

# Communication Integration in Virtual Construction

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## INTRODUCTION

In recent times the use of the virtual and allied concepts in the delivery of tasks in the construction industry has received attention in literature (Barima, 2003). However it appears there is the lack of integrated models to support the study and practice of communication in the physical world (the place) and the virtual realms (the space) in the construction industry. This chapter seeks to evolve frameworks which integrate communication paths in the traditional construction place with that of the construction space. This approach may provide an integrated perspective to support the study and practice of communication in the place and space in the construction industry. First, a review of traditional communication theories is done, and then integrated models of the construction place and space are presented, before an integrated matrix of potential communication paths across likely construction work scenarios is given. The suggestions for future studies and the conclusions to this chapter are preceded by a map of the potential communication conflicts (or agreements) in both realms (i.e., physical and virtual).

## BACKGROUND

### Communication Theories

The study and practice of communication is not a new science. It has been claimed that the formal origin of this science may be traced to an essay in the year 3000 BC (Bryant, 2004). In this essay advice was given to the son of an Egyptian king on how to communicate effectively (Bryant, 2004). Other notable historical contributors to the communication theory are Aristotle, who advanced the works of Heraclitus, and Socrates and Plato in rhetoric theory (Bryant, 2004).

Communication theory has evolved over the years since the days of Aristotle, and seven traditional communication typologies are now established in communications studies. The seven traditions are: (1) the semiotic, (2) sociopsychological, (3) cybernetic, (4) phenomenological, (5) sociocultural, (6) rhetorical, and (7) critical traditions (Craig, 1999; Griffin, 2003). There has been suggestions to add areas like ethical, economic, aesthetic, and so on to the seven communication traditions, however there seems to be a consensus that the

seven traditions have the capacity to explain (to a greater extent) the research and practice of communication (Griffin, 2003). The seven traditions of communication theory may be summarized as follows (Craig, 1999; Griffin, 2003):

- Semiotic involves the study of signs. According to the semiotic tradition, meaning does not reside in words or other symbols, but it resides in people. Words, for example, are perceived to be arbitrary symbols with no latent meaning.
- In the sociopsychological tradition communication is seen from the perspective of interpersonal influence. Studies focus on the cause-and-effect factors in relationships, so as to understand which communication behavior will succeed.
- Cybernetic tradition perceives communication as the link which binds the components of a system together, and also as a means for processing information.
- The phenomenological tradition emphasizes (among others) the personal experience of communication and that of others via discourse.
- The sociocultural perspective of communication is very helpful in understanding the gaps in culture which may exist among parties. This tradition perceives communication to involve the creation and realization of social reality, and culture is created and recreated when people talk.
- The rhetorical tradition concerns (among others) the art of public speaking or practical art of discourse.
- The critical theorists are against the use of language to attain imbalances in power; the blind acceptance of scientific methods and empirical findings without criticisms. They theorize communication via discursive reflection.

In relating the summary of the seven communication traditions to the theme of this chapter, communication may be seen as the information processing glue which may connect actors in a construction project together. This process may involve emphasizing: the communication experience of construction actors; interpersonal influences; and the effective communication of meaning which resides in the actors and their effect on successful communication. Communication may also be put under the lens of critical thinking/analysis to advance any desired communication

objectives in a construction project. In a construction project the objectives may include effective results delivery across both the construction space and place. Another important communication aspect may concern ethical issues in the virtual construction project. Ethical issues may require critical attention in the communication processes in both the space and place. With the track of traditional communication studies and practice reviewed, the next section discusses recent developments in communication and the virtual construction project environment.

## **Communication and Virtual Construction Projects**

Communication in the construction industry has been directly or indirectly studied by a number of scholars (Jaggar, Ross, Love, & Smith, 2001). Over the years most of the studies have focused on traditional communication systems which use media like face-to-face collocation (see e.g., Jaggar et al., 2001). However, recent revolutionary developments in the information and communication technology (ICT) sector have provided significant transformations in the manner in which construction project actors are able to communicate and share information. Concepts like virtual construction where construction actors may rely on ICT to function irrespective of time and space to deliver common goals have emerged (Barima, 2003). The two major means used to support communication in virtual construction environments are either via fixed or mobile ICT terminals. For example, fixed computer terminals may be used to access virtual construction project environments like project Web sites via the Internet (Andresen, Christensen, & Howard, 2003). Another access to the virtual construction environment may be via mobile ICT tools. Certain earlier studies on the virtual concept used or implied the use of fixed ICT terminals to access the virtual environment (Caneparo, 2001; Clayton, Warden, & Parker, 2002). This review will emphasize on the most recent trends in this field of communication, and this appears to be on the use of mobile computing in the construction industry. The next paragraph discusses the use of mobile computing in the construction industry.

In recent times scholars have given recognition to the important use of mobile and allied facilities to support the exchange of information in the construction industry (Johanson & Törlind, 2004; Kuladinithi, Timm-Giel, & Görg, 2004; Olofsson & Emborg, 2004; Rebolj & Menzel, 2004; Ward, Thorpe, Price, & Wren, 2004). Various proposals for the empirical use of mobile computing have been made to assist in fieldwork, partner integration, supervision, scheduling, and less formal specifications (Olofsson & Emborg, 2004; Rebolj & Menzel, 2004). Also the utility in the use of portable computing tools like mobile phones to access databases, CAD drawings, and hold video conferences among parties (either on construction sites or via remote means) without

being burdened by any extra hardware have been reported (Kuladinithi et al., 2004). At the construction site level, the use of mobile devices to capture and store data for easy and timely access to the flow of information and also manage projects for cost reduction and performance improvement have also been examined (Ward et al., 2004). Despite their noted limitations like communications costs, bandwidth and coverage, and so forth (Johanson & Törlind, 2004; Kuladinithi et al., 2004), mobile computing also appears to hold promise for the future of communication in the construction industry just like the use of fixed terminals/tools.

## **The Need for Integration**

Certain scholars have directly or indirectly noted the potential benefits of the virtual construction concept in task delivery (Barima, 2003; Savioja et al., 2003; Sulankivi, 2004). For example, the use of the virtual concept to support construction works delivery among dispersed parties may potentially provide cost and time savings (Barima, 2003). However, it is also essential to remember that the nature of construction work makes traditional communication media like rich physical face-to-face interaction very important. The two scenarios therefore necessitate the integration of communication processes in both the physical and virtual realms in the construction industry. This will remind, structure, and focus communication studies and practice within the construction industry. In reality the two may support each other, and the strengths of one may be leveraged to support the weaknesses of the other. Further, the rich lessons learned from the traditional systems (in particular) could also aid communication in the construction place and space. The next sections introduce models for the structured integration of the two worlds.

## **MODEL PRESENTATION**

### **Construction Space and the Construction Place**

Rayport and Sviokla (1999) have identified and classified two worlds where business communications may occur as the market place and market space. In a similar analogy construction activities (or value delivery mechanisms) may also occur within the construction place and construction space. Figure 1 demonstrates the two realms of operation. Each of the two realms (construction space and construction place) have two dimensions which may be characterized as mobile and fixed: locations or spaces (see Figure 1). The construction place may refer to the traditional physical places/sites where physical construction activities/delivery may occur, while the fixed and mobile construction space refer to the

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