Change Management for using a Project Website in Design Team Communication

CHANGE MANAGEMENT FOR USING A PROJECT WEBSITE IN DESIGN TEAM COMMUNICATION

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Abstract
A Project Website (PWS) has been advocated as an important tool for design teams of construction projects, because the tool is supposed to greatly enhance team communication. This, finally, should result in improved team performance in terms of increase of efficiency and effectiveness. PWS vendors claim these results on expected better communication of teams who share and update their design information using a PWS together. The growing use of IT tools by design team members who electronically generate, collect and update design information increases the need for such an IT tool that allow fast and easy access and overview of the status of the latest changed and generated design information of the whole team. Also due to the growing complexity of building projects, the number of design partners and the number of electronic means for communication, the need for better collective communication is more important then it has ever been before. However, due to the expanding complexity and changes in design information, the redundancy of design information is growing too and the risk to failures. Team members need new skills for collective use of a PWS. The use of the tool might need radical changes in information flows to become effective. It might be experienced also that use of a PWS formalizes team communication too much, or might be threatening because of 'big brother effects'. Within this view the change to collective use of a PWS by a design team is not an automatic change to an effective communication environment as vendors like us to believe and many pitfalls can be encountered. In this paper the most important aspects of change to collective use of a project website for team communication will be discussed, based on the results of a Dutch PhD research project.

Keywords: Change promoters, project website, rivalry of tools, second-order change, technological frames.

Communication aspects
To communicate collectively it is important that all members of a group are involved actively in the group's communication. According to Ruler (1996) three concepts of communication can be identified: inter-active, effective and active. These communication concepts are mainly based on differences in communication processes regarding feedback (expected by the sender) of a receiver or group receivers. Feedback is a type of message that the receiver transmits to the sender in response to having received a message (Wiener, 1948). Shannon and Weaver's communication theory (1949) is the basis for this approach. Ruler's interactive concept is defined as a back and forth process between sender and receiver(s) with changing roles. In this process, feedback is essential for communication (for example: in a dialogue, telephone conversation or group meetings).

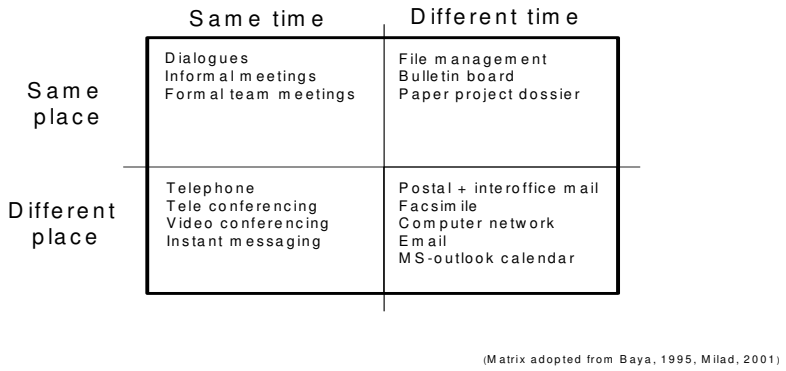

Figure 1: Time/space matrixes of commonly available communication means for design teams

The effective concept is defined as a one-way process with an active sender and passive receiver(s) with a predictable re-action. In this process, feedback is possible but not expected (for example: postal mail, facsimile). The active concept is defined as an active one-way process of a sender, for broadcasting or publishing of information to receivers. In this process, the same channel of communication usually cannot give feedback (for example: the Queen's Christmas message on television). A sender might use a specific communication means to send a message to receiver(s) depending on the sender's need for feedback, the available means and his preference for use of a specific means synchronous or asynchronous. Synchronous communication can be defined as the communication between senders and receivers at the same time, whether or not it is in the same place (Robbins, 2001) while asynchronous communication between senders and receivers takes place at different times and mostly at different places. Figure 1 gives an overview of commonly available means for synchronous and asynchronous communication, structured by their time and place relation.

