Systems and Culture: Connecting the Dots

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Abstract

"Poor fit with the culture" is a common explanation of disappointments or failures in system-related innovations. Almost anyone in the IS field would probably agree that a mismatch between a system and an organization's culture spells trouble, but most methods currently used for analyzing and designing IT-based systems downplay issues related to culture and provide no help in treating these issues rigorously. As a step toward making organizational culture more visible in systems analysis and design, this paper tries to "connect the dots" between systems and culture by taking a deeper look at the relationships through which systems and culture interact.

As a step toward a rich, nuanced view of systems and culture, this paper combines a holistic view of organizational culture with a holistic view of systems in organizations. The holistic view of organizational culture is Schneider's characterization of four distinct organizational cultures (SF, ST, NF, NT) based on two dimensions of Myers Briggs personality types, sensing (S) versus intuiting (N) and thinking (T) versus feeling (F). The holistic view of systems in organizations is Alter's work system framework and work system life cycle model, both of which view the "work system" as the basic unit of analysis for understanding systems in organizations. Different organizational cultures might project different values and norms on typical work system activities such as communication and decision-making. Different organizational cultures might also show different concerns and priorities in each of four phases of a work system life cycle. The paper argues that most of the impacts of culture on systems are directly related to the nature of specific work systems and only indirectly related to information systems that support the work systems. In other words, statements about the impact of culture on information systems alone may disregard the path through which the most direct impacts of culture actually occur. System designers and implementation teams might use this paper's ideas when considering both the content of systems they are building or modifying and the process of designing and implementing those systems. Researchers might use its ideas when formulating research questions and research designs.

Keywords: organizational culture, information system, work system, Myers Briggs personality type, system development, system implementation, work system framework, work system life cycle model

I. Introduction

Issues related to organizational culture appear frequently in discussions of information system success. Statements such as "the IS didn't fit the culture" are often part of the explanation of why a particular information system encountered unanticipated resistance and never met expectations, whether or not it eventually operated in some manner. Such statements are so common that almost anyone is the IS field would probably agree that an organization's information systems should fit with its culture and that mismatch between a system and an organization's culture spells trouble. This generalization makes sense on its face, is consistent with structuration theory, and is supported by numerous surveys and case studies that attribute system rejection or at least major difficulties to a mismatch between the organization's culture and the intended system functions (Strickland, 1998, Bate et al., 2000, Shaw and Tuggle, 2002). Unfortunately, it does not go far enough.

When looking retrospectively at what went right or wrong in a situation it is often easy to claim the IS did or didn't fit the culture. When looking at a proposed IS or IS improvement, however, it would be useful to have a theory that would identify the relevant cultural variables and would help in understanding how these variables might interact with the characteristics and operation of the intended system.

To further the discussion of systems and organizational culture, this paper theorizes about the nature of their mutual impacts and concludes that information systems play a secondary rather than primary role. It introduces Schneider's (1994) four-culture model as a holistic way of looking at organizational culture. Its view of systems in organizations initially focuses on work systems rather than the information systems that support those work systems. (The work system approach conceives as work systems the way particular organizations perform important functions such as hiring employees, producing products and services, and finding customers.) Looking at typical work system activities such as communication, decision making, and coordination, it applies Schneider's model to argue that the different norms and values in different cultures should affect both the way these activities are performed in operational systems as well as the way the phases of a work system life cycle are performed. The discussion of activities leads to hypotheses implying that the impact of culture occurs mostly through work systems rather than through the information systems that support those work systems. Some observers might theorize that the mutual impacts of culture and work systems differ from the mutual impacts of cultural and information systems, but this paper's analysis implies that these differences are far less important and less interesting than more direct impacts involving culture and work systems.

The ideas presented here might help managers, user representatives, systems analysts, organizational change specialists, and IT professionals understand current conflicts between culture and work system features and anticipate future conflicts between culture and proposed work system changes. In regard to information systems, it might also help in anticipating possible reinforcement or conflict involving the organization's culture and current or proposed features and capabilities. It might help in anticipating implementation problems and launching change management activities that might otherwise be

overlooked. These ideas might lead toward a diagnostic method for assessing how well a proposed or existing information system fits a company's culture and what to do about areas of mismatch.

II. Describing Organizational Cultures

In one of the definitive works on organizational culture, Schein (1992) defines corporate culture as "a pattern of shared basic beliefs that the group learned as it solves its problems of external adaptation and internal integration, that has worked well enough to be considered valid, and therefore to be taught to new members as the correct way to perceive, think, and feel in relation to those problems." Schein views organizational culture as a three mutually reinforcing layers. Most readily evident to outsiders is the top level, the visible artifacts related to physical aspects of the work environment. The second level is the espoused values and explicitly articulated beliefs often found in the organization's mission statement, strategic plan, or corporate credo. At the heart of an organization's culture are the underlying beliefs -- the largely unexpressed and unconscious assumptions shared by its members. These beliefs guide thinking, suggest the ways in which problems are addressed, and define notions of equity and justice.

Organizational culture is complex and multi-dimensional. For example, a recent qualitative content analysis of the literature on organizational culture since 1992, Detert et al [2000] reviewed over 25 multi-concept frameworks, identified commonalities in their dimensions, and eventually concluded that eight general dimensions listed in Table 1 suffice for characterizing values and beliefs underlying TQM practices. Regardless of whether a table of this type contains 5 or 8 or 15 dimensions, using a purely multi-dimensional view in practice is difficult because it does not provide a holistic impression of how a culture operates.

