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Implementation of Web-based Information Systems in Distributed Organizations

A Change Management Approach

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Abstract. This article presents results elicited from studies conducted in relation to implementing a web-based information system throughout a large distributed organization. We demonstrate the kind of expectations and conditions for change that management face in relation to open-ended, configurable, and context specific web-based information systems like Lotus QuickPlace. Our synthesis from the empirical findings is related to two recent models, the improvisational change management model suggested by Orlikowski and Hofman (1997), and Gallivan's (2001) model for organizational adoption and assimilation. In line with comparable approaches from the knowledge management area (Dixon 2000; Markus 2001), we relate to, refine, and operationalize the models from an overall organizational view by identifying and characterizing four different and general implementation contexts.

Key words: implementation, change management, generic open-ended configurable and context specific WIS, Lotus QuickPlace, distributed organization.

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1 Introduction

Information systems, organizational change, and change management have been researched intensively in relation to large, costly, and strategic management information systems. Change management approaches to large, strategic, and critical IT applications are traditionally characterized as thorough, long-term, and top-down planned initiatives known as strategic alignment or strategic information systems planning (Burnes 1992; Ciborra 1997; Earl 1993; Henderson and Venkatraman 1992; Lederer and Salmela 1996; Simonsen 1999; Venkatraman et al. 1993). In contrast, small, generic, open-ended and reconfigurable systems—as groupware products in general and the type of web-based information systems (WIS) presented in this article in specific—are seldom to be considered as strategic and critical IT applications. Nevertheless it has for a number of years been accepted that implementing such systems in an organization is far from a trivial task; that in many cases these systems are either hardly used or do not produce the intended effects; and that attention has to be given not only to the technical implementation but also to a range of organizational conditions (Grudin 1994; Orlikowski 1993; 1996; 2000). Change management with respect to such systems usually has to take a bottom up approach (Butcher and Atkinson 2000; Whiteley 1995), based on local improvisations and opportunities (Ciborra 1996; Orlikowski and Hofman 1997), since these systems’ “...unpredicted, open-ended, and context-specific nature make it difficult to predefine the exact changes to be realized and to predict their likely organizational impact” (Orlikowski and Hofman 1997, p. 12).

This article presents a longitudinal case study of change related to the implementation of a WIS that has spread rapidly throughout a distributed organization. We have studied the introduction and use of a generic product, Lotus QuickPlace™ in a large, distributed Scandinavian financial organization, here after referred to as “Summa,” throughout 18 months. Lotus QuickPlace, later renamed and marketed as a virtual workspace product by IBM under the brand: Team Workplace™, is a flexible technology that offers users a web-based shared virtual workspace called a QuickPlace, here after referred to as QP, with a folder structure, notification functions, support for custom document types, joint editing of documents, shared calendar, and support for simple workflows.

The case study draws on empirical findings where more than 100 QP comprising in total about 3000 active users and more than 20 Gigabyte of documents have accumulated in less than two years. Based on our analyses of the actual practice and use of Lotus QuickPlace, we have identified four typical

implementation contexts in which a QP is used, and elicited six overall characteristics that have influenced the implementation of Lotus QuickPlace. The characteristics describe potentials as well as obstacles for change related to WIS and the case demonstrates the kind of expectations and conditions for change that management face when implementing generic, flexible and open-ended technologies for communication and coordination in a distributed organization.

WIS technologies like Lotus QuickPlace is often used in distributed organizations to support communication and coordination. Managers direct resources and set up goals for the implementation of such technologies but it is difficult to foresee the effects of the implementation. Our case shows that the outcome is definitely more complex than the apparent intended goals for providing Lotus QuickPlace, and that ambitious goals might be very difficult to obtain. Generic, open-ended, configurable and, context specific WIS like Lotus QuickPlace mediate interactions among multiple distributed actors, who are not only users of the system (in the traditional sense) but also contribute to the system's evolving structure and content. Organizational models for implementing such technologies have only recently started to take form. The aim of this article is to *refine and operationalize existing models to change management with respect to the implementation of WIS like Lotus QuickPlace used to support communication and coordination in distributed organizations.*

We relate our empirical findings to two recent models, the improvisational change management model suggested by Orlikowski and Hofman (1997) and Gallivan's (2001) model for organizational adoption and assimilation of complex technological innovations. Our approach to refine and operationalize these change management strategies is to identify and characterize typical implementation contexts. We generalize our findings and specify managerial challenges and potential strategies for implementing generic, open-ended, and flexible technologies in large distributed organizations in relation to general implementation contexts. This is in line with similar approaches to change management strategies known from knowledge management: Markus (2001) elicits from a number of empirical sources four distinct and general knowledge reuse contexts and classifies them by seven characteristics; Dixon (2000) presents a similar typology with five general knowledge transfer contexts characterized in four ways. Both Markus and Dixon use this approach to refine and operationalize general models within knowledge management.

The article is structured as follows. In the next section we review the literature on implementation of information technology in large organizations from a change management perspective. Section 3 describes the research context from which we draw empirical findings and the research method. Section 4

contains a description of the implementation of Lotus QuickPlace in Summa and the four identified typical implementation contexts along with the six overall characteristics that have influenced change related to the implementation of Lotus QuickPlace. In section 5 we discuss our findings on the basis of the empirical study by relating our findings to Orlikowski and Hofman's improvisational model of change management (Orlikowski and Hofman 1997) and to Gallivan's model of organizational adoption processes (Gallivan 2001). Further, we discuss the challenges facing managers given the identified characteristics, and the expectations and immediate goals they might apply. We present a generalized change management approach concerning strategies to stimulate change related to each implementation context as a refinement/operationalization of Orlikowski and Hofman as well as Gallivan's model. Section 6 concludes the article.

2 Implementation and Change Management

Introducing IT in an organization has been researched under different labels such as diffusion, e.g., (Rogers 1995); infusion, e.g., (Masseti and Zmud 1996); adoption, e.g., (Davis 1989); assimilation, e.g., (Fichman 2000); and change management, e.g., (Kwon and Zmud 1987). Also CSCW researchers like Bullen and Bennett (1990), Grudin (1994), and Orlikowski (1993; 1996; 2000) have early identified technological as well as organizational and social factors influencing the implementation of technology to support communication and coordination in groups.

