 60 expatriate managers that worked with a direct hire workforce of approximately 600 employees of Indian, Malay, and Chinese decent. In keeping with local practice, the group of expatriate managers decided to hire people of Chinese decent to do management work and people of Indian decent to do manual work. However, the expatriate managers became uncomfortable with how they felt several Chinese managers were (based on expatriate perceptions) mistreating Indian workers. In reaction, the expatriate managers began to promote and empower Indian labourers into managerial positions to replace the Chinese managers who they considered to be abusive. As a result, cohesion, control and efficiency increased. Subsequently, more of the Chinese managers were replaced with Indian managers. Several local participants on the project criticized the Canadian led JV

and said it would fail. This criticism made the expatriate managers question their decision for many weeks, and they had many internal conversations about what to do in response. The outcome of their talks was a decision to continue promoting Indians to management positions, even if that would attract further criticism. The JV's reputation for promoting Indians travelled quickly within the Indian community, and this attracted many of the highest calibre Indian people to come over from other companies. On the whole, the practice of promoting Indian managers to run Indian crews brought increased productivity and profitability to the firm.

Case 5 can be said to have involved presentational ambiguity due to communication situation. In particular, heterophilous communication between dissimilar individuals may cause cognitive dissonance because an individual is exposed to messages that are inconsistent with existing beliefs, resulting in an uncomfortable psychological state. In this case, the communication between the Chinese managers and Indian workers may have been heterophilous. Subsequently, when the Indian workers had Indian managers appointed to them, communication may have become homophilous and as a result much more effective. Within network organization communications the newly appointed Indian managers could be viewed as more effective gatekeepers to the Indian workforce than their Chinese predecessors. In this case, neither the reliability nor the validity of the Chinese managers' communications was compromised. Nonetheless, there was disruption to the project. This suggests that the preliminary model shown in Figures 1 to 4 needs to be modified. This is because the model includes only communication between senders and recipients. It does not include non-recipients. This case illustrates the potential complexity of network organization communications. If the expatriates had not overheard the communications made by the Chinese managers to the Indian workers, the communications may well have gone on as they had for many years earlier. Moreover, the project may well have been implemented within programme and budget.

Case 6: Communication of work plan (Cameroon, Canada)

A not-for-profit organization based in Canada sent two engineers to the Cameroon to manage the implementation phase of a project to provide 12 rural communities with potable drinking water and latrines. Upon arrival, the Canadian engineers hired local labour and staff, and they started latrine construction almost immediately. Initially, materials and tools disappeared every night. It seemed to the Canadian engineers that villagers were deliberately sabotaging the project. They were confused by this because they were in the Cameroon to help, and not hurt, the locals. As they got to know the local people better, the engineers learned about the local social structure and, most importantly, about how to gain the blessing of the village chieftain. However, after having violated local customs, it took some time to re-gain the trust of the local people. This involved many long conversations with villagers who helped them to understand the local taboos and routines. The Canadian engineers learned to follow the proper

protocol. First, know someone on the chieftain's council. Second, get that person to set up an audience with the chieftain. Third, go to meet the chieftain and bring a gift based on the prestige of the chieftain in order to show submission to his authority. Behaviour with the chieftain was found to be very important. After leaning about the protocols, the Canadian engineers made the effort to meet with the chieftain in each of the 12 villages, and their work was usually approved in just one or two meetings. As the development project went on, the engineers learned to hold bi-weekly audiences, and to give additional gifts to prevent any further mysterious obstacles to productivity.

Case 6 can be said to have involved presentational ambiguity due to communication situation. In particular, the Canadian engineers' initial choice of who to include, and who not to include, in their communications of the project received a negative interpretation among the local Cameroonian communities. In response to the actions that followed from the negative interpretation, the Canadian engineers chose to include village chieftains and to adopt the local forms of presentational behaviour during meetings with village chieftains. This enabled them to re-gain the trust of the local people. Trust within network organization communications involves goodwill – and in this case, goodwill was jeopardized at the outset. Within network organization communications, the local chieftains could be described as gatekeepers. It could be argued that the validity of the Canadians' communications was not compromised because there is no evidence that their intent was not understood by the people who they actually communicated with at the outset of the project. Rather, unintended actions were carried out not by recipients of their communications, but by non-recipients. This suggests that the preliminary model shown in Figures 1 to 4 needs to be modified. This is because the model includes only communication between senders and recipients. It does not include non-recipients. This case illustrates the potential complexity of network organization communications.

Case 7: Communication of work plan (Philippines, Korea, U.S.)

In the late 1990s, a multi-purpose redevelopment project in the Philippines was to divert water from two rivers to irrigate the fields, so that in the dry season it would be possible to have two rice crops. The project was carried out in very high mountainous ground. The Philippine government was the major developer; a U.S. company was providing much of the funding; and a Korean contractor was doing most of the construction. When the project was initiated, no one consulted with the local tribe's people. When the contractor first started trying to cut the access roads to get to the main part of the site where they could actually do the construction, they would come back to work in the morning to find that their access roads had been blockaded. They would be blocked with heavy trees that were very difficult to move, or the road would be torn up, or made impassable with large holes, or sometimes there would be human blockades. The sabotage to the access road and resultant project delays continued for at least six

months, and during this time the Korean contractor on the site was portraying a very negative picture of the local people and saying that there would not be a solution. Although the U.S. financier would have expected that the Korean contractor would have entered into discussions with the local people, because the contractor is responsible for the construction being on time and on schedule, eventually the U.S. financier did send its own representative to enter into discussions with the local people. The U.S. financier's representative had meetings with the chieftain and was able to negotiate. Subsequently, some of the local people worked in the construction, and it became a partnership with the local people. As a result, roadblocks etc., went away, and the people were happy. After the few weeks it took to solve the main problem, there were regular meetings, for example, to keep the local people informed about project process.

Case 7 can be said to have involved presentational ambiguity due to communication situation. In particular, the Korean contractor's choice of who to include, and who not to include, in their communications of the project received a negative interpretation among the local community. In response to negative interpretation, the Korean contractor did not extend their communications to the local community. As a consequence the negative interpretations, and negative actions, of the local community continued. Subsequently, when the U.S. financier did chose to include the local community into its communications, the negative interpretations and negative actions came to an end. Within network organization communications, the local chieftains could be described as gatekeepers. As in Case 6, it could be argued that the validity of the Korean's communications was not compromised because there is no evidence that their intent was not understood by the people who they actually communicated with at the outset of the project. Rather, unintended actions were carried out not by recipients of their communications, but by non-recipients. This suggests that the preliminary model shown in Figures 1 to 4 needs to be modified. This is because the model includes only communication between senders and recipients. It does not include non-recipients. This case further illustrates the potential complexity of network organization communications. In particular, successful communication was delayed because the U.S. financier interpreted the Korean contractor responsibility for the construction being on time and on schedule to include responsibility to enter into conciliatory discussions with the local population. By contrast, the Korean contractor did not share this interpretation.

Case 8: Communication of fabrication details (Japan, U.S.)

During the project introduced in Case 5, there was a delay of 368 days due to unforeseen ground conditions. Had the Japanese delivered deck sections to programme, they would have had to have been stored for 368 days in port. The U.S. client would have had to pay for that storage. Hence, every day that the fabrication of the deck sections by the Japanese company could be delayed was one less day of storage that the U.S. client would have to pay for. According to the contract between the Japanese

company and the U.S. client, the Japanese company had to do a submittal which comprised the documentation of its fabrication procedure. Once the project was delayed, the U.S. client demanded a special submittal rather than accept the usual fabrication procedure documentation of the Japanese company – which is a world leader in its field. The U.S. client demanded that the Japanese company provide details on the entire fabrication procedure. The U.S. client stated that this was necessary because the Japanese company was going to use a technology that was new in the U.S. Further, the consultant employed by the U.S. client continually contested the details put forward by the Japanese company. As a consequence, it took one and a half years to get the fabrication procedure approved, and the U.S. client did not have to pay for additional storage due to the delay caused by unforeseen ground conditions.

Case 8 can be said to have involved presentational ambiguity due to communication situation. In particular, different parties can have different goals for the same communication situation. Moreover, there can be different interpretations of the communication goals of different parties in the same situation. In this case, the U.S. consultant may have had the goal of delaying fabrication by the Japanese company in order to limit additional costs to the U.S. client. Further, the U.S. consultant charged by the hour and could have had the goal of increasing its consultancy fee. By contrast, the Japanese contractor may have believed that the U.S. consultant was simply trying to ensure that the best possible fabrication procedures were going to be used. The intent of the U.S. consultant was called into question by other U.S. participants, but not by the Japanese company. With regard to network organization communications, the Japanese company may have been able to learn more about the goals of the U.S. consultant if they had had some personal linkages among the U.S. organizations involved in the project. In this case, the communicated intent of the U.S. consultant was understood by the Japanese contractor – to provide very detailed information about fabrication. Accordingly, it could be argued that the validity of the U.S. consultant's communication was not compromised. Nonetheless, it is important to note that the U.S. consultant may have deliberately avoided communication of its goal – which may have been to delay delivery of deck sections. Consideration of this case reveals a further short-coming of the communication model shown in Figure 1 to 4. The model includes the intent of communication, but it does not include the goal which the communication serves.

Case 9: Communication of design details (Japan, U.S.)

The U.S. Navy planned to construct a softball diamond and a two-story concession building next to a U.S. Navy base in Japan. A Japanese engineering group had prepared the design documents and specifications for the project. Before construction began, the U.S. Navy officer who was to manage the construction was reviewing the drawings from her U.S. home office when she noticed an unfamiliar and very expensive material specified for wall construction: woodchip cement sideboard. None of her American

engineering colleagues were familiar with this product or had any idea about the method of installation. She decided to contact the Japanese engineering group to ask them to change the material to a less expensive poured-concrete solution. After a month of slow email and teleconference communication, with multi-person email exchanges and long waits between replies, the U.S. Navy officer was unable to convince the Japanese engineer to change the design. The emails from the Japanese basically said, do it this way because this is how we do it in Japan. The Japanese offered several reasons for using the woodchip cement sideboard. In particular, they had a process that worked really well for them and they did not want to change it. Not wanting to make early enemies with an engineering team that would be an important participant on the project, the U.S. Navy officer finally agreed to use the new product, even though it seemed more expensive. Much later, during construction, when the material arrived on site, the U.S. Navy work crew was unclear on the proper method of installation. For example, there was a felt paper that came with it, and glue, and an instruction book about 20 pages thick all in Japanese. So a Japanese contractor came out for two days to train the U.S. Navy work crew. After some initial rework, partly due to the unfamiliar product, and partly due to the low level of experience of the U.S. Navy work crew, the job was completed to the satisfaction of the Japanese engineers.