COMMUNICATION IN ARCHITECTURAL DESIGN TEAMS

Architectural design teams can been defined as temporary, multi-disciplinary and network based organizations of collaborating specialist designers. Design team members usually are designers with a management task and can be characterized as creative, visionary, spatially aware and abstract thinking practitioners with a high level of technical knowledge and experience (Schön, 1987). In today's architectural design teams, a growing number of specialist designers are required to execute equivocal and uncertain tasks in accomplishing the necessary performance of the design (Loon, 1998). The key information carriers of designers mostly are sketches, schemes, images, drawings and written descriptions together with explanatory stories. Knowledge about the design exists on a cognitive level of team members, on the level of collaborating design team partners and on the design team's external level via the client, users and other stakeholders. Team members generate new knowledge by collecting, sharing and transforming information about the design to be produced. Communication is necessary to facilitate these processes. To distribute generated design knowledge among team members for the progress of design they communicate both synchronously and asynchronously using the available means of communication (e.g., Davenport, 1997; Donker, 1999).

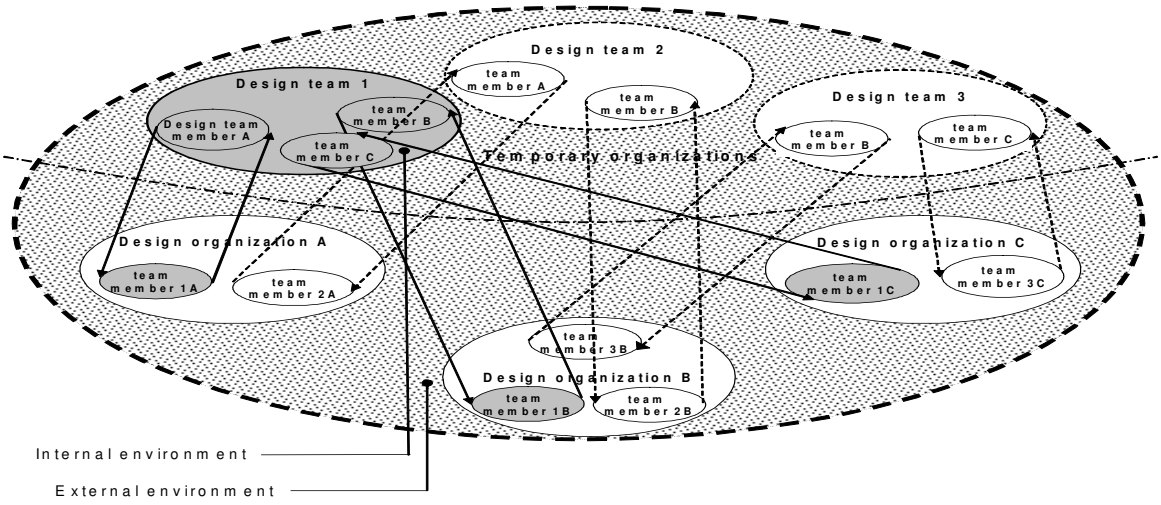

Figure 2: The information environment of design teams

They need to process their own specialist data before useful information can be delivered to others. Not all designers participate in the same way at the same time. There are many who participate as individuals, working alone for crucial periods and then returning to the network process (Latour, 1987). Moreover, design team members greatly depend on the most current design information to work out their own design tasks (Kvan, 1997; Wiegeraad, 1999). Specifically in design teams that are organized for integral design, asynchronous communication is of great importance because of the designer's dependency on each other's generated and updated design information. Thus team communication of an architectural design team might be defined as the compilation of all processes for sending and receiving messages between team members individually and collectively using the various, available means of communication (Sproull, 1991). The design to be made is mainly both visualized and discussed by team members. For this reason, the design process of architectural design can usually be characterized as a continuous process of change that has to be well documented and updated because typically many stakeholders are involved. In the team's external environment, communication with their client, users and other stakeholders takes place. In Table 1 an overview is shown of attributes of the available means of communication and a PWS. The specific attributes of a PWS concerning overview, status and version, are marked. Based on Ruler's concepts of communication the use of PWS might be classified to four different communication modes (Figure 3).