A large body of research is devoted to studying the diffusion and assimilation of technologies in organizations and in society in general. Fichman (2000) characterizes two strains of research in this field. The first is characterized as research identifying factors relevant for the rate, pattern, and extent of diffusion. Rogers (1995) has formulated one of the central theories, the diffusion of innovation theory, which has guided much of this research. The second strain is research aiming at identifying factors relevant to the diffusion and assimilation of technologies in organizations—in general and for specific technologies. The technology-acceptance model (Davis 1989) is a classical example of such a theory.

The diffusion of innovation theory is being used intensively to study the diffusion of information technologies, and is also being used as a framework for understanding the adoption of new technologies in organizations, see (Prescott and Conger 1995) for an early overview. With the classical diffusion of innovation theory the relation between the (technical parts of a new) tech-

nology and use is a binary one—either the technology is adopted, or it is rejected. The diffusion of innovation theory to some degree does acknowledge that a technology might be changed during the adoption process, captured by the concept *re-invention* (Rogers 1995). However as we will see, the situation with an open and flexible technology like Lotus QuickPlace is more complex, see (Bøving and Bødker 2004) for an elaboration of this argument. Many studies have shown the value of the diffusion of innovation theory and the technology-acceptance model in explaining individual acceptance of technologies for personal use where the individual has a free choice of whether to accept the technology, but studies have also demonstrated limitations in terms of misfits between the assumptions underlying the models and the actual technology (Gallivan 2001, p. 55).

Based on a thorough review of literature on diffusion and adoption models, Gallivan develops a framework for studying and analyzing the implementation of complex technologies in organizations when there is an organizational mandate to adopt the innovation. Gallivan's approach acknowledges that the organizational context of adoption decisions is not well captured by the traditional models, be it the diffusion of innovation theory or the technology-acceptance model. His theoretical framework is based on a two-step decision process, the initial decision being taken by an authority at an organizational, division or department level, and the secondary adoption process following one of three paths: (a) total commitment—a mandate that the innovation be adopted throughout the organization, (b) support strategy—the necessary infrastructure is provided while the adoption is voluntarily, or (c) advocacy strategy—based on specific pilot projects, observations of their processes and outcomes decisions are made whether to implement more broadly. Gallivan's model focuses on the factors influencing the secondary adoption process, and includes a *feedback loop* between what he terms the organizational consequences and the secondary adoption process with the assimilation stage. The content of this feedback loop, which Gallivan does not elaborate on, is highly relevant when the technology in question (like Lotus QuickPlace) is highly open-ended, configurable, and context-specific.

Change management models have been proposed in the literature as analytic tools to describe actual implementation processes, or as more prescriptive tools to guide an implementation effort in practice. The traditional model of change management sees change as something following an *unfreeze-change-refreeze* model (Kwon and Zmud 1987). *Unfreezing* is the phase of motivating people and creating a readiness for change. *Change* is the process of actually implementing the change, and *refreezing* is the process of consolidating the change and return to some new equilibrium. This approach has been criticized

as inappropriate in the turbulent conditions that most modern organizations face, or when introducing open-ended technologies (Orlikowski and Hofman 1997). Orlikowski and Hofman suggest a different approach suitable for QP-like technologies. Their approach rests on the assumption that changes associated with the implementation are ongoing processes, and that the changes cannot all be anticipated or planned ahead of time. They suggest distinguishing three kinds of change: anticipated change, emergent change, and opportunity-based change. *Anticipated change* is planned ahead and occurs as intended by the originators of the change. *Emergent change* is defined as local and spontaneous changes, not originally anticipated or intended. Such changes do not involve deliberate actions but grow out of practice. The last kind of change identified by Orlikowski and Hofman is opportunity-based change. *Opportunity-based changes* are purposefully introduced changes resulting from unexpected opportunities that might arise after e.g. the introduction of a new technology.

In the CSCW research field it is generally acknowledged that the coordination of collaborative activities is a social activity, which is typically achieved successfully only in stable groups over an extended period of collaboration. Thus, changing it by introducing new technology is difficult to plan or predict. Also it is well known that the introduction of technologies to support coordination requires activities like re-negotiation, re-creation and re-definition of social protocols in relation to coordination. In other words people need to agree on how to use the new technology and to establish trust that actions and re-actions are appropriate. CSCW researchers like Bullen and Bennett (1990), Grudin (1994), and Orlikowski (1993) have early identified technological as well as organizational and social factors influencing the implementation of technologies for supporting communication and coordination. Grudin (1994) for example discusses eight challenges, or problem areas, facing developers of groupware - including a call for attention to the adoption process. According to Grudin groupware requires a more careful implementation in the workplace than product developers have confronted - implying that consultation on how to use the product should go hand in hand with the acquisition of the product, and/or be integrated in the product (built-in support).

We find Orlikowski and Hofman's improvisational model of change management as well as Gallivan's model of organizational adoption processes to be particular relevant to the present study. Orlikowski and Hofman explicitly deal with the same type of technology as found in our study of Lotus QuickPlace in Summa: an open and flexible technology to be used in a complex organizational setting. Gallivan deals with organizational adoption and assimilation of complex technological innovations: Lotus QuickPlace is not in itself

a complex technology, however the relation between the technology and the organizational context constitute a complex technological innovation.

3 Research Context and Method

Our study is part of a larger research program investigating the design and use of web-based information systems supporting geographically distributed work practices. The research has been conducted with a grounded and interpretative approach (Golden-Biddle and Locke 1997) drawing on findings from several initiatives in Summa during 2000-2002:

- An initial investigation of needs and strategies for intranet applications (based upon group interviews in six sections of the organization);
- An analysis of strategies and practices for Summa's organizational change support and special interest groups (based on interviews with key actors in the section);
- Analyses of three development projects (based on interviews with and observations of key actors in the projects);
- Document analysis of 90 requests for a QP from managers to IT Operations stating the intended aim of using a QP;
- An analysis of specific use of a QP in newly established organizational units, projects, and teams handling recurrent tasks (based on interviews and document analysis of QPs);
- A survey based on electronic questionnaires reporting from 53 QPs;
- An analysis based on a log of all http transactions to and from the Lotus QuickPlace server during a 10-month period documenting all operations concerning the structure and content of QPs.

Though relevant in their own right, the first three of the above mentioned activities are considered background information for the present study encompassing the latter four activities. The initial investigation of the intranet strategies served as an exploratory study of the organization and its corporate communicational infrastructure. Together with the analysis of the practices in Summa's organizational change support and special interest groups the in-depth studies of three development projects based on interviews and observations provided insights into concepts, project models, and practices of the development organization in the corporate headquarters of Summa. These studies took place over a period of one year.