Case 9 can be said to have involved conceptual ambiguity across more than one language. Concepts exist in the mind as abstract entities independent of the terms used to express them. The concept in this case was: appropriate component for wall construction in Japan. The Japanese engineers considered that the concept of appropriate component for wall construction in Japan can be realized by woodchip cement sideboard. By contrast, the American engineers initially considered that the concept of appropriate component for wall construction in Japan cannot be realized by woodchip cement sideboard. Hence, conceptual ambiguity was involved in the communication of design details. This conceptual ambiguity occurred across more than one language, as the two nationalities discussed the wall construction among themselves in their own languages. With regard to network organization communication, the U.S. organization sought to ensure that cooperation between the parties was not jeopardized at an early stage and accepted a recommendation based on local knowledge. In this case, it could be argued that the validity of communication was not compromised. Nonetheless, there was disruption to the project. This case highlights that disruption will arise if there is conflict between the goals that are served by different parties' communication. This case further emphasizes the need to expand the model show in Figures 1 to 4 to include the goals which communications will serve.

Case 10: Communication of design details (Germany, U.S.)

A U.S. real estate investor and developer entered Berlin, Germany to build a high-rise office building. The Americans and the Germans had different opinions about what type

of windows would be appropriate for this building. In the U.S.A., most high-rise buildings have internal air conditioning systems, and the windows in the glass façade are not operable – they have no moving parts and they are permanently closed to ventilation. By contrast, in Western Europe, air conditioning systems are less common, and windows in high-rise buildings are generally operable – they can be opened and closed to regulate the ambient temperature within the building. Hence, the Americans preferred non-operable windows, while the Germans preferred operable windows. In particular, the Germans feared that the non-operable windows would lead to the building having what could be considered an unattractive appearance, causing a loss of respect among their peers, and making it difficult to contract with tenants. During the course of deciding what type of windows should be used, there were several heated discussions and meetings between the American and German project participants, damaging trust, openness, and respect in the relationship. Eventually, after several months of deliberation, the U.S. firm finally accepted and adopted the German standard of operable windows. Subsequently, a representative of the U.S. firm opined that they had originally set out with the intention to develop a U.S. building in Germany.

Case 10 can be said to have involved conceptual ambiguity across more than one language. Concepts exist in the mind as abstract entities independent of the terms used to express them. The concept in this case was: appropriate window type for high-rise buildings in Germany. The Germans considered that the concept of appropriate window type for high-rise buildings in Germany can be realized by operable window. By contrast, the Americans initially considered that the concept cannot be realized by operable window. Hence, conceptual ambiguity was involved in the communication of design details. This conceptual ambiguity occurred across more than one language, as the two nationalities discussed the wall construction among themselves in their own languages. With regard to network organization communication, communication goals for a situation can be *instrumental* (e.g. persuading, instructing, gathering information etc.), *identity* (e.g. presenting oneself in a desired way and/or treating others as if they certain kinds of people), *relationship* (e.g. reflect what one thinks of a relationship and/or how one wants to shape a relationship). Identity communication goals and relational communication goals can be closely intertwined. Relationships are based on perceived identities. People throughout network organizations all construct, perform, and negotiate identities and relationships. In this case, the Americans' instrumental goal was to impose the use of non-operable windows – not to establish cooperation (as in Case 9). This led to their identity being perceived negatively by the Germans and a loss of respect towards them. Moreover, trust, which is essential to the performance of network organization communication, was damaged. Again in this case, it could be argued that the validity of communication was not compromised. Nonetheless, there was disruption to the project. This case highlights that disruption will arise if there is conflict between the goals that are served by different parties' communication. This

case further emphasizes the need to expand the model show in Figures 1 to 4 to include the goals which communications will serve.

Case 11: Communication of legal obligations (Canada, U.S.)

A large U.S. multi-national firm specializing in the providing facilities for the production and refinement of chemical products built a plant in Winnipeg, Canada. The U.S. firm did not realize that under Canadian provincial law it needed to have a certified professional engineer from Manitoba to stamp its drawings etc. The U.S. firm had built plants in other Canadian provinces including Ontario and Quebec, and assumed that regulatory requirements would be the same in Manitoba. The error of their assumption was recognized early in the design process, and was obvious to correct, because it was a matter of compliance with a formal legal requirement. However, because the contract with the client, the City of Winnipeg, had been fixed based on inaccurate assumptions, the overall impact of having misjudged the legal requirement was an irrecoverable loss in the value of the transaction. In addition to the financial loss, there was a time delay to the project of several weeks, during which time a local Canadian firm was identified, and the necessary certification process was carried out to completion.

Case 11 can be said to have involved conceptual ambiguity across one language. Concepts exist in the mind as abstract entities independent of the terms used to express them. The concept in this case was: legal obligations for the validation of design work in Manitoba, Canada. Legal obligations for the validation of design work in Manitoba were considered by the client to include certification by a professional engineer from Manitoba. By contrast, legal obligations for the validation of design work in Manitoba were considered by the U.S. firm not to include certification by a professional engineer from Manitoba. Hence, conceptual ambiguity was involved in the communication of legal obligations. With regard to network organizational communication, it may have been possible for the U.S. firm to discover earlier that Manitoba had its own distinctive regulatory requirements, if the U.S. firm had fostered personal linkages with Manitoba's relevant authorities at an early stage. Again in this case, it could be argued that the validity of communication was not compromised. Moreover, consideration of this case reveals a further shortcoming in the model shown in Figures 1 to 4. In this case, the communication of the legal obligation was contained in pre-prepared documentation that the U.S. firm had to seek out and look through. Thus, the U.S. firm was not the recipient of the relevant communication unless the pre-prepared communication was sought out the U.S. firm – or belatedly brought to its attention. Hence, it could be argued that the role of the sender is less immediate and pro-active than suggested by the model shown in Figures 1 to 4. Moreover, the actions of the U.S. firm were based on previous communications, which were not relevant, that they had been recipients of. Accordingly, the model shown in Figure 1 may have been congruent with the earlier communications during earlier projects. However, the carrying over of its previous

correct understanding of earlier communications to another project in other place led to incorrect actions. Consideration of this phenomenon, suggests the need to add communication context to the model shown in Figures 1 to 4, and further highlights the potential for complexity in network organization communication.

Case 12: Communication of legal obligations (Spain, U.S.)

A U.S. real estate developer was attracted to invest in a new high-rise office building development in Spain. An agreement was reached with a Spanish sub-contractor to manage all of the sub-surface excavation, earthmoving, and foundation construction. To seal the agreement, the U.S. developer had the Spanish sub-contractor review, approve, and then sign a standard contract form for foundation work, a contract form that had served the U.S. developer well, and had been iteratively refined over decades of project development work in the United States. The contract form included a specific clause making the sub-contractor responsible for all adverse and unexpected ground-conditions. The sub-contractor signed the contract, without any objection to this clause, even though it was very strongly worded in favour of the U.S. side. The project went well for several months. However, then temporary shoring structures that had been constructed to buttress and strengthen the walls of the excavation collapsed without warning. As the walls of the excavation caved inwards, the temporary structures, formwork, and foundations were buried or destroyed. After the unexpected and sudden failure, the Spanish sub-contractor refused to continue work. Estimates put repair of this failure at tens of thousands of U.S. dollars. The Spanish sub-contractor told the U.S. developer that it would only resume work after the walls of the excavation had been stabilized and the damages repaired. Not feeling that it was their responsibility to cover the damages, the U.S. developer went back to the contract that had been signed. They met with the Spanish sub-contractor to remind them that by signing this contract, they had assumed absolute responsibility for unexpected site conditions, including the very sort of failure that had occurred. Additionally, the U.S. developer tried to threaten, stating that they would file a lawsuit unless the sub-contractor returned to site, repaired the damages, and resumed their work. However, the threats were not successful. The Spanish sub-contractor remained defiant and refused to return to work. With the parties at an impasse and the project delayed, the U.S. developer sought advice from a respected Spanish lawyer who specialized in construction claims. After hearing the story, the legal counsel concluded that no judge in Spain would enforce such a ridiculously one-sided contract. So, with the outcome of a lawsuit looking very unfavourable, the U.S. developer completed the restabilization work at their own expense, in order to keep the project on schedule, by hiring a second local subcontractor. Only after the restabilization work was complete did the Spanish sub-contractor finally return to the site to resume foundation construction.

Case 12 can be said to have involved conceptual ambiguity across more than one language. Concepts exist in the mind as abstract entities independent of the terms used to express them. The concept in this case was: allocation of responsibility for work associated with all adverse and unexpected ground-conditions during a project in Spain. Responsibility for work associated with all adverse and unexpected ground-conditions was considered by the U.S. developer to have been allocated wholly to the Spanish sub-contractor. By contrast, responsibility for work associated with all adverse and unexpected ground-conditions was not considered by the Spanish sub-contractor to have been allocated wholly to itself. Hence, conceptual ambiguity was involved in the communication of legal obligations. This conceptual ambiguity occurred across more than one language, as the two nationalities discussed the wall construction among themselves in their own languages. With regard to network organization communication, the U.S. developer might have discovered that the specific clause would not be enforceable in Spain if it had fostered personal linkages with Spanish organizations at an early stage. Again in this case, it could be argued that the validity of the U.S. developer's communication was not compromised. The Spanish contractor may well have understood exactly the intent of the communication. Nonetheless, there was disruption to the project. This may have been because the Spanish contractor may have deliberately avoided communication of its goal – which may have been to not to draw attention to its knowledge that the U.S. developer would be liable. Consideration of this case highlights a short-coming of the communication model shown in Figure 1 to 4. The model includes the intent of communication, but it does not include the goal which the communication serves.

Case 13: Communication of legal obligations (Japan, U.S.)

A Japanese building contractor won a design-build bid to retrofit and renovate a manufacturing facility for a U.S. high technology firm. Without comprehending the implications of the decision, they agreed to sign the owner's contract form. This contract specified that the final price was not to exceed 43.1 million U.S. dollars. There were no clauses in the contract to allow change-orders based on unknown, uncertain, unexpected, or unforeseen conditions. This so-called guaranteed maximum price (GMAX) contract form is used commonly in the U.S. construction industry. Based on its past experience, the Japanese contractor would not knowingly make a GMAX price at such an earlier stage of a project. Rather, they would consider signing a GMAX towards the end of a project. Moreover, the Japanese contractor considered the signing of a GMAX on a retrofit at the beginning of a project to be particularly unwise is not smart because of the increased probability of unknown, uncertain, unexpected, or unforeseen conditions. So even though the Japanese company signed the contract, its meaning was not understood at the time. As the project unfolded, many unexpected technical complications related to the retrofit caused extra costs and the final price ended up at US $62.9 (excluding the Japanese contractor's fee). As costs escalated, the

Japanese firm continued to submit budget revisions on a monthly basis to the owner in the form of a cost report. However, they did not submit a formal change order to request an increase in the contract amount. They did not consider it necessary to submit a formal change order because the owner knew the cost was rising because the Japanese contractor was submitting the cost reports – and even though the U.S. parties were receiving them, they did not say anything. When the project was completed, the Japanese firm submitted the final invoice to the owner to request payment. In response, the U.S. client argued that it did not owe any more than the GMAX price stipulated in the original contract document. A lengthy negotiation followed during which the Japanese firm sought U.S. legal counsel. It was the U.S. legal counsel's opinion that the Japanese firm should have pressed for a formal change order at the time it realized the project cost was escalating, and if this had not been granted, halted all work on the project. Furthermore, in the absence of having submitted formal change order requests, they determined that the Japanese firm had no basis to file a lawsuit. In the end, the U.S. owner, realizing an honest mistake had been made, agreed to split the cost over run and awarded the Japanese firm the sum of 52.8 million U.S. dollars. However, even with this extra payment, the Japanese firm ended-up absorbing $10.1 million U.S. dollars and forfeiting their fee on the project.