Dimension	*Typical variables or issues related to this dimension*
Basis of truth and rationality	• Tacit and internalized truth versus fact-based and scientific truth
Nature of time and time horizon	• Long-term versus here-and-now (short-term)
Motivation	• Internal versus external motives for people • Viewing people as inherently good or bad • Motivation through rewards versus punishments
Stability vs. change	• Individual propensity toward stability or change • Innovative versus non-innovative organization • Stability versus continuous improvement
Orientation to work, task, coworkers	• Work as an end in itself versus work as a means toward other goals • Task focus versus social focus in work • Results focus versus process focus
Isolation vs. collaboration	• Premium on individual autonomy versus premium on collaboration and teamwork
Control, coordination, responsibility	• Top-down versus shared control • Tight control with formalized rules set by a few versus loose control featuring flexibility and shared decision making
Internal vs. external focus and orientation	• Assumption that the basis of success is employees and internal processes versus external constituencies, customers, competitors, and the environment

Table 1: Variables and issues related to eight dimensions of culture

Schneider's Model of Organizational Culture

Instead of using a multi-dimensional approach, we will use William Schneider's holistic theory that describes four distinct organizational cultures. We selected this particular theory because we believe it is especially effective for thinking about the impact of organizational culture on systems and system-related projects due to its straightforward associations with many activities and issues related to systems and their creation and maintenance. Schneider's theory is described in his 1994 book *The Reengineering Alternative: A Plan for Making Your Current Culture Work.* He uses two of the four dimensions of Myers-Briggs personality types[1] to identify four idealized organizational cultures,[2] each of which has its own advantages and disadvantages. Any culture's advantages are usually the mirror image of its disadvantages. Key characteristics of the four cultures are summarized in Table 2.

SF: Collaboration culture (emphasizing teams, affiliation, synergies, harmony)
ST: Control culture   (emphasizing power, reality, and enforcement of procedures)
NF: Cultivation culture   (emphasizing values, personal growth, achieving potential)
NT: Competence culture   (emphasizing achievement, excellence, innovation)

Table 2: Summary of four organizational cultures (summary of Schneider, pp. 102-111)

SF: Collaboration	ST: Control
Archetype: Family or team	Archetype: Military organization
Success based on: synergy	Success based on: dominance
Leadership focus: team builder, coach, participative, trust builder	Leadership focus: Authoritative/directive, commanding, tough-minded
Management style: collegial, participative, personal, emotional, people driven	Management style: methodical, systematic, task driven, impersonal
Organizational form: Group cluster based on being a team player and contributing to the overall effort	Organizational form: Hierarchy based on compliance and adherence to role requirements in order to serve the pursuits of the organization

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1 Sensing (S) involves gathering information using the five senses. Intuiting (N) involves imagining possibilities. Thinking (T) involves using logic and facts to make decisions. Feeling (F) involves using values and connection to others to make decisions. Everyone uses all of these, but research on personality type (within a Myers-Briggs tradition) has shown that many people have consistent preferences along the S versus N and T versus F dimensions.   In other words, some people are much more anchored in sensory data while others put more of their consciousness into perceiving patterns and possibilities. Similarly, some people tend to rely more on logic and facts, while others tend to rely more on values and connectedness with others. These terms first appeared in the IS literature over 25 years ago in relation to individual differences in using information and differences between users and analysts [Mason and Mitroff , 1973; McKenney and Keen, 1974; Kilmann and Mitroff, 1976, Land and Kennedy-McGregor, 1987].

2 The full Myers-Briggs typology contains two other dimensions that are not important for our purposes because Schneider used only S-N and F-T to characterize organizational culture. For completeness it is worth noting that Schneider's book describes organizational culture in terms of Myers-Briggs categories mainly in an Appendix called "Corroboration from the Work of Others," and there, only as a reference to prior work by Hirsh [1985], who wrote about SF, ST, NF, and NT as organizational "preferences." Schneider also mentions Jung, Myers and Briggs, and subsequent researchers in a footnote on p. 125 in a Chapter called "The Genesis of Organizational Culture."

Power focus: Based on relationships Key norms: synergy, egalitarianism, involvement, harmony, pragmatism	Power focus: Based on roles and positions Key norms: certainty, systematism, objectivity, order, standardization
NF: Cultivation Archetype: church, temple, or mosque Success based on: realization of potential Leadership focus: Empower people, catalyst, inspire, foster self-expression Management style: committed, personal, emotional, people-driven, humanistic Organizational form: Circular or lattice-like, based on self-expression, willingness to grow, and cooperation Power focus: based on charisma Key norms: growth and development, humanism, involvement, values	**NT: Competence** Archetype: university or research lab Success based on: superiority Leadership focus: Standard setter, visionary, recruit the most competent Management style: task driven, objective, rational/analytical, challenging, impersonal Organizational form: Matrix adhocracy based on being experts, being creative, functioning independently, and serving the pursuits of the organization Power focus: based on expertise Key norms: professionalism, meritocracy, pursue excellence, creativity

Schneider's characterization of four idealized cultures is based on the relative dominance of different preferences in an organization's culture. For example, a strict military culture (as might exist on a warship or in an operating room) is very much steeped in S and T, sensing what is going on and applying logic and facts to draw conclusions. These are control cultures in which power, reality, and enforcement of procedures are very important, but even in these situations the primary modes of the other idealized cultures do occur occasionally. As with S, N, F, and T in Myers-Briggs, the four cultures might be viewed as different preferences that any organization might use in information gathering and decision-making. The preferred or predominant combination defines the culture in Schneider's terms.