The focal parts of the case study concerning the use of QP in the distributed organizational units of Summa in cooperation with Summa's Communications

Department (responsible for the overall use of Lotus QuickPlace) took place in 2001-02. These studies concerned the implementation and use of QP in conjunction with distributed work practices and involved interviews, document analysis, a survey by a questionnaire, and log-analysis. The first round of interviews and document analysis were done in parallel over a period of three months in early summer 2001. The interviews lasted between 1 and 2 hours, and were based upon an interview guide that was sent to the informant ahead of time. Interviews were tape-recorded and later transcribed ad verbatim. The investigations of the introduction and use of QP lead to the identification of four typical implementation contexts of QP use and characteristics critical for the deployment of Lotus QuickPlace. Logging of all http-transactions with the server was initiated at the end of this period.

For the analysis of the interviews we appropriated a version of the affinity-diagramming technique (Beyer and Holtzblatt 1998) to create a common understanding from the empirical material. The characterization of the four types of implementation context developed in this way as a common interpretation from this empirical basis and was later refined during several subsequent presentations and discussions in our research group and also with representatives from Summa's Communications Department.

In fall 2001 we conducted a survey by distributing a questionnaire by email to 123 QP administrators, who were in charge of a total of 77 QPs, all of which had shown to be active in the first weeks of logging http transactions. The questionnaire contained 28 closed questions, 3 open questions, and an option for additional comments. The questions all related to the use of QP: who are the users, what is the QP used for, and how is it used. The questionnaire was sent out 18 months after initial deployment of Lotus QuickPlace in Summa. 56 of the administrators (45%) responded to the survey representing 53 of all QPs (65%). The survey confirmed the general distribution of the identified implementation contexts, see table 1 showing the distribution of answers to the question: "What group of people is using your QP?". The open-ended questions from the survey gave additional information on the characteristics to be presented in section 4.

Table 1 shows that the dominant use of a QP is within the newly established organizational units or short-term projects (accounting for 38 and 32%, respectively, of the total number of QP use in the survey, or together for 70% of all QPs in use). Use of a QP in a special interest group or a team handling recurrent tasks is much less prevalent (11 and 13% respectively, or 24% of the total number of QP use). Only 6% of the QP use was reported from a different implementation context than the four identified by the initial interviews.

<i>Implementation context</i>	<i># of QP</i>	<i>% of QP</i>
Newly established organizational units	20	38
Special interest groups	6	11
Short term projects	17	32
Teams handling recurrent tasks	7	13
Other	3	6
Total	53	100

Table 1. Distribution of the four identified implementation contexts in Summa

Logging of all http transactions between a client web browser and the Lotus QuickPlace server was part of the research activities, and took place over a period of 10 months. The many practical difficulties and ambiguities of the gathered material encountered with this particular technique for gathering material, showed that log-analysis should be combined with other more qualitative research methods to be able to make sense of the log-data (see Bøving and Simonsen, this volume). However, applying quantitative techniques like the survey and the log analysis gave us ample material to discuss and generalize our findings. Based on findings from the log-analysis we conducted follow-up interviews with users of specific QPs.

All of our analyses of this multi-faceted material were reported on and discussed with management and other informants from Summa on several occasions. The collected investigations constitute the basis of the research presented in this article.

4 Lotus QuickPlace and its Implementation in Summa

In this section we describe Lotus QuickPlace and its implementation in Summa. In particular we identify four typical implementation contexts (section 4.1), and we further describe characteristics of the implementation contexts (section 4.2).

Lotus QuickPlace a typical representative of virtual workspace products, a group of products that also includes BSCW from GMD (see (Bentley et al. 1997) and www.bscw.gmd.de) and eROOM (www.eroom.com). Virtual

workspaces are generic products for collaboration and communication in small teams. This gives the application some basic characteristics:

- Lotus QuickPlace is very open in terms of which kinds of collaboration it supports. There is no suggested workflow inscribed in the application for example to support projects, recurrent tasks, interest groups etc. The members of a QP need to agree on how to work together using the tool in a specific context, e.g. using the tool as a shared archive or as a coordination mechanism for collaborative work (cf. Schmidt and Simone 1996), and to design the structure and content of the QP accordingly.
- Lotus QuickPlace has a distributed security infrastructure. Due to its background as an ASP application (Application Service Provider) there is no central system administrator with extensive access rights, but a very flexible scheme for user management. Any manager of a QP can set up a room, invite others to participate in this room, and grant them privileges as managers, authors, or readers.

These characteristics make the software both cheap to purchase and easy to implement in an organization. Once the QPserver is installed, the QP managers set up a particular QP by defining the structure—rooms, folders, document types, as well as access rights to each room and folder. Each QP thus consists of a number of rooms with folders containing documents, which can be reached from a single URL, for example provided in an email notification. Users' access to specific documents is defined partly by the managerially defined access to rooms and folders, partly by the author, i.e., access to individual documents as well as rights to edit individual documents.

Summa was created in Scandinavia by a merger involving financial companies (private, corporate, and investment banks as well as insurance companies) located throughout four Scandinavian countries. The new company needed an application that could support the collaboration and communication when establishing new geographically distributed organizational units. New organizational units were formed spanning the four countries, including core business areas such as corporate banking and support functions like IT, human resources, and communications. Projects were established to merge operations. There was a need for supporting communication and coordination in these new organizational units, and Lotus QuickPlace was deployed approximately one month after the merger for this purpose. Lotus QuickPlace presents itself as being very easy to implement—“create a Team Workspace on the Web—Instantly” and “A QP is a place that you can create on the Internet in 30 seconds to communicate with your team, share resources, and keep track of

your project” (Lotus 2001). In line with this, the implementation process of the technology in Summa was lightweight—not providing any education or guidelines apart from the ones on the manufacturer's web site and the built-in tutorial and help function.