Case 13 can be said to have involved conceptual ambiguity across more than one language. Concepts exist in the mind as abstract entities independent of the terms used to express them. The concept in this case was: allocation of responsibility for work associated with unknown, uncertain, unexpected, or unforeseen conditions. Responsibility for work associated with unknown, uncertain, unexpected, or unforeseen conditions was considered by the U.S. client to have been allocated wholly to the Japanese contractor. By contrast, responsibility for work associated with unknown, uncertain, unexpected, or unforeseen conditions was <u>not</u> considered by the Japanese contractor to have been allocated wholly to itself. Hence, conceptual ambiguity was involved in the communication of legal obligations. This conceptual ambiguity occurred across more than one language, as the two nationalities discussed the wall construction among themselves in their own languages. With regard to network organization communication, it could be argued that the Japanese contractor's thorough co-ordination with the U.S. owner (its submission of month budget revisions) did at least facilitate sufficient cooperation to enable its recovery of nearly 10 million U.S. dollars of costs. In this case, the validity of the U.S. owner's communication to the Japanese contractor was compromised.

<u>Case 14</u>: Communication of performance improvement goals (China, U.S.)

A U.S. firm entered China to build and operate a manufacturing facility. The U.S. managers were unhappy with production output and offered an incentive program to Chinese factory workers who contributed to production increases. However, after

several weeks the incentive program was not working. Management of the U.S. firm was perplexed as to why it did not seem to motivate the Chinese workers to increase production levels. It was an incentive program that had worked in other countries. Subsequently, the U.S. firm hired a Chinese consultant. Following discussions with the workers, the consultant provided two pieces of advice. First, promotion incentives were not likely to be successful, because people that rise to the top had been watched closely by the government, and occasionally even killed, under the rule of communism. Second, they negative reinforcement works more effectively because Chinese prefer not to produce more than their friends and cause disharmony. Based on the advice received, U.S. managers replaced the ineffective performance incentive program with a program to punish non-performance. As a result, all of the employees increased their output in unison, and none of the employees felt that they were rising above the rest.

Case 14 can be said to have involved conceptual vagueness across more than one language. To say that a concept is vague is to say that the boundaries of meaning are indistinct, and that there may be cases in which there is no clear fact of the matter whether the concept applies or not. In this case, there was no fact of the matter whether the U.S. conceptualization of incentive applied in China – until people who could be described as liaison within network communications theory informed that it did not. In this case, the validity of the communication from the U.S. firm was compromised.

Case 15: Communicating safety requirements (Japan, U.S.)

In 1999, a U.S. military unit was managing a building construction project on a U.S. military base in Japan. A few weeks into the project, a U.S. superintendent noticed that the workers employed by the Japanese scaffolding contractor were not wearing steel-toed safety boots. Instead, they were wearing *tabi* shoes (something like thick socks with a rubber sole, and a single split forming two big toes). According to U.S. military contract requirements, all contractors on U.S. military bases are required to abide by standard U.S. military safety regulations. Accordingly, the U.S. superintendent told the Japanese that they were on an U.S. job, they had agreed to conform to U.S. regulations, and therefore needed to wear steel-toed boots. The next day the Japanese construction manager was wearing steel-toed boots, but the construction workers were not. The U.S. superintendent then clarified that everybody needed to wear steel-toed boots. In response, the Japanese manager advised that such boots were not made in Japan. The U.S. superintendent checked this with a Japanese building inspector, who responded that steel-toed boots were made in Japan. The next day, the Japanese scaffolding contractor was issued with a letter of non-compliance and was shown a copy of the particular section of the safety manual that had to be followed. The Japanese scaffolding contractor was also shown a catalogue including several pairs of steel-toed boots that could be obtained locally. After resisting for several weeks, the entire Japanese scaffold crew reported to work wearing new low-cut, light-weight sneakers, but with the

necessary steel-toes. According to U.S. rules the sneakers were acceptable. Thus, the Japanese scaffolding contractor's workers managed to find a way around the rules. This solution provided a satisfactory trade-off between the safety regulation and the comfort of the work crew who preferred to wear the lighter, thin-soled footwear that enables them to feel with their feet better. Although this episode was resolved, it did cause strain and anxiety in the relationship between the U.S and Japanese parties involved.

Case 15 can be said to have involved conceptual vagueness across more than one language. To say that a concept is vague is to say that the boundaries of meaning are indistinct, and that there may be cases in which there is no clear fact of the matter whether the concept applies or not. In this case, the conceptualization of safe footwear accepted as being definitive to the U.S. personnel was vague to the workforce of the Japanese scaffolding contractor. To the Japanese scaffolding operatives, safety in their work was more closely related to being able to feel the scaffolding with their feet than protecting their toes from falling objects. With regard to network organization communications, both parties may have lacked sufficient commitment to co-ordination at the outset. In this case, the validity of communication from the U.S. military unit was compromised.

Case 16: Communication of procurement goals (Albania, U.S.)

A U.S. institution sought to obtain several low bids and select best value for goods needed in the construction of a road. In doing so, they encountered objections among different suppliers, vendors, and what the U.S. representatives referred to as local mafia groups. These parties sought to have the U.S. institution procure goods on the basis of individuals' recommendations. After several of weeks of unsuccessfully trying to obtain low bids and select best value in the procurement process, the U.S. representatives decided to hire a local husbanding agent. His job was to be an interface between the people working on the project, the U.S. company, and the host nation. He would go into the local community with the U.S. representatives to do purchasing or translation. Alternatively, he would do some research to choose a vendor that would offer most value in the end. Then, the U.S. representatives would go to that vendor to negotiate.

Case 16 can be said to have involved conceptual vagueness across more than one language. To say that a concept is vague is to say that the boundaries of meaning are indistinct, and that there may be cases in which there is no clear fact of the matter whether the concept applies or not. In this case, there was no fact of the matter whether the U.S. conceptualization of best value applied in Albania – until the experiences of the U.S. representatives in Albania revealed to them that U.S. conceptualization of best value did not apply. In order to overcome their resulting problems in procurement, the U.S. representatives hired a person who could be described as a liaison within network

communication theory. In this case, the validity of the communication from the U.S. institution was compromised.

Case 17: Communicating purpose of meetings (Korea, U.S. / U.K.)

A joint venture (JV) formed between a U.S. engineering firm and a U.K. architectural design firm designed a transportation system for an international airport in Korea. Early in the project, meetings called design charettes were planned by the U.S. / U.K. JV partners. The objective was to work with the Korean client in order to prepare a conceptual design for the project. However, the Korean client representatives tended to be more reluctant to openly express or discuss their interests or concerns during the meetings than the U.S. / U.K. personnel had expected. The U.S. / U.K. participants discovered, through the course of subsequent informal conversations, that the Korean client team had viewed the design charettes as a sign of technical incompetence on the part of the U.S. / U.K. joint venture. They learned that in Korea, the process of conceptual design preparation does not typically involve participatory meetings where a client is expected to give real-time input into the design. Rather, a design firm typically prepares a series of comprehensive design alternatives, which the client formally reviews and marks up. Then, after each design revision, the design firm incorporates the suggested feedback. As a result of the design charettes being unsuccessful, the U.S. design team never reached a clear understanding of the Korean client's needs or expectations. This, in turn, caused problems in the later stages of the project.

Case 17 can be said to have involved conceptual vagueness across more than one language. To say that a concept is vague is to say that the boundaries of meaning are indistinct, and that there may be cases in which there is no clear fact of the matter whether the concept applies or not. In this case, the conceptualization of design charette accepted as being definitive by the U.S./U.K. joint venture personnel was vague to the Korean client. In this case, the Korean client's personnel interpreted the design charette concept in a very different way to U.S./U.K. joint venture personnel. In order to work cooperatively, people in inter-organizational networks can construct, perform and negotiate shared definitions of situations and identities. In this case, the Korea client saw the situation to be inappropriate and the joint venture participants to be technically incompetent. These difficulties may have been avoided if the JV had hired a liaison. In this case, the validity of the communication from the JV was compromised.

Case 18: Communication of design progress (Korea, U.S. / U.K.)

Subsequently, in the Case 17 project, the Korean owner understood the weekly U.S. reports to mean that the design was progressing faster than it actually was. Six months in to the project, when the Koreans actually reviewed a draft of the drawings, they were shocked at the visible lack of detail. As the U.S. manager remembered, There was a lot

of difference in terms of what they meant by basic design and what we meant by basic design. We thought that basic design meant about 10% designs complete. So, six months into the project we showed them what we had done and it was nowhere near what they expected. The U.S. manager reported that the miscommunication hurt the level of trust in the relationship, and noted that, we spent many days and hours trying to figure out and understand the accepted process of design in Korea. We also tried to accelerate the project, because the client was unhappy, but this led to additional misunderstandings related to the change order process, and it all became very cumbersome. It delayed the project substantially and also the cost escalated.

Case 18 can be said to have involved conceptual vagueness across one language. To say that a concept is vague is to say that the boundaries of meaning are indistinct, and that there may be cases in which there is no clear fact of the matter whether the concept applies or not. In this case, the Korean participants defined detail design as 100% design complete, and basic design as 30–40% design complete. By contrast, the U.S. participants made use of another conceptualization: detailed design means 90% complete, schematic design means 60% complete, and concept design means 30% complete. The term, basic design, was not part of the U.S. participants' established conceptualization for reporting of design progress. Accordingly, the concept described by the term, basic design, was vague to them – even though they were native speakers of the one language used to categorize the stages of design progress – English. This case illustrates that concepts exist in the mind as abstract entities independent of the terms used to express them. In this case, the arising misunderstanding had a negative affect on trust – which is widely recognized as an important factor in network organization communications. These difficulties may have been avoided if the JV had hired a liaison. In this case, the validity of the communication from the JV was compromised.

Case 19: Communication of design responsibility (Spain, U.S.)

The U.S. Navy needed to have an office building constructed on one of its bases in Spain. There was considerable delay due to a mix-up between the U.S. design group, who did not understand the Spanish construction industry practices, and the Spanish contractors. There were repeated iterations of shop drawings for concrete panels over a period of several months. During this time, there were numerous meetings involving six to 10 people including U.S. personnel who spoke Spanish. Nonetheless, tension in the relationship developed and ultimately the panel contract was terminated. Eventually, the U.S. design group realized that the methods they wanted to be used were not known in Spain. One U.S. personnel remarked, instead of getting a little more local knowledge, we went with a design that we thought would work based on our experiences in other parts of Europe. A contributory factor may have been that Spanish contractors do not typically employ in-house designers, architects or engineers to prepare shop drawings. Instead, this expertise typically resides in specialized engineering and design firms. By

contrast, U.S. contractors tend to offer in-house design expertise to their clients. Accordingly, the Spanish contractor may have been confused by the U.S. demand that they should prepare detailed shop-drawings.