Any of the four cultures might apply in entire companies or in departments in most industries For example, a sales organization or a business school or a software firm might have a collaboration culture or a control culture or a competence culture or even a cultivation culture. Consider a public library, for example. A library whose culture emphasizes the process of checking out books accurately and making sure they are returned promptly sounds like a control culture. A library that tries to be cooperative and accommodating to its patrons and tries to help them figure out what they want sounds more like a collaboration culture. A library that provides the best search methods and access to specialized information might have more a competence culture. A library organized to inculcate its patrons with values of literacy and enjoyment of literature might have more of a cultivation culture. Any library might perform all of these functions to some extent, but its culture would be described in terms of the approach that best describes "how we do things around here."

A specific firm might contain different departments whose individual cultures might be quite different. A university or consulting firm with a competence culture might have an accounting or finance department with a control culture because revenues need to be collected and recorded accurately regardless of what the firm produces. Similarly, a high precision manufacturing firm with a strong control culture in its production department might have a personnel department with a cultivation culture that revolves around finding the best way to develop the firm's managers and technical experts.

In addition to describing four idealized cultures, Schneider's book argues that companies or departments should identify their own culture and should try to make sure that activities calling for aspects of other cultures should be directed at maximizing goals of the core culture. For example a church (typically a cultivation culture) that needs to set up controls to keep its finances from degenerating into chaos should try to make sure that financial systems and controls genuinely serve the values and personal growth objectives of the church rather than just being controls for their own sake. The book also points out that mergers of companies with different cultures often cause major problems, as does bringing in a new CEO or other high level manager whose agenda represents a different culture.

The same issues related to alignment and misalignment should also apply to systems in organizations. The original impetus for exploring the possible application of Schneider's cultures to systems was the frequent claims that mismatch with organizational culture is one of many reasons why systems fail, generate disappointing results, or turn out to have unexpected consequences. If this assumption is generally correct, it makes sense to develop a set of ideas for recognizing alignment between an organization's culture and a new or existing system. The ideas could be the basis of a diagnostic that could help address these issues.

### III. Characterizing Systems and System Change in Organizations

An organization's culture is reflected in the way it does its work. Accordingly, our attempt to characterize systems in organizations will start with work systems. As has been explained elsewhere [Alter, 2002a, 2002b, 2002c], a work system[3] is a system in which human participants and/or machines perform business processes using information, technologies, and other resources to produce products and/or services for internal or external customers. Typical business organizations have work systems for obtaining materials from suppliers, producing and delivering end products, finding customers, creating financial reports, hiring employees, coordinating work across departments, and many other functions.

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[3] Over at least three decades sociotechnical researchers have occasionally used the term work system, but from most seem to have used it in a rather informal manner and seem not to have used it as an analytic concept. (Explained further in Alter and Dennis, 2002) The term *work system* appeared in Volume 1 of *MIS Quarterly* in 1977in articles by Bostrom and Heinen [1977a and 1977b] presenting a sociotechnical perspective on MIS problems and failures.

The Work System Framework

Figure 1 is a graphical representation of a framework that can be used to summarize any work system and to serve as a focal point for analyzing a work system. [Alter, 2002a, 2002b, 2002c]. The nine elements are defined in Appendix 1. Each element in the framework should be included in even a superficial understanding of a specific system. The arrows between various elements reflect the importance of maintaining mutual alignment between these elements. The trapezoid surrounding the business process, participants, information, and technology in Figure 1 indicates that those four elements constitute the system performing the work. The work system's outputs are the products and services received and used by its customers. Consideration of products, services, and customers even though they are not part of the system reflects the notion that a work system exists to produce things customers want. Environment and infrastructure are usually key determinants of whether a work system can operate as intended and can accomplish its goals. Strategies of the work system and organization may not be well articulated, but sometimes help in explaining why the work system operates as it does.
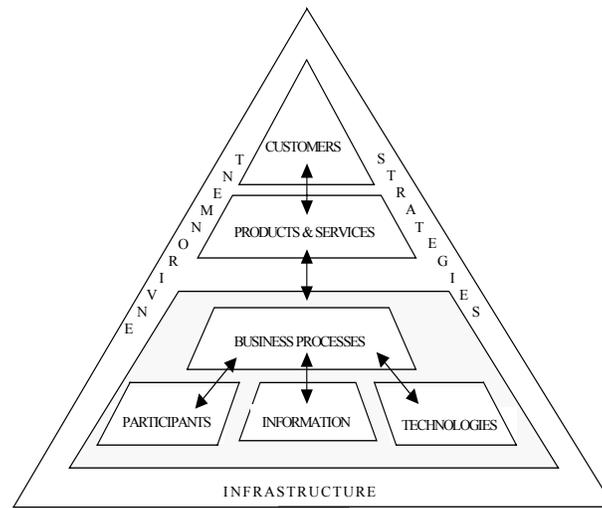

Figure 1: The Work System Framework

Work System Life Cycle Model

Work systems exist in a particular form during a particular time interval. Changes in the work system's state may occur during that interval without significantly changing the work system's form. The work system life cycle (WSLC) model in Figure 2 [Alter, 2002c] summarizes how a work system's form evolves through iterations combining planned and unplanned change. In planned change, human, monetary, and technical resources are allocated to a visible project (with initiation, development, and implementation phases) whose goal is to change the system's form. In unplanned change, incremental adaptations lead to further adaptations usually accomplished without major projects or major allocation of resources. The WSLC applies equally to work systems in general and to information systems because information systems are a special case.