The decision to introduce Lotus QuickPlace to support the post-merger organizational units and projects in Summa was done quickly without thorough studies of needs and possibilities. Lotus QuickPlace was chosen for the following reasons: it was web-based; needed no integration with the existing IT infrastructures of the pre-merger companies; unlike for example simple email, QP offers secure (encrypted) communication; there was a positive experience with Lotus products; and the product could be implemented very quickly seen from an IT Operations point of view. One month after the merger, the Communications Department was commissioned to distribute Lotus QuickPlace in Summa. The availability of the technology was announced through e-mails and oral presentations to selected groups of people, typically middle managers at headquarters. A potential QP manager should send an email to IT Operations applying for a QP. The original idea was that the application should contain a business justification, but in practice applications were approved provided there were members from geographically dispersed organizational units or project teams.

Our study showed that the number of active QPs grew steadily within the first year at Summa. In the first month of our log-period there were 805 active users in 80 QPs. The growth continued during the 10-month log-period to 1618 active users in 126 QPs in the last month. Table 2 summarizes the development in activity over the period, in which we studied the log-files of the QP-server.

<i>Activity measure</i>	<i>Development in activity</i>
No. of active QPs	+58%
No. of active users	+101%
No. of operations	+275%
No. of operations pr. QP	+138%
No. of operations pr. user	+87%

Table 2. Development of QP activity in a 10-month period in Summa

The study also showed that QPs were used for quite different purposes: to support communication and coordination in organizational units, to support different recurrent tasks like translating the quarterly financial reports and the corporate newsletter, and to support communication and coordination in

projects and special interest groups. One QP was even used as a local intranet with almost 300 active users. In the following section we will take a closer look at the different implementation contexts of QP use.

4.1 Four Types of Implementation Context

This section describes the four general types of implementation contexts in Summa where a QP was used. The implementation contexts are further characterized in section 4.2.

Newly established organizationa units. Following the merger, new organizational units were established. Units from the former organizations with overlapping functions were merged into corporate units. As an example, a new corporate department was formed and made responsible for establishing the new name, corporate identity, media relations, etc. This department was staffed with 80 employees distributed across four countries and had to be established more or less from 'scratch'. The staff did not know each other (across countries), they spoke different languages, and together they spanned multiple different organizational and domestic cultures. The starting point was typically the appointment of a top manager and the production of a charter (in the form of a PowerPoint presentation), consisting of the overall areas of responsibility, an organizational chart, and the names of the managers and employees allocated to each section in the unit.

The QP for the new organizational unit was initially structured according to the organizational chart, representing the unit's basic, and initially only, shared common denominator. Each section was given their own entry: a folder in QP along with a few (or no) stated guidelines for how to use it. The primary use of these QPs was distributing management information such as meeting schedules, agendas and minutes, strategies and goals for different sections. The QP was also used as an archive where users uploaded documents that they felt might be useful for others. However, extensive use patterns did not develop. A reason for this may be that it is problematic to find specific information browsing a structure that reflects the organizational chart and not the content of the documents. Thus, the QP seldom succeeded in mediating interactions among users.

Special interest groups. An important part of a merger is to share knowledge and achieve synergy. In Summa practitioners that share a professional interest in a specific topic form special interest groups. Examples on such groups are project managers, change consultants, and experts within specific technologies such as Oracle, Java, and Notes. Members of the special interest groups are distributed organizationally as well as geographically.

The overall aim of supporting special interest groups was argued in knowledge management terms, for example by enhancing possibilities for the exchange of experiences and for gradually building up a kind of ‘professional handbook’ where knowledge would be represented and eventually made broadly accessible within Summa. A typical QP for this implementation context is structured according to topics and contains a bulletin board with news and events of interest, an archive with profession specific articles, and a frequently asked questions list.

Using QPs is a secondary function compared to the daily work of the members. None of the QPs for special interest groups (focusing on general issues of interest) offered ‘tools’ supporting the members’ daily work practices. No functions were found that were used frequently as an integral part of work procedures. Being a member of the interest group, and using the QP supporting this, is a detached activity compared to the daily tasks and deadlines, and thus it has a low priority.

Short term projects. The merger initiated an instant need for a number of cross-organizational projects: a new Internet portal presenting the merged organization, establishing a new internal email system, etc. In Summa all organizational change projects (including IT projects) are limited to a 6 months ‘time box’. The goals of using a QP in the distributed projects have primarily been to support project documentation, but attempts have also been made to use the QP to support coordination, problem solving, and negotiation.

One project had the purpose of evaluating the possibility of creating a shared customer security architecture across countries. The project’s QP was organized into specific issues and deliveries such as documents describing issues like ‘Security’ and ‘Infrastructure’, or deliverables like a ‘Project Charter’. Working on the subject matter of the project requires a great deal of coordination and negotiation of the means and the goals of the project itself. To the members, representing several IT sections, such negotiations can be a delicate matter of strategic disclosure and nondisclosure. When trying to use the QP to support negotiating different solutions to problems members may not wish to lay all the cards on the table straight away. Thus attempts to use the QP for problem solving and negotiation in projects have failed, and also attempts to ease coordination have proven difficult. A QP in development projects thus typically resembles a project archive, where the results of the projects are developed and maintained in a post hoc manner.

Teams handling recurrent tasks. In Summa teams within the departments manage tasks that periodically must be carried out. Teams handling frequent recurrent tasks are often organized as sections. Some teams consist of members that belong to different units. For example there are information providers

and translators handling the quarterly translation of the financial reports. Recurrent tasks are typically intense efforts performed over a short period of time, requiring a high degree of coordination and critical predefined procedures. The aim of using a QP is mainly to support coordination within the team when performing the task.

Consider Summa's quarterly task of producing financial reports for the stock markets. This comprises a translation of an English master into four different languages. The completed financial reports are to be released simultaneously to the stock exchanges and to the press in the five languages. The translation is initiated about one week before the release deadline. At this time, the master is not in its final state and corrections occur several times up to the deadline. These changes to the English master must be coordinated very tightly. The translators work in parallel on the texts and usually in different geographic locations. When a translator has completed part of the documents, he or she uploads them to the QP with a specific version name. It then becomes available to all others and the status and progression of the work becomes visible in the QP.

QPs for recurrent tasks are organized to reflect deliveries and typically also reflect the workflow of the tasks. QP's main function is as a coordination mechanism supporting the coordinating work by mediating mutual dependencies (Pors and Simonsen 2003; Schmidt and Simone 1996). In addition the QP provides an overview of the process as well as performing some of the tedious footwork that the collaboration entails.