Means of communication	Fast	Ease of use	Feed-back	Struc-tured	Over-view	Infor-mal	Formal	Contract docs	Info owner	Info updater	Status	Ver-sion
Postal mail	-	-	-	-	-	-	xx	xx	x	-	xx	-
Facsimile	-	x	x	-	-	-	xx	x	xx	-	xx	-
Project dossier	-	-	-	x	-	-	xx	xx	x	-	-	-
Email message	xx	xx	xx	-	-	xx	xx	-	xx	xx	-	-
Email attachment	xx	x	-	-	-	xx	xx	-	x	-	-	-
Outlook calendar	xx	x	x	xx	-	-	xx	-	xx	xx	-	-
Computer network	xx	xx	-	x	-	-	x	-	-	-	-	-
Project Website	xx	x	-	xx	xx	-	xx	x	xx	xx	xx	x

Table 1: Overview of attributes of means of a-synchronous communication

Interactive mode	Effective mode	Active mode	Re-use mode
Use of PWS In workflow of integral design, in every days work with a high frequency of generating and change of information	Use of PWS in workflow, in every days work or in integral design processes	Use of PWS for sharing of information between design partners, for publication of information to client and stakeholders.	Use of PWS as information archive with final information for re-use of design information in other design projects
Storage and updating per hour or less	Storage and updating per day or per 1/2 day	Storage and updating when files are printed for publication to client / stakeholders	Storage of information when the design phase is finished

Figure 3: PWS modes of communication

The inter-active mode of communication is defined if files are stored, updated and read in less than four hours or half a day; the effective mode of communication is defined for storage, updating and readings once per day; the active communication mode is defined when storage and updating are less than daily and might be related for instance to team meetings or printing activities for sending information by postal mail; the re-use communication mode is defined as the digital library in which all finalized files of a project are stored. A substantial contribution of PWS-use for team communication might not be expected in active and re-use mode because of the low frequency of updating. Feedback of readers of PWS-information is expected to increase more if a PWS is used in effective and inter-active mode because of the higher frequency of generating and updating.

Research findings

In this section the results of a Dutch research project (Otter, 2005) are discussed concerning design team communication and performance using a PWS. The adoption and use of a PWS was investigated first, by means of a multiple case studies in a large design organization, regionally organized in units in which design teams used a PWS. By comparing the team communication of two teams in each unit that executed comparable projects in size and complexity, differences in PWS-use were extracted. One of the teams, the experimental one received extensive training for use of the package while the control team only got user instructions and a manual for PWS-use. Team communication concerns flows of information between members of a group through specific channels by using the available means of communication. Team communication is not restricted to transfer of information, but concerns all activities of information handling needed for the exchange and storing of information through specific channels to members of a group, individually and collectively. Discrimination between synchronous and asynchronous communication is necessary because of substantial differences in synchronous information flows using voice, ears and brains for generating, transmitting and storing information compared to asynchronous flows by a) paper using postal mail channels and paper dossiers for storage and b) electronically using electronic means for storage. According to our conceptual framework, the mixed use of these means of communication is required to improve team communication. Team communication was investigated by measuring the frequency of using available different means of communication and the information handling activities for collecting, storing, reading, and maintaining information. Moreover, team communication and preferences for using specific means of communication were identified by asking questions about use, information handling and preferences for using particular means of communication.

	Design firms	Design & construction firms
Communication mode	Active mode	Effective mode
Change management	First-order	Second-order
Management approach	Top-down	Bottom-up
Re-design of workflow	No	Yes
Re-design of information flow	No	Yes
Rivalry between PWS and computer network	Yes	Yes
Change agents	No / Re-active	Pro-active
Change implementers	No	Yes
User training	User instructions	Team training
User platform	Some	Yes

Table 2: Overview of findings of change management aspects for effective PWS-use

Finally, effectiveness of the use of a PWS for team communication was operationalized by measuring changes in the frequency of using means of communication, caused by PWS-use as a new means for team communication. The results of the multiple research project show that the PWS was not used collectively in the effective communication mode and rivalry between PWS-use and parts of the computer network was detected while now effects on team communication and small effects on team performance were observed. The outcomes also suggest that team training and a bottom-up management approach actively involving users in the change, better stimulate PW-adoption. However, if a user platform is organized for this purpose, and not managed by change agents, the focus on the change might move to the re-use mode instead of the effective communication mode. The PWS was implemented as a first-order instead of a second-order change (Levy, 1986) mostly by using a top-down approach of management. Ideally management style should show a bottom-up approach using pro-active change agents and stimulating more interaction with ultimate users.