The WSLC described in Figure 2 starts with a current system in operation, and views each iteration of that system as a project involving initiation, development, and implementation in the organization. The WSLC model contains explicit recognition of unanticipated opportunities and unanticipated adaptations, thereby recognizing the importance of diffusion of innovation, experimentation, adaptation, emergent change, path dependence, windows of opportunity, and assimilation gaps. Inclusion of these factors is at least partly inconsistent with a project-control viewpoint, which tends to treat unanticipated opportunities and adaptations as problems rather than opportunities and categorizes them under pejorative headings such as "requirements creep" and nonconformance.
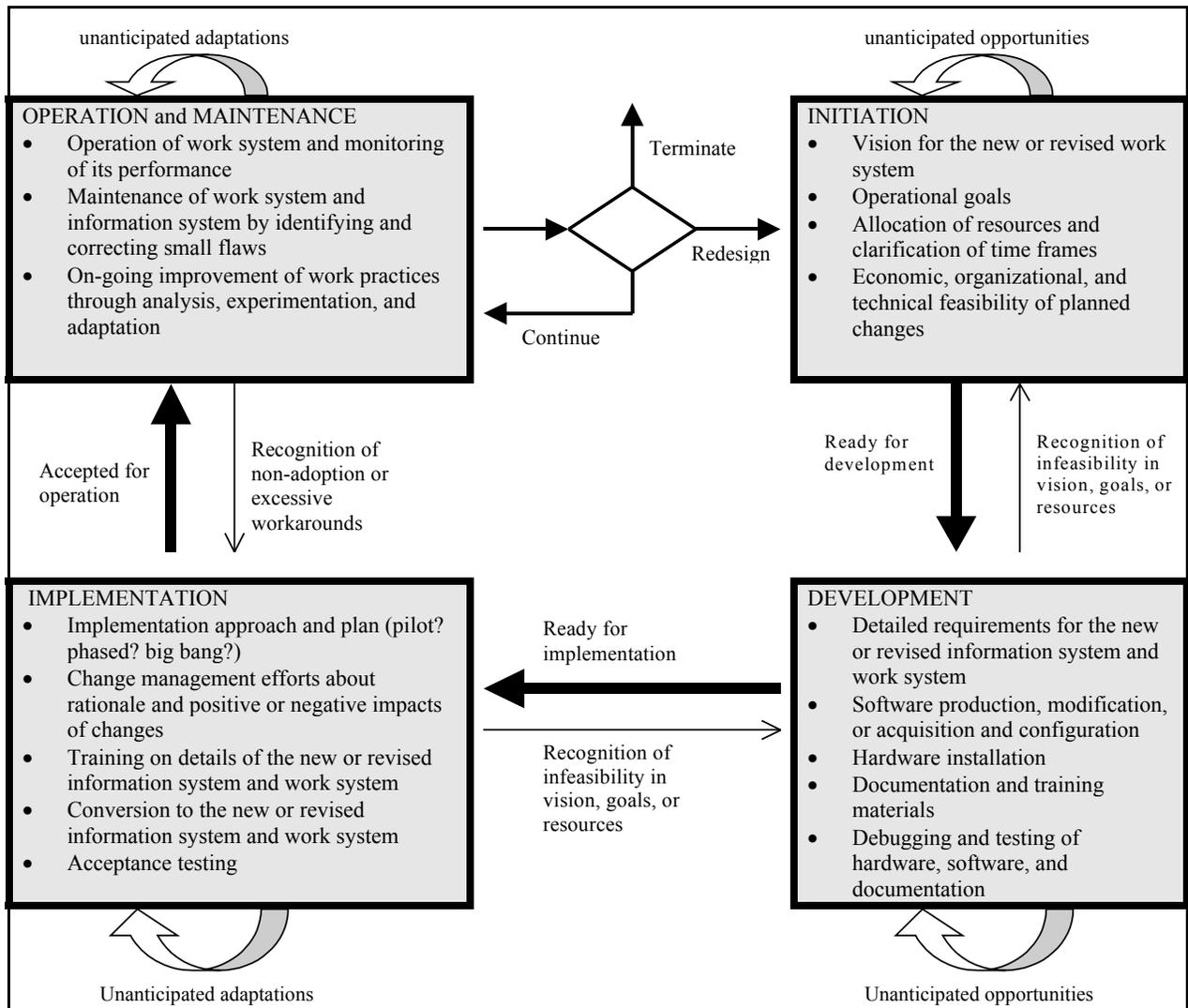
Figure 2: The Work System Life Cycle Model

IV. Characterizing the Relationship between Culture and Work Systems

Although people frequently say that current and proposed work systems and work system-related projects should be consistent with an organization's current culture, organizations often find themselves in competitive and practical situations in which they must change systems even if some aspects of the new work system will be inconsistent with the culture of the organization. Similarly, over-valuing conformance to an existing culture may reduce the chances of healthy adaptations that the organization needs.

Analogy with gardens and gardening

The analogy to a garden is useful in motivating hypotheses by helping visualize some of the realities of systems and culture. Used since Biblical times, this analogy encompasses ideas including cultivation, attention, diversity, and holism.

A garden (as opposed to a forest or jungle) is a consciously constructed configuration of plants and other objects. Most gardens are at least somewhat diverse (in contrast to cornfields) because they contain different types of plants that often serve different functions in the garden (such as flowering at different times and providing different colors and shapes).