4.2 Characteristics of the Implementation Contexts

Our synthesis from the empirical material has resulted in six overall characteristics of the implementation contexts with respect to managerial potential for initiating, managing, and implementing change related to the implementation of Lotus QuickPlace in a distributed organization. These overall characteristics are summarized in table 3 below and further described in the following—highlighting similarities and differences across the four implementation contexts.

Management position and role. An obvious characteristic related to organizational change in general is the position and role of management. Organizational units in Summa have a hierarchical management structure, where managers take on the traditional role of personnel managers. With respect to special interest groups Summa initiated a very ambitious organizational initiative in order to support these. Every special interest group was allocated a network manager. This person was 100% allocated to supporting and maintaining

<i>Context</i> Characteristic	<i>Newly established organizational units</i>	<i>Special interest groups</i>	<i>Short term projects</i>	<i>Teams handling recurrent tasks</i>
Management position & role	Hierarchical (personnel mgr.)	Network manager (among peers)	Project manager (among experts)	Team manager (personnel mgr.)
Administration of the QP	Egalitarian, multiple administrators	Network manager	Project manager or deputy	Team manager
Membership	Growing and heterogeneous	Continuous and homogeneous	Transient and temporary	Continuous and congenial
Evaluation and re-design of the QP	Occasionally	Continuous maintenance	Difficult (due to short life cycle)	Regularly (between tasks)
Work practice integration	Low	Low	Medium	High (critical)
Dependency of the QP	Nice to have	Nice to have	Nice to have	Need to have

Table 3. Comparison of characteristics related to a QP in the four types of implementation context identified.

the group. The network manager is the initiator, administrator, and main contributor to the group's QP. However this effort has not changed the management role of this context, where the network managers are among peers when considering the practitioners participating in the group. A somewhat similar situation is found in the projects. While the project manager is in charge of the project, the members of the project team are often specialists and they might also be managers. In the customer security architecture project mentioned in Section 4.1.3, the team members were managers of the IT sections from each of the companies that went into the merger. The teams handling recurrent tasks are comparable to the new organizational units: the teams might indeed be organizational units or the manager of the team is typically a personnel manager within a team where the other members have the status of employees.

Administration of a QP. Administrators of QPs are responsible for configuring and customizing the technology to fit intended goals and requested needs, including setting up the QP, changing the structure of the QP, user

access rights, etc. In the newly established organizational units, this task was usually distributed to the person, who had suggested using the QP, or (in larger units) to several persons. Even though the use of the QP might have an important signal effect, the manager's involvement in shaping the QP had a secondary role. In the other three contexts, this role was taken on by either the manager himself or was delegated to a deputy in close cooperation with the manager. Network managers are also QP administrators. The QPs in the projects were typically initiated by the project managers themselves and introduced to the project members as part of the project establishment. In the teams handling recurrent tasks, QPs take on the roles of an important communication tool and a workflow mediator.

Membership. The users of a QP constitute communities that vary across the four contexts. The new organizational unit is characterized by a growing number of actors that are allocated to the unit as it is being established. This community might be viewed as heterogeneous since the employees of sections came from different pre-merger companies. The members of a special interest group constitute a relatively stable and homogeneous network of practitioners. The short-term projects have a transient and temporary membership, since a project ends after 6 months or less. Teams handling recurrent tasks have the most stable membership. The fact that these members share the same aim, and that they typically perform the task under stress, contributes to the often seen congenial relationships among team members.

Evaluation and re-design of the QP. The open-ended nature of Lotus QuickPlace, along with the continuous changes in the organization, necessitate periodical evaluation and re-design of the QP in order to align the configuration and structure of information in the QP with the agreements and practices related to its use. In the organizational units this seems to happen only occasionally and might be triggered by a restructuring of the unit, by a detection of the QP use as being very low, or by a sudden managerial initiative, such as making the QP calendar the default intro page in order to make the QP members aware of upcoming meetings and arrangements. By contrast, the special interest groups, having a full-time network manager who is responsible for administrating each QP, view evaluation and re-design as part of overall maintenance and conduct it in a continuous manner. Re-design within projects is difficult simply due to the short life cycle of the projects. The initial setup of the QP is thus usually rarely changed. The teams handling recurrent tasks have a periodically occurring opportunity for reconsidering the use of QP where former experiences can be incorporated in the future routines. The recurrent task has an advantage in this respect, since it provides such frequent

occasions for evaluation and re-design, and because the character of work is well defined and has been tried several times before within a stable group.

Integration with work practice. Integrating the QP with work practices is in general problematic and demands, among other things, that users are able to see the benefits from its use and that they choose the QP instead of other well established alternative technologies such as email (Grudin 1994). The QP's integration with work practices in the organizational units is low and reflects the overall aim of offering the QP as an information distribution channel and as a shared archive. This is also the case for special interest groups, where the focus on general issues of interest leads the QP to have a secondary role when compared to the daily work for the members. The integration varies in projects. A few projects succeed in integrating the QP into their work by for example using the QP as a working library for object oriented use cases. In most projects, though, the main use of the QP is as an archive for project documentation with little integration with work practices, except for the project manager. On the other hand, the QPs of the teams handling recurrent tasks show a very tight integration with work practice. The ways of coordinating work are well defined and shared among the members, giving an effective basis for using the QP as a coordination mechanism. Any changes to established agreements have to be carefully prepared in advance, allowing for the necessary coordination and avoiding any misunderstandings or other disruptions in the completion of the task.

Dependency of the QP. The dependency of having access to the QP in a given context reflects the integration with work practice. For the organizational units and the special interest groups, it is generally a nice-to-have facility, and work will continue (with only a few irritations) even if the server (theoretically) should crash and be out of use for days. This would also be the case for most projects, where the typical situation is a project manager that needs the QP when managing the issues and deliverables and where the QP is mostly viewed as a nice-to-have service for the project members. In order to get their work done, other means for coordinating work such as e-mail and phone calls might even be more immediately gratifying. Dependency on the QP is highly critical when considering teams handling recurrent tasks. When the team producing financial reports starts the quarterly translation task, this work is considered so critical that the server and central network facilities enters a 'frozen zone mode' where all other QPs are restricted from certain kinds of updates in order to minimize the risk of a server crash.