Case 19 can be said to have involved conceptual vagueness across more than one language. To say that a concept is vague is to say that the boundaries of meaning are indistinct, and that there may be cases in which there is no clear fact of the matter whether the concept applies or not. In this case, conceptual frameworks for design responsibility and for design content that were familiar to the personnel of the U.S. institution were vague to the Spanish panel contractor. If it had been clear to the Spanish panel contractor what it was that the U.S. institution wanted, the Spanish panel contractor could have employed the services of a specialized Spanish design firm. These difficulties may have been avoided if the U.S. had hired a liaison person with expertise in this particular topic. In this case, the validity of the communication from the U.S. parties was compromised.

Case 20: Communication of valuation principles (Isreal, U.S./U.K.)

In the late 1990s, a joint venture (JV) between an Israeli firm and a U.S. / U.K. group won a lump sum bid to complete a major airport construction project in Europe. The U.S. / U.K. group was a large international contractor while the Israeli firm was smaller and locally headquartered. As the project went along, the JV managers noticed mistakes in their estimate calculations and realized that their lump-sum bid price to the owner was not enough to cover their costs, let alone leave allowance for a profit. While the JV managers all agreed that the project was on the brink of becoming seriously unprofitable, they could not reach an agreement about an appropriate plan of action for how to proceed in this awkward circumstance. One of the JV managers on the U.S. side reported that the Israeli contractor felt strongly they could pursue change-orders into profitability while U.S. / U.K. group did not feel that they should do that as that it would not be an honourable course of action. Subsequently, the working relationship became dysfunctional and the JV made a substantial financial loss.

Case 20 can be said to have involved conceptual vagueness across all languages. A concept can be said to be vague when the boundaries of its meaning are indistinct. The boundaries of the concept of honourable are indistinct. Interorganizational relationships require a strong commitment to cooperation and this case that commitment was lost. In this case, it could be argued that the validity of communication was not compromised. This case further highlights that disruption will arise if there is conflict between the goals that are served by different parties' communication. This case further emphasizes the need to expand the model show in Figures 1 to 4 to include the goals which communications will serve.

Case 21: Communication of tender requirements (Russia, Canada)

Members of the Russian government invited a Canadian telecommunications contractor to design, supply, and build a new fiber optic backbone which would connect major cities along the trans-Siberian railroad. The Canadian firm sent an estimating team to Russia, to fly the route in a helicopter, and to survey the geography and condition of the existing railroad infrastructure. After the route survey, the Canadian firm returned home, with a promise from the Russian government sponsors that they would be awarded the project on a negotiated price basis, without a competitive bidding process. At the same time, they were informed that they would be required to share the profits. Initially, the Canadians did not understand what the Russians meant by sharing the profits. Through subsequently discussions, it became apparent that the Russians wanted the Canadians to send cash to their private bank accounts in return for awarding them the project. After several weeks of internal deliberations the Canadians, submitted their bid to do the work but refuse to pay the bribes. Without an agreement on the bribes, the Russians would not accept the bid.

Case 21 can be said to have involved conceptual vagueness across more than one language. To say that a concept is vague is to say that the boundaries of meaning are indistinct, and that there may be cases in which there is no clear fact of the matter whether the concept applies or not. In this case, there was no fact of the matter whether the Canadian conceptualization of negotiated price applied in Russia – until exploratory discussions with the Russians revealed that it did not. These difficulties may have been avoided if the Canadian telecommunications contractor had hired a liaison at the outset. In this case, it could be argued that the validity of the communication from the Russian parties was compromised. However, it could also be argued that the Russian parties may not have wanted to make an entirely explicit statement of what they wanted from the Canadians. Accordingly, consideration of this case further emphasizes the need to add the goal that is to be served by a communication in the model shown in Figures 1 to 4.

Case 22: Communication of contractual status (Vietnam, U.S.)

Shortly before the normalization of relations between Vietnam and U.S., the Vietnamese government invited a U.S. consortium to look at improving the three major airports in the country: North Hanoi, Danang, and Saigon. The Vietnamese were looking for a consortium to fund, design, and build. Consortia were invited from several countries. Nonetheless, Vietnamese officials informed the U.S. consortium that it was their favourite. The U.S. consortium went through a whole feasibility study process. At that time Vietnam's legal system lacked a system of contracts and contract enforcement. So instead of preparing contractual agreements to finalize negotiations and investment arrangements, the U.S. consortium drafted and signed what was called an exclusive memorandum of understanding (MOU), and returned home to the U.S., under the

assumption that these memoranda had sealed the arrangements of the various investments that had been discussed. However, the U.S. firm learned that the Vietnamese officials had signed duplicate versions of these supposedly exclusive MOUs with other consortia from other countries. This eroded trust. Subsequently, the U.S. consortium made several trips over a period of a year to Vietnam, with senior personnel and partners from law firms. They met the Minister of the Civil Aviation Authority and a Vice Premier. They learnt that despite the duplicate MOUs, the Vietnamese were interested in working with a U.S. consortium. As far as they were concerned, because they did not have any concept of exclusivity, they had not done anything wrong. Nonetheless, the consortium could not determine if the Vietnamese MOU commitment was sincere. Not sure how to proceed, and not wanting to allocate any more resources to the project, the consortia decided to write-down the initial investment and exit Vietnam. In the end, the exclusive MOUs were never honoured, and the proposed projects were never completed. Ultimately, the consortium backed away, assigned someone to be a contact person, and let the relationship die a slow death.

Case 22 can be said to have involved conceptual vagueness across more than one language. To say that a concept is vague is to say that the boundaries of meaning are indistinct, and that there may be cases in which there is no clear fact of the matter whether the concept applies or not. In this case, conceptualization of contractual exclusivity that was shared by personnel of the U.S. consortium was vague to the Vietnamese officials. Even interaction with senior Vietnamese personnel, such as Vice Premiers, who could be described within network organization communication as gatekeepers could not bring about a successful resolution. In this case, the validity of the communication from the Vietnamese officials was compromised.

Case 23: Communication of project goals (Uganda, U.S.)

A U.S.-based power producer proposed to construct a hydroelectric dam in Uganda. The dam would have displaced 820 people, as well as submerging communal lands of an additional 6,000 people including burial sites and a waterfall. There was almost no replacement land for those who would have lost homes and/or crops. Local people and non-governmental organizations (NGOs) submitted two different requests to have the project reviewed by the World Bank. Main issues in the requests were economic questions such as whether the Ugandans would be able to afford the electricity. In the second request, it was noted that the local people were angered about the loss of the waterfall, which was said to be a host for an important spirit. Over time, it became apparent that the Ugandan government officials thought very differently from the displaced people, and they thought very differently from the "requestors" who launched the complaints about the project. The Bank had sessions with both of the persons who claimed to represent the "spirit in the waterfall". Eventually, after several years of negotiation the project was abandoned. The project was opposed by those who

questioned its development value due to economic and environmental issues. By contrast, the second request concerning the "spirit in the waterfall" got much more media attention than the economic and environmental questions.

Case 23 can be said to have involved conceptual vagueness across all languages. In this case, some of the affected parties thought that the U.S. company's conceptualization of development did not apply. There remained no fact of the matter even after years of negotiation which included people who could be described as gatekeepers within network organization communications: the persons who claimed to represent the "spirit in the waterfall". A contributory factor to the failure to establish fact of the matter may have been the media focus on the "spirit in the waterfall" that emerged, and highlights the potential for complexity in network organization communications. International development is a concept that lacks a universally accepted definition and can be said to vague across all languages. For example, "development" projects that are funded nationally and involve people who are working in their own home country, and who share the same language and culture, are also abandoned after long and expensive discussions. Consider, for example, the five years and 14 million pounds sterling that were spent discussing the proposal for a so called, London super-hospital (BBC, 2005). In this case, the reliability and the validity of communications from the U.S. power producer were compromised.

4.2 Analysis of vagueness and ambiguity

A summary of the different types of ambiguity / vagueness in the cases is provided in Table 12 on the following page. Also, the duration of each case and project phase in which it occurred is summarized in Table 12. Phases are categorized as being either implementation phase (abbreviated to "Implement") or phase other than implementation phase (abbreviated to "Other"). Phases other than implementation include design, pre-design, and post-production. Durations are categorized as day(s), week(s), month(s), or year(s). Perhaps the most striking finding from the analysis as summarized in Table 12 is that linguistic factors were not found to be of primary importance in any of the cases. Rather, conceptual factors and presentational factors were found to be important. This is consistent with research by others which has found that while linguistic factors can be a source of some frustration in communication but not necessarily a source of major problems on projects (Loosemore and Lee, 2002). Also, presentational factors relating to the choice and/or the use of media were not found to be important in any of the cases. In particular, conceptual vagueness was found to be the most prevalent factor among the cases. Conceptual ambiguity was found to be the second most prevalent factor. Presentational ambiguity due to situation, and due to behaviour, were important in a total of seven cases, while presentation ambiguity due to composition was important in only one case.

Table 12. Ambiguity / vagueness in cases.

No.	Communication of	Type of ambiguity or vagueness	Duration	Phase
1	Reporting conventions	Presentational ambiguity – composition	Months	Implement
2	Work instruction	Presentational ambiguity – behaviour	Days	Implement
3	Work agreement	Presentational ambiguity – behaviour	Weeks	Implement
4	Quality requirements	Presentational ambiguity – behaviour	Days	Implement
5	Work instructions	Presentational ambiguity – situation	Weeks	Implement
6	Project plans	Presentational ambiguity – situation	Weeks	Implement
7	Project plans	Presentational ambiguity – situation	Months	Implement
8	Fabrication details	Presentational ambiguity – situation	Months	Other
9	Design details	Conceptual ambiguity – 1+ languages	Weeks	Other
10	Design details	Conceptual ambiguity – 1+ languages	Months	Other
11	Legal obligations	Conceptual ambiguity – 1 languages	Weeks	Other
12	Legal obligations	Conceptual ambiguity – 1+ languages	Weeks	Implement
13	Legal obligations	Conceptual ambiguity – 1+ languages	Months	Other
14	Performance goals	Conceptual vagueness – 1+ languages	Weeks	Implement
15	Safety requirements	Conceptual vagueness – 1+ languages	Weeks	Implement
16	Procurement goals	Conceptual vagueness – 1+ languages	Weeks	Other
17	Purpose of meetings	Conceptual vagueness – 1+ languages	Months	Other
18	Design progress	Conceptual vagueness – 1+ languages	Months	Other
19	Design responsibility	Conceptual vagueness – 1+ languages	Months	Other
20	Valuation principles	Conceptual vagueness – all languages	Months	Implement
21	Tender requirements	Conceptual vagueness – 1+ languages	Weeks	Other
22	Contractual status	Conceptual vagueness – 1+ languages	Years	Other
23	Project goals	Conceptual vagueness – all languages	Years	Other

Figure 7 shows that the majority of cases of conceptual vagueness and conceptual ambiguity (11 out of 15) occurred during phases other than implementation. By contrast, all but one of the eight cases of presentational ambiguity occurred during the implementation phase.