> *An organization and its work systems are consciously constructed configurations of people and resources. Organizations include different individuals and groups of individuals who perform tasks and may have unique characteristics but need to work together to accomplish the organization's goals.*

Creating and maintaining a garden requires substantial time and effort in design, site preparation, fertilizing, planting, watering, and pruning.

> *Creating and maintaining an organization and its culture requires substantial time and effort in design, management, and maintenance.*

Both native and non-native plants can thrive in a garden.

> *Organizations are open systems that operate in dynamic environments. Successful organizations use their culture to maintain internal coherence but also must respond to external conditions and must innovate. Many of the changes (especially those related to competitive responses) are adaptations of innovations first articulated or developed elsewhere.*

Plants that are poorly adapted to the local climate and soil conditions are more difficult to sustain and in many cases die unless they receive extraordinary amounts of attention and resources.

Work systems whose design conflicts with the organization's culture are more difficult to sustain and more likely to be rejected by the organization unless they receive extraordinary amounts of attention and resources.

Plants in a garden may or may not affect each either. For example, a tree's shade can prevent roses from thriving but other plants may live side by side with no discernible mutual impacts.

Some pairs of work systems in organizations operate independently, whereas others are directly or indirectly linked. Therefore changes in any particular work system may or may not affect other specific work systems. The more prominent a work system's role in an organization, the more likely that the work system itself or changes in the work system will affect other systems directly or indirectly.

Plants may grow in unplanned ways and plants that were never intended for inclusion, both weeds and desirable plants, may take root and grow on their own regardless of the gardener's original plans.

Regardless of the original understandings and intentions of work system designers, system participants tend to adapt the work system to address their goals and the pressures they feel.

A well-designed and well-maintained garden takes on a holistic essence and appearance that involves more than the sum of the individual plants. Pruning or even replacing some of the smaller plants may have little effect on the garden as a whole. However, pruning or replacing large plants in crucial locations can have a significant effect on the garden.

Taken in combination, an organization's work systems enact and reinforce the organization's culture. Changing important work systems in an organization may change its culture, but changing small or tangential work systems may have little impact on its culture.

Regardless of whether the topic is growing and maintaining plants in a garden or creating and maintaining work systems in an organization, the real issue is not that mismatched plants (or work systems) should be avoided under all circumstances, but rather that gardeners (or managers) need to recognize the nature of the mismatches and consider the additional time and effort and risk that will result from these mismatches.

In other words, saying "work systems must fit the culture" is simply misleading. Work systems may or may not fit the culture. Work systems that fit the culture are easier to build and maintain. Work systems that deviate from the culture are more difficult to build and maintain, and may absorb extraordinary effort if they play a prominent role in the organization. In addition, changing procedures or other aspects of work systems may or may not affect the organization's culture. Changes in very important work systems may change the culture. Changes in small, tangential work systems may have very little effect.

Culture, Work Systems, and Changes in Work Systems

The garden analogy leads to five general hypotheses about work systems and culture that are consistent with much of the literature. The five hypotheses are represented graphically in Figure 3. The first two hypotheses concern the mutual impacts of culture and work systems in operation. The other three hypotheses concern the content and process of changes in work systems. The impact of culture on what is attempted (content of the change) may be different from the impact of culture on how the changes are undertaken (process of change). Planned and unplanned change are treated separately because the impact of any particular culture on pre-defined projects might be different from its impact on adaptations and improvisations. Separating planned change from unplanned change also reflects current interest in organizational improvisation, e.g., the 1998 special edition of *Organization Science* on Jazz Improvisation and Organizing [Meyer et al, 1998]. In terms of the WSLC in Figure 2, planned change occurs through pre-defined projects that encompass all the phases, whereas unplanned change is the adaptations and improvisations within individual phases.
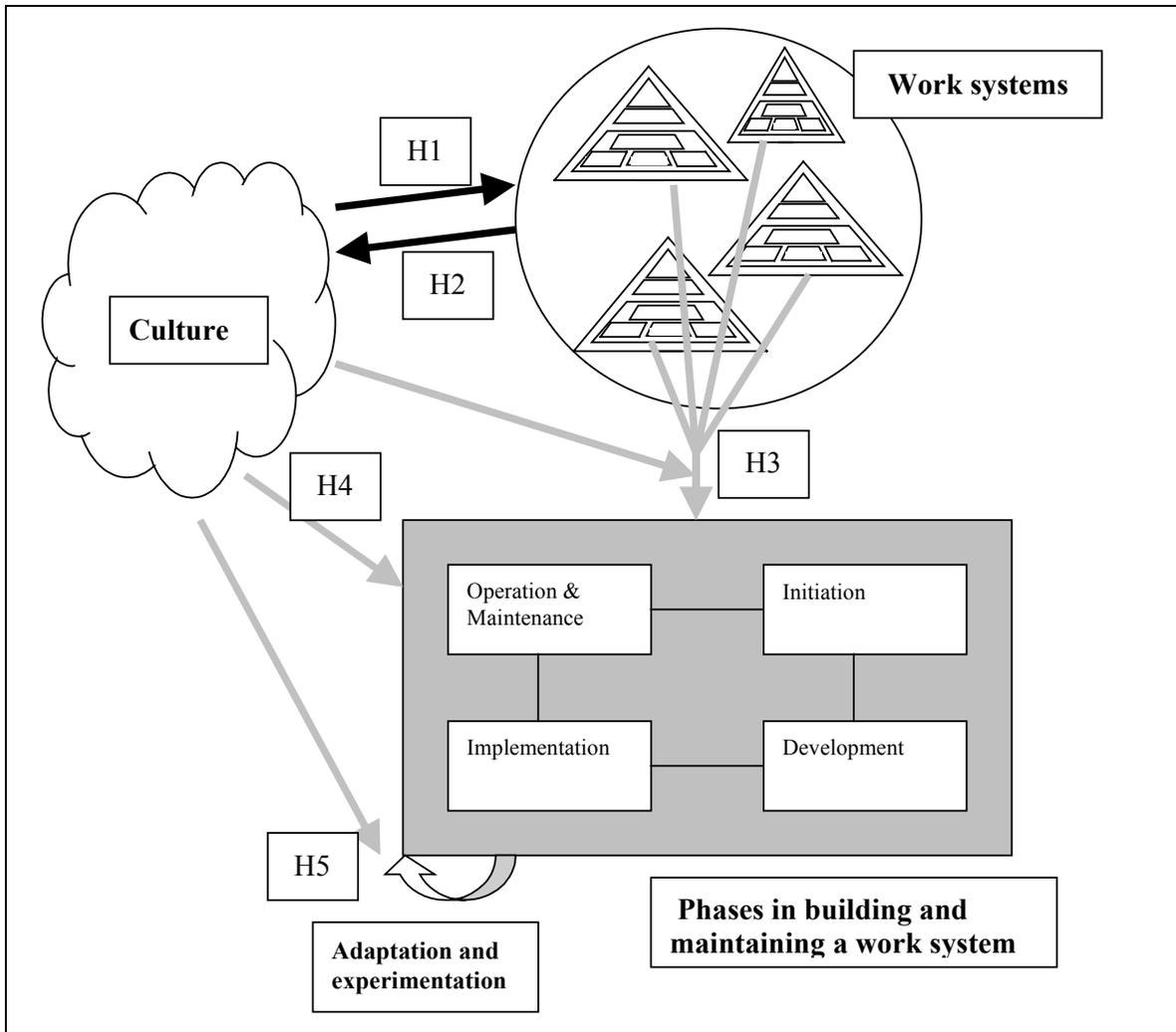
Figure 3: Five Hypotheses Relating Organizational Culture and Work Systems