Second, to derive more general findings, the outcomes of the multiple case studies were reflected to the experiences of a substantial number of design firms and design & construction firms, using the same and different PWS packages that were chosen by the vendors of PWS-packages. The results of these so-called mini-cases show that most design & construction firms use a PWS collectively in the effective mode of communication successfully that affects team performance (Table 2). The design firms use a PWS in the active mode of communication not showing substantial changes in team communication or performance. Rivalry between PWS-use and use of parts of network disks was reported in almost all firms, which might prove it to be an important cause for the non-adoption of PW-use. Design & construction firms appear to have better results with the adoption of a PWS, by planning the change as a second-order change, redesigning workflow processes to optimize PWS-use and avoiding rivalry of tools, testing PWS-users on their PWS-competences, pro-actively using change agents, and reporting a bottom-up approach by organizing user meetings to stimulate PWS-use.

PLANNED CHANGE

Concerning the planning of change using a PWS in team communication, Levy argued that discrimination between a so-called first-order and second-order change is important to identify the nature of the change. First-order changes concern changes that do not change the system's core. "First-order changes are linear and continuous.
It implies no fundamental shifts in the assumptions that organizational members hold about the world or how the organization can improve it's functioning".

Robbins (2002) argued. "Second-order change in contrast, is a multidimensional, multilevel, discontinuous, radical change involving reframing of assumptions about the organization and the world in which it operates". Clear goals, tasks and responsibilities need to be defined for change agents, in particular for the change implementer (Kanter, 1992) on workflow level to stimulate the collective PW-adoption by design team members. By using a bottom-up approach, using change implementers and involving users in the change, management need to involve non-adopters and laggards, which more specifically were identified in the multiple case studies as the architects and structural engineers. These designers showed to be less involved in the change compared to the other designers. In addition, where possible, change should be managed from a pull as opposed to a push setting. Rivalry between IT-tools combined with insufficient user insight into the use of the tool in their daily work and insufficient changes in workflow leave opportunities open for the development of incongruent technological frames between individuals and groups. Orlikowski (1994) states, "Where the technological frames of key groups in the organizations, such as managers, technologists, and users are significantly different, difficulties and conflict around the development, use, and change of technology may result". She uses the term technological frame to identify the assumptions, expectations and knowledge that members use to understand technology. This includes not only the nature and role of technology itself, but also the specific conditions, applications and consequences of that technology in particular contexts. To analyze and discuss whether such technological frames between groups in an organization are incongruent, she distinguished three aspects: nature of technology, technology strategy and technology in use.

MANAGED CHANGE

With respect to the management of the change process, Lewin (1951) states that change agents are needed to 'unfreeze' the organization. Similarly, Tichy (1986) argues that the organization needs to awake by mobilizing driving forces of change, promoting the benefits of change, trainings to get the required user skills and the benefits in daily work (Kanter, 1992), removing restraining forces to change and making the change operational in the organization. Because of the need of collective use in the same way, team training in using the PWS collectively on a daily base is necessary to show possibilities and how sharing of information is expected, what is expected of use of the system and how all team members have to change their existing information processes and working habits, needed to achieve the defined targets. In the multiple cases studies, the organizing of PWS-team workshops showed to be important to increase PWS-adoption and use. In the most successful design & construction firms using a PWS, prescribed use was tested and certificates were presented to successful users. It is also important to choose which tactics to use for change management: fast or slow change, changing a part of the organization or the organization in total, and focusing on change by individuals or by groups (Lawler, 1989). After execution of the change, 'refreezing' the organization is necessary to establish the new routines as part of the organizational routines.

To remove restraining forces to change and making the change to effective PWS use operational in the organization, a change leader is needed. Hauschild and Kirchmann (1998) did research to drivers for technological change in organizations that changed successfully, and introduced the Troika of innovation (Figure 4), in which the process promoter was introduced besides the power promotor and the technology promotor and the need for interaction between these promoters.

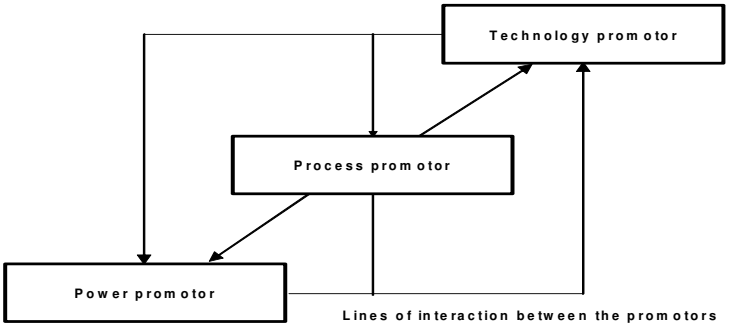

Figure 4: Troika of Promoters for successful innovation

The process promotor, they stated, is the champion of the innovation and is needed because the power and technology promotor are not able in their positions to discuss changes on the workflow level.