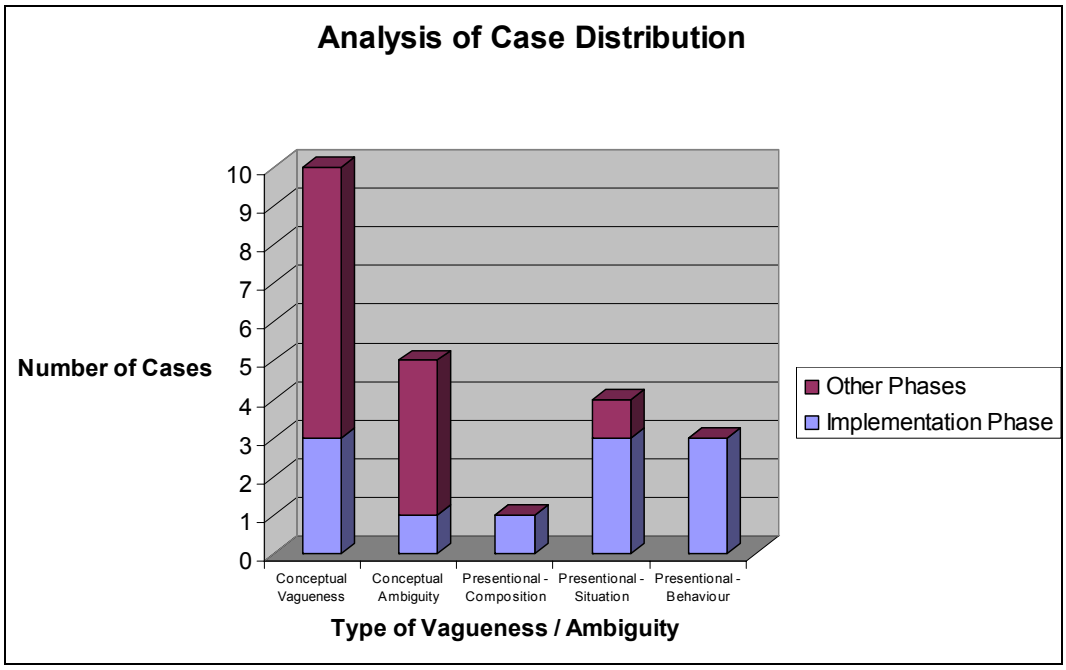


Figure 7. Distribution of cases.

Figure 8 below shows that only 27% of cases in the implementation phases had durations of months compared to 67% of cases in other phases. The difference between durations is less pronounced between presentational cases (37.5% of cases with a duration of months) and conceptual (53% of cases with a duration of months or longer).

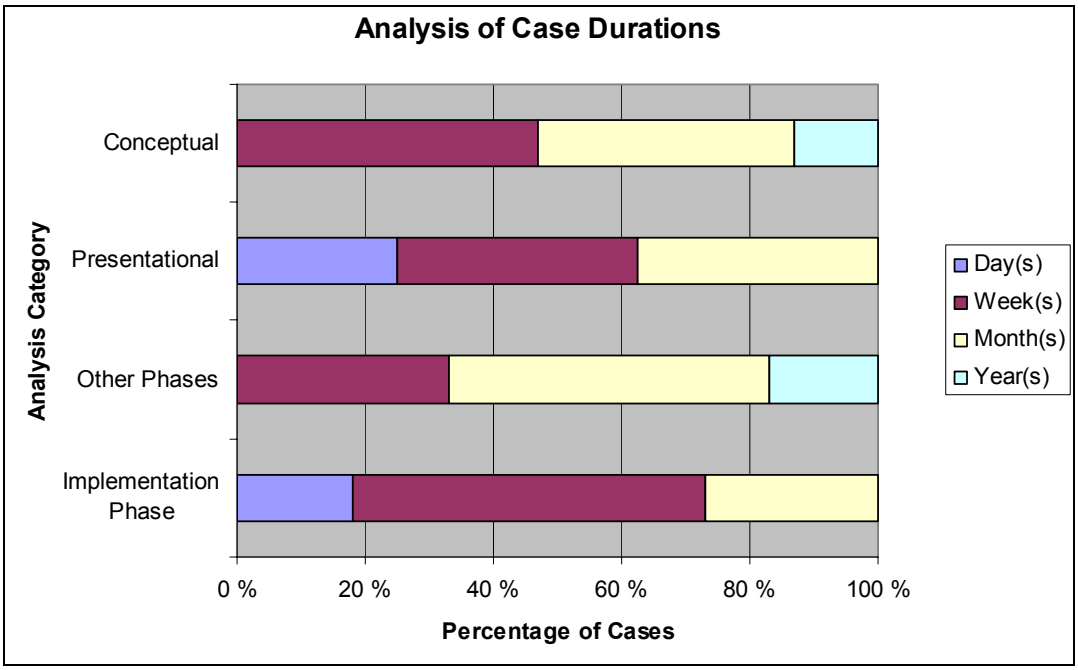


Figure 8. Duration of cases.

The apparent trend for cases to have shorter durations in implementation phase is shown further in Figure 9 below. This figure shows the differences between the duration of conceptual vagueness cases in the implementation phase and in other phases. The majority of cases in implementation phase had durations of weeks. By contrast, the majority of cases in other phases had durations of months or years.

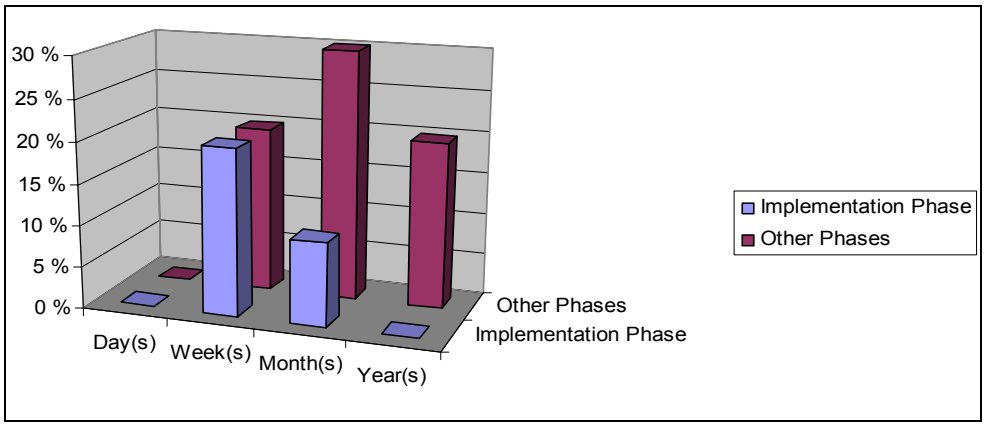


Figure 9. Characteristics of conceptual vagueness cases.

The analysis of presentational ambiguity cases, shown in Figure 10 below, also suggests that cases in the implementation phase may have shorter durations than cases that occur in other phases. In particular, the majority of presentational cases that occurred in the implementation phase had durations of weeks or less. By contrast, the one presentational case that occurred in another phase had a duration of months.

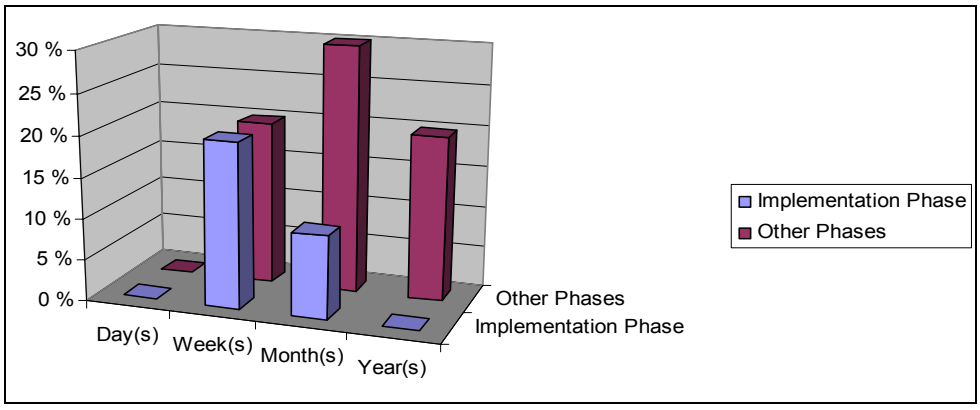


Figure 10. Characteristics of presentational ambiguity cases.

One reason for cases to have longer durations during phases other than implementation may be that cases of conceptual vagueness may be more likely to occur during pre-implementation phases such as feasibility study and concept design. It is in these initial phases of projects that fundamental concepts, such as project goals, need to be defined in terms which are meaningful to a variety of different parties. Establishing meaningful

definitions of concepts can be difficult because concepts exist in the mind as abstract entities independent of the terms used to express them. Moreover, the concepts that are most important may not yet exist as even partially developed abstract entities in any of the parties' minds during initial project phases. Rather, concepts are evolving within the minds of a few of the leading parties involved such as the client. Accordingly, the boundaries of meaning can be extremely indistinct and especially difficult to communicate to others in any terms. By contrast, the most important concepts such as project goals should be well defined by the time the implementation phase begins. Furthermore, there may be well developed representations to describe how concepts are to be realized during the implementation phase. These representations can include three dimensional images, physical models and written documents including legal contracts. Such representations can make cases of ambiguity more likely than cases of vagueness. Cases of ambiguity have more potential to be resolved than cases of vagueness, because cases of ambiguity tend to offer options that are meaningful to the parties involved. For example, is the sub-contractor liable for the unforeseen costs – or not; should the communication of work plans include the local chieftain – or not; was the supervisor joking when he said what could be an instruction – or was he joking? Moreover, there may be more of an imperative to resolve cases of ambiguity quickly during the implementation phase because most of the parties involved may already have made considerable investment in resources and be more likely to suffer significant losses and/or penalties as a result of delays.

4.3 Analysis of network organization communication

A summary of the different network communication factors in the cases is provided in Table 13 on the following page. Also, the duration of each case, and project phase in which it occurred, is summarized in Table 13. Perhaps the most striking finding from the analysis as summarized in Table 13 is that nearly all of the cases involved communication among just a few parties. This finding offers some support for Krackhardt's (1994) notion that there are strong constraints on communication in networks that lead to parties tending to communicate with fewer other parties than might be expected. Also, it is notable that three types of factors were most significant among the cases: roles, linkages, and co-ordination. In particular, the roles of gatekeeper and liaison were important, either by their presence or absence, in twelve of the cases. Linkage factors were important in five of the cases. With the absence of personal linkages and reliance on representative linkages being an important issue. In six of the cases, co-ordination was an important factor that determined, for example, how trust was developed (e.g. Case 9) or undermined (e.g. Case 10). The potential for complexity within network organization communications was illustrated in five cases. In Cases 5, 6 and 7. In all of these cases, disruption to the projects arose from the actions of people

who were not communicated with. Similarly in Case 23, media reports focused more upon the "spirit in the waterfall" than upon the economic issues that were the main focus of communications between the principal parties involved. This media interests and associated influence on events is consistent with notion of complex systems being characterized by self-organization and emergent properties. In Case 11, the U.S. company based its actions on previous communications from other projects in other parts of Canada where different regulations applied.

Table 13. Network communication factors in cases.