4.3 Simple Use Patterns

As part of the analysis of the log files, we used ‘document life cycle’ as an analytical unit for understanding the QP use. A document life cycle is the trajectory of all operations on a document in a QP. The document life cycle analysis shows simple use patterns to be dominating. First, the typical lifecycle of a document in a QP is that the author publishes a document that is then never touched again. No subsequent operations like edit, read, move or deletion are performed on the document, and we have therefore viewed them as ‘sleeping’ documents. This life cycle is observed for 70% of the documents. Second, for the remaining 30% of the documents the typical pattern is that a document is published and then subsequently read by a number of people. The technology offers support for the collaborative production of documents by a locking mechanism, which prevents multiple persons from editing a document concurrently. This feature is only very rarely used (1% of all active documents).

Both when we use the document life cycle as the analytical unit and when we use the individual QP as the analytical unit, the use of the technology is characterized by a large number of unsuccessful attempts. We identified 37 QPs, which were started during the log-period. By analyzing the weekly number of users, document reads and document edits, we portrayed the activity in each new QP. This analysis showed that 14 of the 37 QPs, or 38%, only showed very fragmentary use, or no use at all. While all 37 QPs were based on an explicit decision to start using a QP, in more than one third of the QPs it did not result in sustained use.

Another characteristic of the QP use is that use is intertwined with the use of other media in a competing, or supplementary manner. There is no clear distinction between the situations where the QP is used and where e-mail or telephone is used. In most cases they are combined. Responding to the inclusive question “Which other media do you use to communicate or exchange files with the other members of the QuickPlace?” in the questionnaire, 95% of the respondents selected “e-mail”, and 60% selected “telephone” as well as “face-to-face.”

To sum up, the large percentage of ‘sleeping’ documents as well as the QPs that are started but never get into sustained use during the 10-month log period, indicate a lot of unsuccessful attempts to use the technology. The QP use, in general, shows a simple life cycle, and in specific situations the potentials of the technology are not fully utilized.

5 Discussion

From the study of the implementation of Lotus QuickPlace in Summa we can make a number of observations. First, it is worth noting that a sustained use of Lotus QuickPlace has been established. This is a relevant observation because many studies have shown that the introduction of open and flexible technologies to support communication and coordination is bound with obstacles, and that this type of technology is fragile. As described above the implementation effort of Lotus QuickPlace in Summa was rudimentary - there was neither educational effort of users, nor any organization-specific guidelines as to how a QP could and should be used to support various communicational, coordinative or collaborative needs. Users were left with the general guidelines provided by the software manufacturer. As noted above, creating and setting up a QP is by default distributed to the manager(s) of the QP. The QP managers define the initial structure (rooms and folders) of the QP and the authorization structure. In all cases an important precondition for a QP to work is that the users of the QP must come to an understanding of (Simonsen and Pors, 2003):

- The purpose for which they want to use QP,
- How the QP should be structured to support the intended use
- The work flow of using the QP as intended (“how to use it”)

So, given the lack of support of local implementation efforts and the uncertainty and flux dominating Summa in the months following the merger, a prediction that sustained use of a QP would be difficult to achieve would seem feasible. However as demonstrated in section 4, The technology has spread in Summa to reach a substantial level of use one year after its introduction, and this growth continued during the 10 months of our log period.

Secondly, we can however also describe the QP use in Summa as being characterized by many unsuccessful attempts and an underutilization of the technology's facilities for coordination. As we noted in section 4.1 and 4.2 there are many obstacles to reach the intended goals in three out of four implementation contexts. One obvious conclusion from this is that Summa's implementation effort did not fit a product like Lotus QuickPlace—it simply overlooked essential activities at individual QP level, and thus did not support them. In many ways Summa's implementation efforts resemble the implementation of an individual office application overlooking the complications introduced with technologies for supporting communication and coordination, as warned by Grudin (1994). This has led to a situation where the product's potentials are far from fully exploited.

Thirdly, the case clearly demonstrates the validity of Orlikowski and Hofman's improvisational model of change management (1997). We can identify change processes of all three types: *Anticipated change*, i.e., change that is planned ahead and occurring as intended by the originators of the change, is for example the use of QP by new organizational units and merger projects to support communication and coordination in order to minimize travel. *Emergent change*, i.e., local and spontaneous changes not originally anticipated or intended, is exemplified in our study by a QP that was started by a small group of people, which gathered risk data from different business units. They started using the QP as a repository where the people involved posted Excel spreadsheets of risk data, which was consolidated into one risk profile for Summa. They thus used the QP to support a recurring business process. *Opportunity-based change*, i.e., purposefully introduced changes resulting from unexpected opportunities that arise after the introduction of the new technology, is for example the use of a QP to support the translation of quarterly financial reports for the stock markets to be published at exactly the same time in four Scandinavian stock exchanges and thus in four Scandinavian languages and English. The idea of using a QP to support this activity appeared as a possibility to the head of the group of translators, who then introduced the QP to the group and carefully designed the structure of the QP to support the progression of the translation process.

5.1 Organizational change management levels

While the Orlikowski and Hofman (1997) approach recognizes changes as ongoing processes consisting of shifts between anticipated, emergent and opportunity-driven changes, and that various technological and organizational changes made during the ongoing process cannot, by definition, all be anticipated ahead of time, it fails to grasp fully the challenge described in our case. With a technology like Lotus QuickPlace, the change processes involved in the integration of Lotus QuickPlace into the organization as mentioned earlier can be understood as taking place at two very different levels. Gallivan's model identifies a two-step adoption decision process (Gallivan 2001), which in relation to the Summa case relates well to changes at the two levels. At one level there is the decision to acquire Lotus QuickPlace followed by the introduction of the QP service, which we choose to call an *organization/infrastructure change*—in Gallivan's model called the primary authority adoption decision. At another level there are the local change processes related to the introduction of the individual QPs and the dynamic reconfigurations at work group level, which we coin *work group level changes*. In Gallivan's model

these are called secondary adoption and organizational assimilation processes. In relation to Gallivan's model we should keep in mind that in Summa the decision to use a QP in an organizational unit, a project, or a work group is a voluntary decision. Thus, in order to better understand—and thus better plan and manage—the implementation of an open and flexible technology like Lotus QuickPlace we suggest the distinction between an organization/infrastructure level and a work group level. As argued previously the centralized introduction of the QP service and the adoption of individual QPs in for example a project are very different change processes. Yet they are equally important. Examples of the changes processes at organizational and group level are provided in table 4.