The Power promoter is needed for formulating the goals underlying the innovation, in this case the effective use of a PWS: what performance improvement is desired/expected by using a PWS and how can this be achieved? In terms of management of conflicts, this person needs to manage conflicts resulting from incompatible demands for resources and from incompatible power of positions. *The Process promoter* is needed for project- and interface management tasks regarding the innovation, networking, providing information about human and financial resources. His or hers main task is to solve and/or dismiss resistances in the team and between the team and the organization against the innovation. This person is 'the man at the helm of the innovation'. The process promoter manages change effectively by knowing the organization very well and connecting persons who are pro innovation (driving forces) as well as debates and negotiates with persons who have antagonistic motives (restraining forces). He indicates conflicts on the organizational-, department-, or personal level. The Process promoter tries to solve these conflicts himself or involves the power promoter to solve these. The promoter by organizational know-how and the champion of the innovation, which in case of a PWS might be identified as the transformational leader of PW-use (Tichy, 1986). *The Technology promoter* is the expert of the IT possibilities, databases, integration of systems and technological problems involved. This person, the IT system manager of an organization knows all about the use of PW and the best way to use PWS effectively. This person assesses existing solutions and generates new alternatives if problems occur to use the PWS for specific tasks. The technology promoter is necessary in the management of conflicts due to contradictory perceptions and information. Kirchmann (1994) showed some evidence that a Troika structure achieves better economic results than any other structure.

Lechler (1997) was able to confirm the assumption that the probability of the occurrence of a process promoter and his positive influence on a project's outcome increases with problem complexity. The process promoter should be well known in the organization on workflow as well as on management level, not being a team member because of the hierarchical position to the team leader. Both in the multiple case studies and in the mini-cases evidence for the functioning of the Troika was found.

The organizing of a user platform at the start of PWS-use shows to be important in a bottom-up approach getting users involved in the change and giving change agents and implementers the chance to discuss user problems that occur related to technical issues, adoption and daily use.

Business process re-design

The design & construction firms that changed successfully using a PWS collectively in the effective communication mode showed re-design of workflow and information processes to optimize the use. In the multiple case studies, only some information flows were changed during the change. However, by leaving the old manual processes open for use it was ambiguous for teams to change trusted work habits. Hammer (1993) argues that re-designing means much more reshaping of processes by differently organizing the work done. In planning second-order change, the radical re-design of existing information processes to effectively and efficiently use new tools should be a part of it. Re-designing should concern both the re-design of manual processes concerning tasks and responsibilities, and re-design of communication flows. By defining and implementing the new processes as part of second order planned change and by indicating how and for which purposes to use these efficiently, designers (specifically architects and framework designers) may easier discover the advantages of collective PW-use in their daily work. This may also help avoiding the development of incongruent technological frames. PWS by nature is a push system compared to Outlook Email because it has to be filled first by its users before it becomes of value for users.

CONCLUSIONS

If the results of the mini cases can be generalized to similar organizations, they suggest that the following conditions are probably to improve the acceptance of the new technology in general and PWS's in particular: (i) rivalry of tools should be avoided from the start; (ii) a team should have sufficient skills to use the technology as good as the rival tools; (iii) both workflow and information handling processes should be redesigned for efficient and effective PWS-use; and (iv) pro-active change and implementing agents are made responsible for the successful change of PWS-use to a pull-setting for users. The IT Productivity Paradox was also observed in design teams in architecture, construction and engineering using a PWS. It differs however in intensity as a function of how change management is implemented. Successful adoption and implementation of PWS and technology in general requires management of a second-order change process. In any case, the ultimate adoption and impact of new technology depends on the extent to which it is perceived as beneficial to design team members in integral design processes on a daily basis. In that sense it may be a more fundamental limit to the impact in professional architectural design teams. Because of the limited number of design teams observed in the research project only the starting of an answer can be given. Replication research is needed to provide full answers for improvement of collective communication in architectural design teams using a PWS.

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