No.	Communication of	Network communication factor	Duration	Phase
1	Reporting conventions	Multiple parties – co-ordination	Months	Implement
2	Work instruction	Two parties – linkage	Days	Implement
3	Work agreement	Two parties – linkage	Weeks	Implement
4	Quality requirements	Two parties – liaison	Days	Implement
5	Work instructions	Multiple parties – gatekeeper	Weeks	Implement
6	Project plans	Two parties – gatekeeper	Weeks	Implement
7	Project plans	Multiple parties – gatekeeper	Months	Implement
8	Fabrication details	Two parties – linkage	Months	Other
9	Design details	Two parties – co-ordination	Weeks	Other
10	Design details	Two parties – co-ordination	Months	Other
11	Legal obligations	Two parties – linkage	Weeks	Other
12	Legal obligations	Two parties – linkage	Weeks	Implement
13	Legal obligations	Two parties – co-ordination	Months	Other
14	Performance goals	Two parties – liaison	Weeks	Implement
15	Safety requirements	Two parties – co-ordination	Weeks	Implement
16	Procurement goals	Two parties – liaison	Weeks	Other
17	Purpose of meetings	Two parties – liaison	Months	Other
18	Design progress	Two parties – liaison	Months	Other
19	Design responsibility	Two parties – liaison	Months	Other
20	Valuation principles	Two parties – co-ordination	Months	Implement
21	Tender requirements	Two parties – liaison	Weeks	Other
22	Contractual status	Two parties – gatekeeper	Years	Other
23	Project goals	Multiple parties – gatekeeper	Years	Other

4.4 Analysis of validity and reliability

The reliability of communications will be compromised if the same communication is understood differently by different recipients. Of the twenty-three cases of communication analysed, only four cases involved multiple parties. Accordingly, the affects of ambiguity and vagueness on communication reliability can only be considered with regard to these four cases. In Case 1, reliability was comprised. In particular, the same U.S. standard forms were understood differently by the different European recipients. By contrast, in Cases 5, 7 and 23 there is no clear indication that reliability was compromised. Nonetheless, all four projects suffered disruption.

The validity of communications will be compromised if the communications do not address the issues that they are intended to address. It could be argued that the validity was not compromised in nine of the Cases: 5, 6, 7, 8, 9, 10, 11, 12, and 20. In Case 5, there is no indication that the Chinese managers failed to communicate their intent successfully to the Indian workforce. In Case 6, there is no indication that the Canadian engineers failed to communicate there intent to the people that they actually communicated with. Similarly in Case 7, there is no indication that the Korean contractor failed to communicate its intent to the people that they actually communicated with. In Case 8, the U.S. consultant communicated its intent to obtain very detailed fabrication information from the Japanese contractor. In Cases 9 and 10, the different parties' intentions to select alternative design details were communicated. In Cases 11 and 12, the communication of legal intent was not compromised. In Case 20, there is no indication that the U.S. / U.K. group failed to communicate its intent not to pursue change-orders in an effort to compensate for estimate calculations. Nonetheless in all of these nine cases, there was disruption to projects.

In Cases 5, 6, and 7, disruption to the project arose from the actions of people who were not the recipients of communications. In Case 8, 9, 10, and 20, the goal(s) that communications are intended to serve was an important factor. In Cases 12 and 13, non-communication was all important. People may be too emotional to communicate (Von Glinow et al., 2004), or not know how to express what they do not understand (Koschmann and LeBaron, 2003), or be fearful of the consequences of communicating. Accordingly, the preliminary model shown in Figures 1 to 4 needs to be expanded to include non-recipients, goals and non-communication. The limitations of the preliminary model are not adequately addressed by extant theories that focus upon how shared meaning is created (e.g. Barwise, et al. 1991; Clark, 1996; Grice, 1981). Interestingly, the context of communication (e.g. physical location) seemed to do little to facilitate the creation of meaning in these cases. Nonetheless, the context of communication (e.g. physical location) may be an important factor when seeking to

model recipients, goals and non-communication. Accordingly, context should be considered in development of the preliminary model.

In Case 11, the communication of the sender was pre-prepared and the U.S. initially failed to seek it out and look through it. Hence, they did not make recipients of themselves. Consideration of this case suggests a further short-coming of the preliminary model shown in Figures 1 to 4. In particular, the model should encompass potential delays and lapses in communication. There are many situations in which communications are pre-prepared as standard documents and have to be sought out. In such cases, recipients are not passive receivers of active senders' communications. Rather, they need to be active searchers of passive senders' communications.

As shown in Figure 11 below, validity was not compromised in any of the four cases of presentational ambiguity due communication situation. Also, validity was not compromised in four out the five cases of conceptual ambiguity. By contrast, validity was compromised in all three cases of presentational ambiguity due to communication behavior. Moreover, validity was compromised in ten out of the eleven cases of conceptual vagueness.

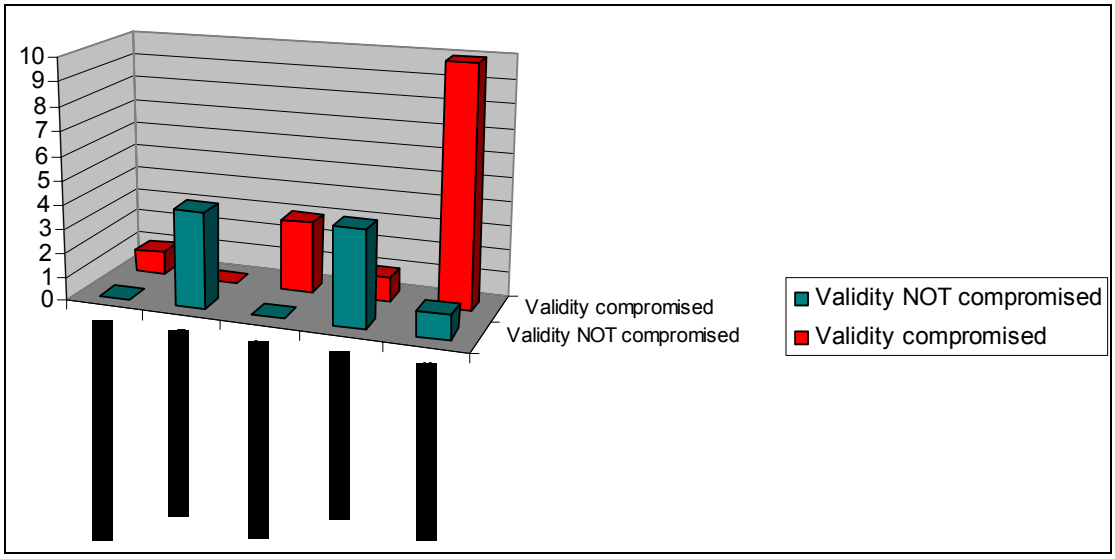


Figure 11. Analysis of Communication Validity.

Overall, unintended consequences arose from validity being compromised in fourteen out of twenty-three cases. Yet, unintended consequences were also experienced in the other nine cases. Consideration of this finding supports that proposition that costly unintended consequences can follow when the validity of communications are compromised. However, conflicting goals among stakeholders, and failure to communicate with all stakeholders, can be equally important as sources of unintended consequences.

4.5 Analysis of ontological uncertainty and semantic uncertainty

It is through communication that human beings express ontology and semantics. However, consideration of the findings from the analysis of twenty-three cases suggests that when communication involves vagueness and ambiguity, similarities and differences between ontology and semantics remain uncertain despite extensive communication. Ontological uncertainty involves different parties in the same interactions having different conceptualizations about what kinds of entities inhabit their world; what kinds of interactions these entities have; how the entities and their interaction modes change as a result of these interactions. For example, the different parties in cases 17 and 19 had different conceptualizations about who (i.e. which entities) should do what (kinds of interactions) within the design phase of projects. Communication took place but ontological uncertainty persisted for long enough to cause significant disruption to the projects. The events of case 13 illustrate well the resistance of ontological uncertainty to communication. In that case, the Japanese contractor signed a contract that clearly stated who would be liable for what in which circumstances. Nonetheless, the Japanese contractor proceeded on the basis of past experience rather than on current communication. Similarly, in case 11, the US contractor working in Canada proceeded on the basis of past experience rather than on current communication. Semantic uncertainty involves different participants to the same interactions giving different meanings to the same term, phrase and/or concepts. The events of cases 2 and 3 illustrate well how behaviour, such as tones of voice and nodding of heads can contribute to semantic uncertainty. It can be argued that ontological uncertainty and/or semantic uncertainty underlay all of the misunderstandings in the twenty-three cases.

Figure 12 illustrates that ontological uncertainty may be more closely related to conceptual vagueness and conceptual ambiguity than to linguistic vagueness and linguistic ambiguity. Further, ontological uncertainty may be more prevalent in mission critical interactions than in routine interactions. Most importantly, Figure 12 illustrates that ontological uncertainty may have more potential to cause project failure than semantic uncertainty. For example, it could be argued that cases 2 and 3 involved routine interactions, semantic uncertainty, and project inefficiency. By contrast, cases 21 and 23 involved mission critical interactions, ontological uncertainty, and project failure. Figure 12 also illustrates that presentational vagueness and/or presentational ambiguity may contribute to both ontological uncertainty and semantic uncertainty, and be an important factor in both mission-critical interactions and routine interactions. In case 1, for example, presentation was an important factor in routine reporting. In case 6, presentation was an important factor in mission-critical interactions with local chieftains.