H1: Impact of culture on work systems in operation: A work system's on-going operation encounters less conflict, non-acceptance, and excessive effort, and more success when the work system's norms, values, and procedures fit well with the organizational culture.

H2: Impact of work systems in operation on culture: Significant work systems in an organization enact and influence the organizational culture.

Taken together, H1 and H2 say that culture affects the form, content, and values inherent in the organization's work systems (in combination) and that the work systems (in combination) play a major role in defining and enacting the organization's culture over the long term. H1 and H2 represent the two sides of structuration, the ongoing interaction between work systems and institutions Giddens (1996). Structuration theory involves the production, reproduction, and transformation of social institutions, which are enacted

through individuals' use of social rules (Orlikowski, 1992). The literature is rich with examples of the interaction and mutual effect of an organization's culture and its systems. For example, culture affects communication patterns (Davenport and Prusak, 1998, DeLong and Fahey, 2000), business processes (Bruhn, 2001, Shaw and Tuggle, 2003), hiring decisions (Bruhn, 2001), strategic decision-making (Johnson, 2000), managerial decision making (Johnson, 2000), the way an office is decorated (Tuggle and Shaw, 2000), technology purchases (Harman and Brelade, 2000), the structure of the organization (Schein, 2000), and training (Tuggle and Shaw, 2001).

> *H3: Impact of culture on acceptance of the content of planned work system changes:* The content of planned work system changes is more easily accepted and generates less conflict and excessive effort when that content fits well with the organizational culture.

H3 says that the process of building, implementing, and maintaining work systems is less difficult when the characteristics of the content of the intended work system change conforms with the culture. H3 is consistent with a number of beliefs and findings in the literature. The high failure rates of organizational change programs (Stickland, 1998) have been attributed to the failure of the expected cultural change, thus resulting in a mismatch between the new structure and the old culture (Bate et al. 2000). Cooper (1994) used the competing values framework to explain the high likelihood of underutilization and sabotage that occurs when aspects of a new IT implementation conflict with an organization's culture, concluding that particular IT capabilities are more in accord with values and assumptions underlying some cultures rather than others. H3 is consistent with the finding that cultural resistance is responsible for the failure of many supply chain initiatives, regardless of industry (Gabel and Pilnick, 2001). Shore (2001) reported that an organization's culture affects the willingness to support information sharing, a common stumbling block in failed efforts to implement supply chain improvements.

> *H4: Impact of culture on acceptance of change processes:* The process of building, implementing, and maintaining a work system encounters less conflict, non-acceptance, and excessive effort when that process fits well with the organizational culture.

H4 says that the phases of building, implementing, and maintaining a particular work system encounter less difficulty when the characteristics of the change process during the implementation and development conform to the organization's culture. In a longitudinal study of the process used in a CASE tool implementation project in two organizations, Orlikowski (1993) argues that the implementation process itself should be considered a form of organizational change over time, and that companies need to focus on the ongoing systems and analysis design process as well as the expected outcome, in order to insure a successful implementation.