	<i>Organization/infrastructure level</i>	<i>Work group level</i>
Anticipated change	Defining goals such as to use a QP to reduce travel; establishing procedures for issuing, setting up and closing QPs, server infrastructure	Defining and agreeing on the group's aim of using a QP, defining folder structure, inviting members, managing content and re-configuring
Emergent change	Change of criteria for opening a QP from including a business justification to geographical dispersed groups	The partially unreflected establishment of new communication patterns over time (e.g. an archive with slide presentations, or using a QP to support gathering risk data)
Opportunity-based change	Introduction of new generic services in the technology like e.g. archiving functions, search patterns, or various templates	Using the QP for supporting the translation of financial reports

Table 4. Examples of change processes at organization and work group level

We find activities at both levels to be central to the implementation of a flexible technology like Lotus QuickPlace. The organization/infrastructure level is important as the changes here constitute the basis for implementation at the work group level, just like the primary adoption decisions in Gallivan's model lay the ground for the secondary adoption decisions. The group level activities are important to support the organization's local implementation of WIS, cf. our earlier argumentation that by ignoring these activities, Summa's implementation efforts did not support the local implementation of the technology. An implication of this distinction is that it could help an organization like Summa understand, foresee, and maybe support a wider spectrum of the

change processes involved in implementing Lotus QuickPlace. For example, identification of the important group level change processes could have helped Summa create an environment supporting these change processes - for example by collecting experience from individual QPs and distributing advice to others. We can thus explain Summa's problems with Lotus QuickPlace as being caused by only identifying and providing guidelines for the organization level of implementation, and ignoring activities at the group level. In retrospect we can say that Summa to some extent failed to understand what kind of technology they were dealing with. Hereby, the open-ended nature of the technology is not well captured. With this understanding we can identify a plausible explanation as to why the features in Lotus QuickPlace for supporting collaboration are far from fully exploited.

5.2 Synthesizing a Change Management Approach

Gallivan's framework for the secondary adoption and organizational assimilation processes includes a feedback loop between what he terms the organizational consequences and the secondary adoption process (Gallivan 2001). As Gallivan's focus is the secondary adoption processes, his model does not give any indications as to the various factors of this feedback. However, we have indicated how experience from using QPs in Summa feed back to re-configurations of the QPs and thus provide input to iterations of the secondary adoption decision. Refining Gallivan's model with respect to this feedback is vital in relation to open-ended technologies like Lotus QuickPlace. Especially, we have indicated that the various implementation contexts provide quite different situations for this feedback.

The overall situation in Summa concerning the implementation of Lotus QuickPlace is characterized by a rapid, however not well supported spread of the technology, where the configuration and customization of QPs are distributed to the users of the technology. Lotus QuickPlace might in this way be considered as a non-strategic generic IT technology that spreads 'bottom-up' and develops into different local guises. An improvisational change management approach is needed relying on anticipated as well as emergent and opportunity-based change processes as suggested by Orlikowski and Hofman (1997). This makes the first three mainly organization oriented characteristics of the implementation context (see table 3: management position and role, administration of the QP, and membership) hard to change without the need for investing resources into for example major managerial and organizational restructuring that exceed the perceived returns of such an investment. For example, we consider that the role of management within special interest

groups and projects is a stable condition that prevents them from relying on authority (alone) to push specific uses of the QP. This must be argued in relation to actual needs, as experienced by the users of the QP, in order to be successfully adopted. Thus it is not considered realistic to initiate changes within these organization-oriented characteristics solely in order to obtain a more efficient use of the QP. The latter three work practice-oriented characteristics (evaluation and re-design of the QP, integration with work practice, dependency of the QP) might in this respect be more fruitful to consider up front.

Below we refine and operationalize Gallivan's feedback loop and Orlikowski and Hofman's improvisational change model and describe a change management approach based on the four typical implementation contexts, see table 5. The change management approach is an attempt to synthesize empirical experiences observed in Summa with regard to open-ended WIS technologies such as QP. Each of the four contexts are characterized with regard to:

- The challenges that management face with regard to the characteristics of the implementation context as outlined in table 3 and discussed in section 4.2.
- The immediate expectation and aims that management can have to the effect of implementing technologies such as Lotus QuickPlace in a given context as observed in Summa.
- Strategies to stimulate change beyond immediate effects by means of applying anticipated and opportunity-based change processes.

Newly established organizational units. This implementation context is characterized by a management orientation towards strategies, organizing, and establishing practices in the new unit that does not leave much room for considering QP use as a primary area of interest. A growing and heterogeneous user group constitutes the members. These characteristics do not support any ambitious expectations regarding collaborative use of the QP. The focus is on clarifying and establishing new processes and collaboration, rather than supporting existing work practices by integrating the QP. Thus, the QP will probably maintain a nice-to-have dependency with the daily work practice for a considerable period of time. The QP might serve a function comparable to an intranet or LAN, and a specific need for the QP concerning the unit, as a whole, is questionable. A potential strategy for change could include aiming for a comprehensive shared archive. This requires a well planned process of anticipated change: developing a comprehensive and shared categorization system for the archive established by regular evaluations and re-designs. If parts of the organizational unit over time evolve into specialized sections and

teams an opportunity-based change process could be initiated including sub-structures with ‘private’ folders. Such opportunities might end up resembling teams handling recurrent tasks, and (like the group of translators) teams within the unit might thus use a QP to support coordination of its work.

<i>Context</i>	<i>Newly established organizational units</i>	<i>Special interest groups</i>	<i>Short term projects</i>	<i>Teams handling recurrent tasks</i>
Change management				
Challenges	Most characteristics do not support effective use of a QP	Low integration with work practice (no specific collaboration among members)	Transient, temporary membership combined with short life cycle	No serious challenges: All characteristics support effective use of the QP
Immediate expectations and aims	QP as (intermediate) substitute for intranet with low effect on collaboration	QP as information distribution channel and ‘information of interest’ archive	QP as information distribution channel and post-hoc project documentation archive	QP as coordination mechanism effectively reducing complexity in collaboration
Strategies to stimulate change processes	[A]: QP as shared archive developed by regular evaluations and re-designs [O]: QP use reflecting teams handling recurrent tasks as such teams evolve	[O]: QP as indispensable tool provider integrated with daily work practice [A]: QP as KM-system, e.g. promoting ‘best practices’	[A]: QP as a strategic application across projects, e.g. by supporting (mandatory) concepts, models, tools, techniques, and deliveries	[O]: QP as local strategic application, requiring full commitment to using QP and aligning work practices to obtain tight integration

Table 5. A change management approach outlining challenges, immediate expectations and aims, and strategies to stimulate change processes, regarding change management of a QP as related to four types of implementation contexts. *Key:* [A]: Anticipated; [O]: Opportunity-based.