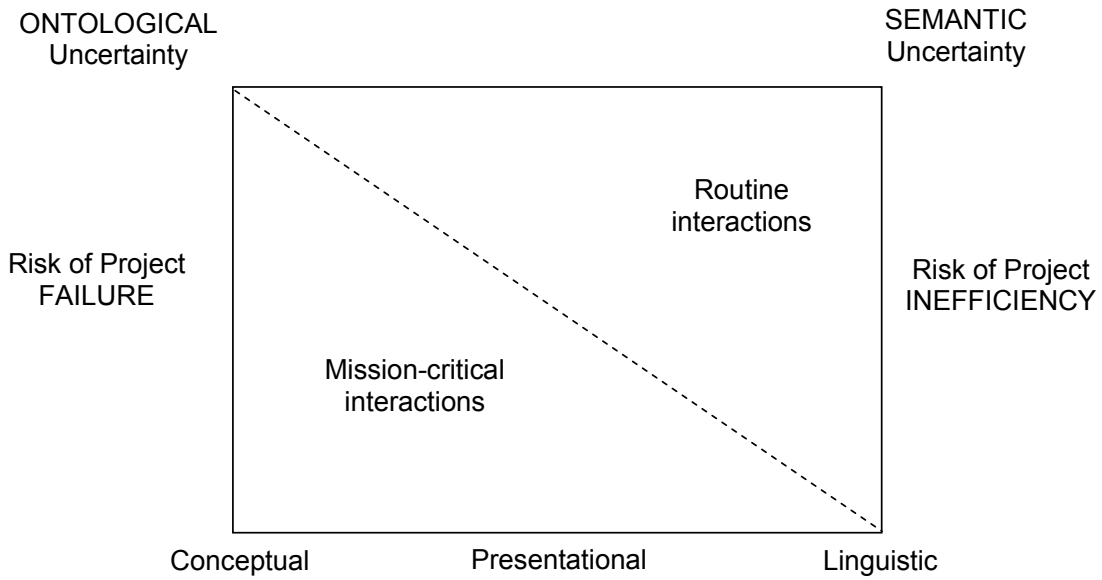
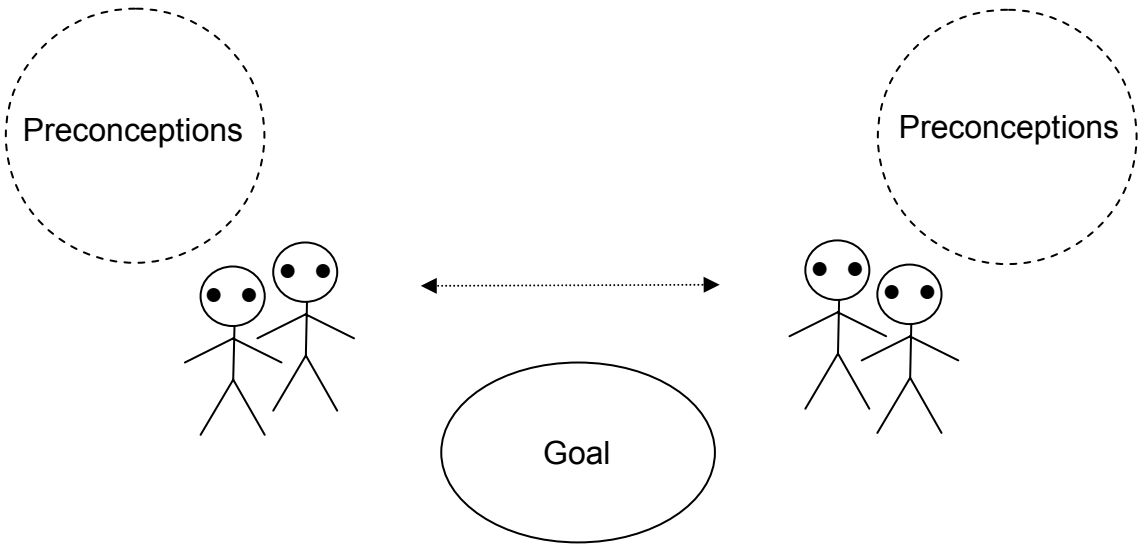
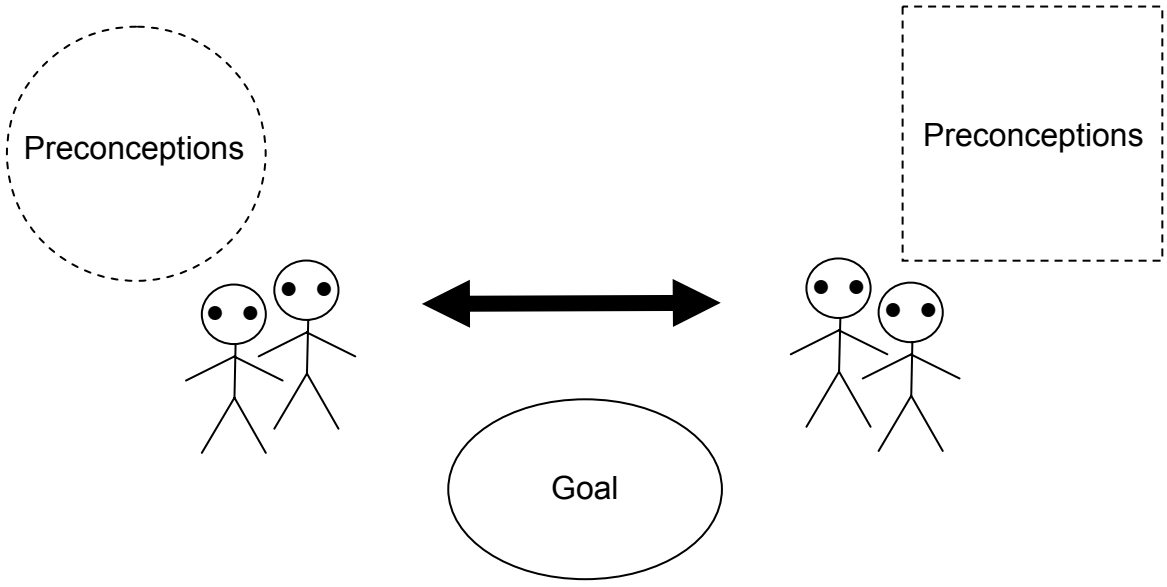


Figure 12. Risks associated with ontological uncertainty and semantic uncertainty.

In summary, it can be argued that people's ontology and semantics can contribute to people's preconceptions about what should and/or will happen in particular situations. Moreover, these preconceptions about situations can provide the basis for assumptions about actions to be taken in those situations. Preconceptions have been described as ideas formed in advance before one can possibly know or form a reliable opinion (Singer, 1998). Preconceptions, and the ontology and semantics related to them, can be very difficult to predict because they can be derived from a mixture of gender, personality type, culture, first language, work experiences, and/or social concerns that are unique to one person at one time in one place. In case 12, for example, the US company's personnel had had learning experiences at work in the USA that they over generalized to Spain. In particular, they had learnt that they could use a particular contract clause to impose responsibility for extra costs onto another party. Similarly, in case 14 the US superintendent had learnt in other places and at other times that only steel toed safety boots were safe for scaffolders. The style of interactions between the parties in these cases may have been influenced by for example personality type and culture, but their preconceptions about the content of interactions was formed by past project experiences. Figure 13 illustrates that methodological information and communication design are necessary when parties' preconceptions and project goals are not compatible. This is because vagueness and ambiguity will not be eliminated, or at least greatly reduced, without methodological design. Methodological information and communication design could involve the use of the templates (based on section two of this working paper) shown on the following pages.



Methodological information and communication design are NOT required when preconceptions and goal are compatible



Methodological information and communication design are required when preconceptions and goal are NOT compatible

Figure 13. Need for methodological information and communication design.

Minimizing ontological uncertainty and semantic uncertainty			
Project:		Author:	Date:
Preparation (Y/N)		Reporting (Y/N)	
Focus	Record of actions taken to identify / eliminate vagueness / ambiguity		Y?
Ca	Identified by	reference to papers / articles	
		discussions with authors of papers / articles	
	Eliminated by	definition of similarities and differences	
		specific examples relevant to participants' experience	
Cf	Identified by	reference to literature	
		discussions with relevant scholars	
	Eliminated by	definition of links between language families	
		provide specific examples	
Cm	Identified by	initial cross referencing using specialist dictionaries	
		discussions with bilinguals	
	Eliminated by	use of alternative words / phrases that are more descriptive	
		provide specific examples	
Co	Identified by	initial cross referencing to specialist dictionaries	
		relating word meanings specific to geographical areas	
	Eliminated by	following advice of native speakers with expert knowledge	
		not using words with different meanings in different places	
Ll	Identified by	discussions with native speakers with expert knowledge	
		checking for homonym, heteronyms, Capitonyms	
	Eliminated by	not using colloquialisms	
		not using homonyms, heteronyms, Capitonyms	
Lp	Identified by	discussions with native speakers with expert knowledge	
		checking for homophones, Capitonyms	
	Eliminated by	not using words which could be blurred together in speech	
		not using of homophones, Capitonyms	
Lp is only relevant to spoken communications			
Lsy	Identified by	discussions with language scholars	
		discussions with native speakers with expert knowledge	
	Eliminated by	not having complicated sentences	
		use of Plain Language	
Lse	Identified by	checking for idiomatic phrases, sociolects	
		checking for different attitudes towards the same words	
	Eliminated by	cutting idiomatic phrases, sociolects	
		use of balanced piloting sample	

Figure 14. One page of preliminary template.

Minimizing ontological uncertainty and semantic uncertainty			
Project:		Author:	Date:
Preparation (Y/N)		Reporting (Y/N)	
Focus	Record of actions taken to identify / eliminate vagueness / ambiguity		Y?
Pc	Identified by	reference to studies concerning function and composition	
		reference to studies considering colour and symbol choices	
		reference to studies considering sound preferences	
		reference to studies considering presentation schema	
	Eliminated by	aligning composition with function	
		not using a colour or symbol unless it is useful and positive	
		not using a sound unless it is useful and positive for all	
		not using a schema unless it is useful and positive for all	
Ps	Identified by	consideration of potential goal conflicts among parties	
		consideration of potential hetrophily among parties	
		consideration of parties perceptions of appropriate roles	
		consideration of perceptions of social context issues	
	Eliminated by	involving parties with congruent goals	
		involving parties who are congruent in key attributes	
		not allocating roles that can be perceived as inappropriate	
		harmonizing social context and communication intent	
Pb	Identified by	considering physical appearance, chronemics, and artifacts	
		considering kinesics, vocalics, haptics and proxemics	
		considering parties' expectations based on their cultures	
		considering parties' expectations due to their relationships	
	Eliminated by	removing intrinsic ambiguities before communication	
		preventing intrinsic ambiguities during communication	
		no extrinsic ambiguities based on cultural expectations	
		no extrinsic ambiguities based on relationship expectations	
Pm	Identified by	defining task requirements and social concerns	
		reference to studies considering cultures and media	
		reference to studies considering gender and media	
		reference to studies considering personality traits and media	
	Eliminated by	aligning task requirements and social concerns	
		aligning parties' cultures and media	
		aligning parties' genders and media	
		aligning parties' personality traits and media	

Figure 15. Another page of preliminary template.

As stated above, ontological uncertainty involves different parties in the same interactions having different conceptualizations about what kinds of entities inhabit their world; what kinds of interactions these entities have; how the entities and their interaction modes change as a result of these interactions. Semantic uncertainty involves different participants to the same interactions giving different meanings to the same term, phrase and/or concepts. Exactly how ontological uncertainty and semantic uncertainty relate to each other in any particular case is very difficult to determine. However, it could be argued that ontological uncertainty is often at the root of semantic uncertainty. In case 18, for example, the US and Korean participants gave different meaning to the term, basic. These different meanings were based on their different ontology. Determining how ontological uncertainty and semantic uncertainty relate to truth uncertainty may be even more difficult to determine. In truth uncertainty, actors are uncertain about whether well-defined propositions are true or not. It has been argued that truth uncertainty for well-defined propositions can be measured in the probability scale (Savage, 1954), but that ontological uncertainty and semantic uncertainty are not probabilizable (Lane and Maxfield, 2004). This limitation to the use of probabilities seems reasonable, given that ontologicial uncertainty and semantic uncertainty can make it very difficult to define propositions and agree their meaning.

Figure 16 provides a tentative representation of how these three types of uncertainty may relate to each other. The axes of this figure are defined using the established terms, aleatory and epistemic (Hora, 1996). The term, epistemic, relates to knowledge and the degree of its validation. The term, aleatory, relates to inherent variation and its irreducibility. Three gradations are shown along the epistemic axis: known and agreed by all; known but not agreed; and known to none. Three gradations are shown along the aleatory axis: always predictable; predictable in some circumstances; never predictable. This figure shows that ontological uncertainty is at the root of semantic uncertainty, and that ontological uncertainty is likely to exist where there is lack of prior agreement among parties. Moreover, ontological uncertainty is likely to exist when phenomena are inherently unpredictable. By contrast, truth uncertainty is likely to exist where phenomena are predictable in at least some circumstances and there is at least some agreement as to what phenomena are. It is not the purpose of Figure 16 to indicate where truth uncertainty, semantic uncertainty, and ontological uncertainty begin and end. Nor is it the purpose of Figure 16 to suggest that the inter-relationships between these types of uncertainty are fixed and static. Indeed, the inter-relationships between these types of uncertainty are likely to be highly dynamic.