H4 implies that attempts to tack cultural change onto the end of project, more or less as an afterthought, may encounter more difficulty than attempts to integrate culture change

throughout an entire project. The literature contains a number of different views on this point. Earlier literature suggested that cultural change be left to the end (e.g. Beatty and Ulrich's (1991) five-stage change model, and Kotter's (1996) eight-step change model). Kotter argues that cultural change should come last, not first, after you have "successfully altered people's actions" (p. 156). However, later literature suggests an alternative approach, such as the proposal by Bate et al. (2000) concerning a "culturally sensitive" approach where culture remains in the field of attention throughout the intervention process, as part of the change process, and change efforts are begun with culture as a focus of concern.

> *H5: Impact of culture on unplanned adaptations and experimentation.* The form and content of adaptation and experimentation in each phase of a work system life cycle tends to reflect the organizational culture.

Consistent with H5, Harper and Utley (1999) note that organizations whose cultural attributes include carefulness and rule orientation would not indulge in experimentation, especially if that experimentation might encourage change. Consistent with both H5 and the inclusion of both planned and unplanned change in the work system life cycle model, Orlikowski and Hofman (1997) note relationships between an organization's culture and its ability to manage three different types of change in an organization: anticipated changes (what we call planned changes here), emergent changes (changes that arise spontaneously from local innovation) and opportunity-based changes (changes that are not anticipated ahead of time but are purposely implemented to take advantage of un unexpected occurrence). For example, in one application of groupware technology, a cooperative, team-oriented culture helped an organization take advantage of improved collaboration afforded by the new technology. In a different organization, the benefits were limited by incompatibility between the organization's competitive culture and the technology's capabilities for supporting collaboration.

Components of a Work System's Fit with Organizational Culture

The five hypotheses are all related to the fit between culture and systems but they say nothing about the components of that fit. Schneider's characterization of the four cultures (as summarized in Table 2) provides a number of immediate clues about whether a particular work system fits the surrounding culture. A work system whose leadership focus, management style, and organizational form are consistent with a particular culture should fit that culture particularly well. Similarly, a work system that enacts a particular culture's key norms and values probably fits the culture better than a work system that downplays or ignores those norms. For example, based on Table 2, a work system that emphasizes egalitarianism, involvement, and harmony would fit better in a collaboration (SF) culture than in a control (ST) culture, which is more consistent with an emphasis on objectivity, order, and standardization.

At the level of observable behaviors, clues about fit with a particular culture are revealed in typical work system activities, such as communication, operational tasks and

15

transactions, management activities, decision-making and coordination. These activities overlap in many situations. For example, coordination involves communication and decision making.   Nonetheless it is worthwhile to look at each of them separately because differences between cultures might result in different norms, values, or concerns when performing these tasks.

Table 3 identifies preferences that one would expect in relation to various work system activities based on Schneider's characterization of his four cultures. For example, it says that in a collaboration (SF) culture, communication activities tend to place more emphasis on enabling personal connection, whereas in a control (ST) culture, communication activities place greater emphasis on communicating facts, procedures, and goals rather than connecting with people.

The differences across Table 3 are differences of degree rather than kind, because collaboration cultures must also handle plans, procedures, and goals just as control cultures certainly have their share of connecting with individuals. However, in terms of understanding the impact of culture on work systems, the differences in emphasis between the different categories might provide useful insights about how systems operate and what types of changes they can absorb easily. For example, work system changes that try to facilitate broader participation in decisions would encounter fewer culture-based obstacles in a collaboration (SF) culture that prefers broad participation than similar changes would encounter in a competence (NT) culture that prefers applying the best knowledge regardless of who has it.

Table 3: Preferences in Typical Activities Based on Particular Organizational Cultures

Activity	Likely priorities or key concerns related to particular organizational cultures
Communication	**SF: Collaboration** • Facilitate collaboration by making it easy for employees to communicate with each other. • Communicate to create a wide range of involvement **ST: Control** • Communicate detailed plans, procedures, and goals. • Help managers contact subordinates at any time. • Establish and support specific communication patterns. • Discourage non-conforming communication patterns. **NF: Cultivation** • Communicate to create a wide range of involvement. • Support mentoring and empowerment of individuals. • Help employees find opportunities **NT: Competence** • Communicate to achieve higher levels of shared knowledge. • Communicate to obtain information from internal or external experts
Operational tasks and transaction processing	**SF: Collaboration** • Facilitate teamwork. • Make it easier for people to get help when they are having difficulty. **ST: Control** • Perform operational tasks based on defined procedures and standards, using real time feedback to catch likely mistakes and to control access to information • Automate highly structured tasks • Monitor the speed and accuracy of work. **NF: Cultivation** • Provide as much freedom as possible in performing operational tasks. **NT: Competence** • Assure the work is done in the best ways and that the best knowledge is applied
Management activities	**SF: Collaboration** • Support participative management approaches and share authority. • Make it easy for managers to communicate with each other and with their organizational subordinates and superiors. **ST: Control** • Help managers monitor productivity and work quality at a detailed level. • Provide managers factual information, especially timely, quantitative information about whether they and their departments are meeting plans and other expectations **NF: Cultivation** • Help managers help employees attain their potential. • Emphasize quality of work life, employee commitment, and other intangibles.