Special interest groups. Even though considerable resources in Summa were put into an ambitious organization of management and administration of the special interest groups, the integration between the QP and work practices

remained low, and thus the need to use the QP was very modest. The members within a special interest group potentially do share a professional interest, but this does not entail any specific collaboration or mutual dependencies. Expectations for using the QP to reach beyond a 'nice-to-have' facility depend on the possibilities for a more tight integration of the QP with the daily work practices of the group members. We see two potential strategies for reaching this aim, a 'tool' strategy and a more ambitious knowledge management strategy. Developing the technology into an indispensable tool requires that opportunities arise where a QP might provide functionality that is more closely integrated with daily work practices, e.g., by offering resource management services for the projects managers, by creating mutual commenting and editing procedures for the change consultants, by providing facilities for software configuration management for the Java developers, etc. Management might also aim for a much more ambitious use of a QP, e.g., to promote and establish 'best practices.' This strategy involves a complicated process of developing the QP into an effective knowledge management tool. The implications include a requirement for an organizational transformation of the groups, where they constitute single, uniform entities, or coherent communities of practice as suggested by Bansler and Havn (2001; 2004). The necessary long-term knowledge management strategies involved are beyond the scope of this article.

Short term projects. The immediate challenge related to projects is to deal with the risk of investing in establishing and maintaining a QP in a situation that can be characterized as a temporary endeavour (in Summa ending within 6 months), and involving project members that are too busy to overcome much threshold, and hereby gain advantage of the investment. Transient and temporary memberships combined with short life cycles are characteristics that seriously restrict successful use of WIS technologies beyond a 'nice-to-have' system. Establishing a QP as a 'need-to-have' coordination mechanism within a specific project, requires both that the collaboration between mutual dependent project members has been established, and that a general need to reduce the complexity of collaboration has been experienced and recognized (Bjørn and Simonsen 2003). Adding to this, the fact that the QP then should be designed to support the coordination, makes it almost impossible within a short time frame. A realistic expectation for a project is using a QP on a relatively low ambition level as an information distribution channel and as an archive for project documentation. Strategies for a more ambitious use of a QP, such as using a QP as a coordination mechanism, should include elements that project members recurrently face in every consecutive project. This could include support for concepts, project models, selected tools and techniques,

and deliverables that are required in all projects. In this way, the QP could be viewed as a strategic application that supports using and coordinating shared (mandatory) elements across projects. In a longer perspective, consecutive projects might in this way resemble teams handling recurrent tasks. Such an initiative could be supplemented by allocating change agents that evaluate use of a QP across several projects, identify opportunities and emergent practices for QP use, and support the disseminating and handing over to new projects.

Teams handling recurrent tasks. This is the only implementation context observed in Summa where a QP has evolved into a critical coordination mechanism having the effect of seriously reducing the complexity involved in collaboration within a geographically distributed team. All aspects are in favour of using a QP based on the special characteristics of this implementation context: recurrent tasks with an ‘embedded’ feedback option that naturally opens for opportunities to reflect on and further develop procedures and practices for using the QP as well as re-configurations of the QP. The strategies for an ambitious and successful use of a QP for recurrent tasks include a full commitment to the technology and potentially a dramatic change in work practices in order to achieve a tight integration of the technology. Supporting the mutual dependencies embedded in a coordination mechanism also differentiates this implementation context from the other three by establishing a situation where a WIS develops into a local strategic application.

6 Conclusion

Our studies of the implementation and use of a QP have illustrated implications related to open-ended, context-specific WIS for communication and coordination in a large, distributed organization.

We can identify two immediate and overall conclusions from our study that are both relevant for organizations that already have, or are planning to implement open-ended virtual workspace technologies: First, attempts to predict the use patterns of these technologies are more or less obsolete. Like e-mail, virtual workspaces have no specific and predefined use patterns inscribed. These emerge and evolve over time as people do their daily work and come to an agreement or common understanding of how to use the system. Eventually, it will over time change the patterns of communication and collaboration in the organization—not as a result of a ‘one-shot’ central change management effort, but as a result of many local and successive changes.

Second, change management efforts are not useless. We found Orlikowski and Hofman’s improvisational model of change (1997) useful as a point of

departure. Combining their model with Gallivan's (2001) elaborate model for organizational adoption of complex technological innovations we identified typical changes of all three types (anticipated, emergent, and opportunity-based change) at two levels: an organization/infrastructure level where the introduction of the technology is prepared, and a work group level where the particular application close to the existing work practice takes place. These levels are mutually interdependent: newly established organizational units might evolve and include sub-units with local teams handling recurrent tasks; special interest groups might be highly organized but effective QP use is dependent on the possibilities of providing indispensable tools integrated with local daily work practices; a QP as a strategic application within short term projects require management to establish cross project concepts and models.

The special characteristics of WIS, entail successive changes including configuration and re-configuration of QPs used in local organizational contexts. This brings a need for refining Gallivan's feedback mechanism linking organizational consequences of technology use to recurrent secondary adoption decisions. Orlikowski and Hofman's three types of improvisational change processes relate closely to this feedback mechanism.

Our change management approach is an attempt to refine and operationalize the change management models by presenting a typology that, similar to (Markus 2001) and (Dixon 2000), identifies and characterizes different, though general, contexts. We identified four implementation contexts: newly established organizational units; special interest groups; short term projects; and teams handling recurrent tasks. The implementation contexts are characterized with respect to their different conditions as outlined in table 3. Change management options are further operationalized by suggesting challenges, immediate expectations and aims, and strategies to stimulate change beyond immediate effects by applying anticipated and opportunity based change processes, as outlined in table 5.

Practitioners might use our approach as an elaboration of Gallivan's and Orlikowski and Hofman's models. The characteristics of the implementation contexts (as characterized in table 3) outline the conditions one should be aware of and the change management approach given in table 5 indicates challenges and options available when considering which strategies to apply.

We encourage researchers to evaluate and challenge our approach. We expect that further empirical studies might yield additional implementation contexts to the four that we have identified, as well as refine the typology by providing additional and elaborated characteristics and guidance for action.

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