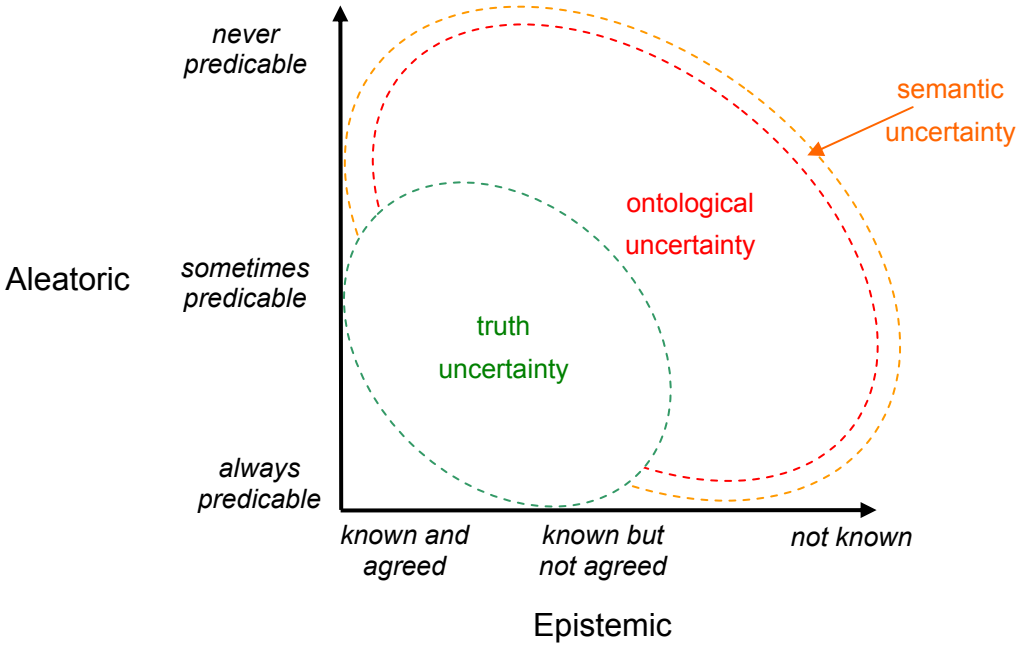


Figure 16. Interrelationships between different types of uncertainty.

5. Conclusions

The principal findings are listed below. Subsequently, possible directions for future research are discussed.

5.1 Principal Findings

- Management of uncertainty is argued to be a central feature of effective project management in the literature. The network is a prevalent organizational form in large global projects. However, differences between network organizations and other types of organizational forms are not highlighted in IPMA's Competence Baseline Version 3.0 (2006) or PMI's A Guide to the Project Management Body of Knowledge 3rd Edition (2004). One of the reasons that these differences are important is because they could affect the emergence and distribution of ontological uncertainty and semantic uncertainty.

- It is through communication that human beings express ontology and semantics. However, if communication involves vagueness and ambiguity, similarities and differences can be uncertain despite extensive communication. This is because vagueness and ambiguity in communication can camouflage ontological uncertainties and/or semantic uncertainties.

- The importance of communication to the success of projects has been recognized for some years in the literature. Further, the International Project Management Association (IMPA) and the Project Management Institute (PMI) stress the importance of communication to the success of projects, programmes and portfolios. Nonetheless, extant project management literature does not include comprehensive and detailed consideration of vagueness and ambiguity in communication. Moreover, there is little consideration of research investigating the characteristics of network organization communication.

- Within extant project management literature, language and culture are identified as being potential sources of communication challenges that can have a negative affect on project outcomes. Moreover, some consideration is given to the various components of language and culture. Terms such as communication barriers and communication problems are used. The terms communication vagueness and communication ambiguity are not used. A communication can be called, ambiguous, if it can be interpreted in more than one way. For example, when the word, two, is spoken it could be interpreted to be the word, too. By contrast, vagueness arises when the boundaries of meaning are indistinct.

- Vagueness and ambiguity in communications can be said to arise from conceptual, presentational, and/or linguistic factors. Conceptual factors can act across all languages; across language families; across more than one language; or across one language. Presentational ambiguity and vagueness can be due to factors relating to composition, situation, behavior, or media. Linguistic ambiguity and vagueness can be due factors to that are lexical, syntactic, semantic, or phonological.

- Findings from case analyses suggest that conceptual vagueness may be quite prevalent in global network organizations, and that eliminating conceptual vagueness may be particularly important to the success of communications. Further, the same findings suggest that presentational factors may be more important to eliminate than linguistic factors. Apropos, there is research by others which also suggests that linguistics factors may be a source of some communication frustration but not necessarily a source of major problems during projects.

- Findings from analysis of twenty-three cases also indicate that conceptual vagueness and conceptual ambiguity are more likely to occur during phases other than implementation. Moreover, analysis findings suggest that cases of vagueness and ambiguity which occur in phases other than implementation are more likely to have a longer duration than cases that occur during implementation.

- Within extant project management literature, there is little consideration of models of communication that focus upon how shared meaning is created. Moreover, there is little consideration of research investigating the characteristics of network organization communication. Such research has identified that interorganizational relationships are highly communication intensive and that global network organizations depend upon sophisticated communication linkages. This is in contrast to traditional organizational forms that were developed to minimize and simplify communication needs.

- Findings from analysis of twenty-three cases suggest that communication in global network organizations that lead to unintended consequences may involve relatively few parties. This finding offers support for existing arguments that there are strong constraints on communication in networks. Three types of network communication factors were most notable among the cases: roles, linkages and co-ordination. In particular, the roles of gatekeeper and liaison were important, either by their presence or their absence.

- Findings from analysis of twenty-three cases suggest that there is some potential for complexity within global network organization communications. In particular, people who are not communicated with can take unforeseen actions. Further, these unforeseen actions might not have been taken if they had been communicated with at the outset. Apropos, there is research by others which suggests that non-recipients

can have an important influence on event that are discussed in communications that they are not included in.

- The reliability of communications will be compromised if the same communication is understood differently by different recipients. Of the twenty-three cases of communication analysed, only four clearly involved multiple parties. Accordingly, the affects of ambiguity and vagueness on reliability can only be considered with regard to these four cases. In Cases 1, reliability was comprised. By contrast, in Cases 5, 7 and 23 there is no clear indication that reliability was compromised. Nonetheless, these are three of the four cases within which complexity was manifested.

- The validity of communications will be compromised if communications do not address the issues that they are intended to address. Of the twenty-three cases of communication analysed, validity was not compromised in any of the four cases of presentational ambiguity due communication situation. Also, validity was not compromised in four out the five cases of conceptual ambiguity. By contrast, validity was compromised in all three cases of presentational ambiguity due to communication behavior. Moreover, validity was compromised in ten out of the eleven cases of conceptual vagueness.

- Unintended consequences arose from validity being compromised in fourteen out of the twenty-three cases analyzed. Yet, unintended consequences were also experienced in the other nine cases. Consideration of this finding supports that proposition that costly unintended consequences can follow when the validity of communications are compromised. However, communication of conflicting goals among stakeholders, and failure to communicate with all stakeholders, can be equally important as sources of costly unintended consequences.

- Consideration of analysis findings suggests that the preliminary model show in Figures 1 to 4 is in need of much further development. In particular, non-recipients could be included. Further, the goals that are served by communications could be included in addition to the intent of communication. Furthermore, the potential for previous communications to become invalid, and for existing standard communications to be overlooked, should be considered. Moreover, the failure to communicate should be considered. It is important to note that these factors are not adequately addressed even within existing theories that focus upon how shared meaning is created.

- It can be argued that ontological uncertainty and/or semantic uncertainty underlay all of the misunderstandings in the twenty-three cases. Further, consideration of the findings from the analysis of twenty-three cases suggests that when communication

involves vagueness and ambiguity, similarities and differences between ontology and semantics can remain uncertain despite extensive communication.

- Ontological uncertainty may be more closely related to conceptual vagueness and conceptual ambiguity than to linguistic vagueness and linguistic ambiguity. Further, ontological uncertainty may be more prevalent in mission critical interactions than in routine interactions. Furthermore, ontological uncertainty may have more potential to cause project failure than semantic uncertainty does. Presentational vagueness and/or presentational ambiguity may contribute to both ontological uncertainty and semantic uncertainty, and be an important factor in both mission-critical interactions and routine interactions.

- People's ontology and semantics can contribute to people's preconceptions about what should and/or will happen in particular situations. Moreover, these preconceptions about situations can provide the basis for assumptions about actions to be taken in those situations. Preconceptions, and the ontology and semantics related to them, can be very difficult to predict because they can be derived from a mixture of gender, personality type, culture, first language, work experiences, and/or social concerns that are unique to one person at one time in one place. Methodological information and communication design are necessary when parties' preconceptions and project goals are not compatible. This is because vagueness and ambiguity will not be eliminated, or at least greatly reduced, without methodological design.

- It can be argued that ontological uncertainty is often at the root of semantic uncertainty. Determining how ontological uncertainty and semantic uncertainty relate to truth uncertainty is difficult to determine. In truth uncertainty, actors are uncertain about whether well-defined propositions are true or not. It has been argued that truth uncertainty for well-defined propositions can be measured in the probability scale but that ontological uncertainty and semantic uncertainty are not probabilizable. It can be argued that ontological uncertainty is likely to exist where there is lack of prior agreement among parties. Moreover, ontological uncertainty is likely to exist when phenomena are inherently unpredictable. By contrast, truth uncertainty is likely to exist where phenomena are predictable in at least some circumstances and there is at least some agreement as to what phenomena are. Inter-relationships between these three types of uncertainty are likely to be highly dynamic.

5.2 Future Research

Determining the scope of, and interrelationships between, truth uncertainty, semantic uncertainty, and ontological uncertainty would be a profound research challenge that might yield few practical benefits. Not least, because people's ontology and semantics are inherently complex and difficult to define. Nonetheless, establishing the limitations of truth uncertainty in relation to these other two types of uncertainty might prevent the over extension of probabilistic methods.

The preliminary model shown in Figures 1 to 4 needs to be expanded to include non-recipients, goals and non-communication. The limitations of the preliminary model are not adequately addressed by extant theories that focus upon how shared meaning is created (e.g. Barwise, et al. 1991; Clark, 1996; Grice, 1981). Interestingly, the context of communication (e.g. physical location) seemed to do little to facilitate the creation of meaning in the cases analysed in this study. Nonetheless, the context of communication (e.g. physical location) may be an important factor when seeking to model non-recipients, goals and non-communication. Accordingly, context should be considered in development of the preliminary model.

Considerable further research would be required to further clarify the distribution and relative durations of vagueness and ambiguity in communications arising from conceptual, presentational, or linguistic factors. Such research would be necessary to determine the relative importance of factors, and the amount of effort that should be devoted to their elimination.

Findings from this research suggest that methods to eliminate, or at least minimize, conceptual vagueness as soon as possible in projects may be a priority for future development work. The preliminary template presented at the end of section 2 provide only a starting point and other potential methods should be investigated.

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