	NT: Competence • Make sure employees continually increase their expertise. • Provide models and trend extrapolations to help in understanding scenarios for the future.
Decision making	**SF: Collaboration** • Support cooperative decision processes with high levels of involvement **ST: Control** • Evaluate whether a possible decision or action would probably generate results within the desired guidelines. • Support analysis to identify and address out of spec conditions. • Automate decision making in highly repetitive situations that are susceptible to automated methods. **NF: Cultivation** • Be sure decision making considers personal and organizational values **NT: Competence** • Be sure decision processes use the best techniques and apply the best available knowledge • Capture expert knowledge and provide it to people doing work in which specific experts may have more experience or insight.
Coordination	**SF: Collaboration** • Support coordination by making sure everyone can participate fully in coordination efforts. **ST: Contro**l • Establish and maintain tight schedules and plans • Make sure all tasks are completed within schedule and evaluate impacts of slippages • Support consistency and conformance to standards. **NF: Cultivation** • Identify potential conflicts between organizational requirements and individual values and goals. **NT: Competence** • Support individual initiative in developing and trying out new ideas.
Knowledge and training-related activities	**SF: Collaboration** • Support sharing of knowledge through interpersonal means such as providing ready access to people who have the right knowledge. **ST: Control** • Test employees to make sure they have the right knowledge and skills. • Use computerized controls to catch likely errors related to skills, knowledge, or judgment. • Prevent knowledge from escaping. **NF: Cultivation** • Provide training and knowledge for personal development to assure attainment of personal values and goals.

	NT: Competence
	• Provide training and knowledge about best practices to make sure employees have leading edge knowledge and skills

Impact of Culture on Projects that Change Work Systems

According to H4, organizational cultures should also be reflected in the processes through which an organization builds, implements, and maintains work systems. Table 4 looks at each of the four phases of the WSLC in turn and identifies some of the differences in emphasis that might occur in the phases in the different cultures. As with the activities mentioned in Table 3, these are differences of degree rather than differences of kind. Nonetheless, if it is generally true that performing projects within the norms of an organization's culture are easier than performing projects using approaches that conflict with those norms, the differences revealed in Table 4 might help system development and implementation teams tailor their approach to the culture whose operations they are trying to support.

Table 4: Areas of special emphasis within phases of the work system life cycle based on differences in organizational cultures

Phase	Areas in which relatively more emphasis might occur based on the type of organizational culture
Operation and Maintenance	**SF: Collaboration** • Greater emphasis on teamwork and broad participation. **ST: Control** • Greater emphasis on formalized procedures and objective measures of performance. • Greater emphasis on making sure the work is executed according to standards and monitored tightly **NF: Cultivation** • Greater emphasis on helping individuals and the entire organization live up to their full potential **NT: Competence** • Greater emphasis on individual accomplishment and having the tools that support individual accomplishment • Greater emphasis on making sure the knowledge of the most expert individuals is fully used
Initiation	**SF: Collaboration** • Greater emphasis on input from everyone and making sure that everyone's views about the new project are heard and used. **ST: Control** • Greater tendency to adhere to the goals announced by the project sponsor.

	• Greater tendency to focus the project on immediate problems rather than on long term possibilities **NF: Cultivation** • Greater emphasis on how the proposed system might benefit the individuals in the organization **NT: Competence** • Greater tendency to view project initiation as a time to redefine the initial mandate in whatever way generates the greatest benefits.
Development	**SF: Collaboration** • Greater emphasis on input from everyone and making sure that everyone's views are heard. • Greater emphasis on developing tools that favor teamwork and coordination **ST: Control** • Greater emphasis on making sure that the old procedures are understood and that the new procedures are fully explained. **NF: Cultivation** • Greater emphasis on possibilities for personal growth and fulfillment. **NT: Competence** • Greater emphasis on doing the work in a better way and on possibilities for further improvements in the future.
Implementation	**SF: Collaboration** • Emphasize the need to work together effectively in making changes that will support future collaboration **ST: Control** • Greater reliance on hierarchy planning and executing the implementation • Greater emphasis on planning a direction and following the plan • Greater reliance on people who understand the current way of doing things and can explain exactly how to convert to the new way and exactly what are the impacts on work practices **NF: Cultivation** • Implementation efforts explained in terms of personal and organizational possibilities in the future **NT: Competence** • Greater emphasis on long term possibilities stemming from the new system • Implementation efforts explained in terms of best practices and application of the best knowledge

V. Connecting the Dots … Where Do Information Systems Belong?

Although researchers and practitioners in the information system field are often concerned about the impact of organizational culture on information system success or failure, the discussion thus far has focused on work systems and has avoided mentioning

impacts related to information systems. The focus on work systems was based on the belief that the mutual impacts between culture and systems are felt most strongly in work system activities, such as communicating, making decisions, and coordinating. Therefore the impacts of culture at the work system level should be more powerful and more direct than the impacts at the information system level.

This section brings information systems into the picture. It defines information systems as a special case of work systems and identifies some of the many forms of overlap between information systems and the work systems they support. Only then does it bring information systems into the picture by expanding Figure 3 and portraying information systems as being in the background because the work systems they support are more important than the information systems themselves and because the impacts of culture most directly affect the work systems.

Information Systems as a Special Case

Information systems[4] constitute a special case of work systems in which the business processes performed and products and services produced are devoted to information. Information systems typically exist to produce products and services used by other work systems that may or may not be information systems. The activities in their business processes are limited to six types of computerized or manual activities: capturing, transmitting, storing, retrieving, manipulating, and displaying information. These activities may be done using computers or networks, or using manual technologies such as pencil and paper. Examples of information systems include tracking systems used by package delivery companies, medical reimbursement systems used by insurance companies and governments, and architectural design systems used by architecture firms. In addition to processing information (with or without the help of IT), the participants in each of these information systems are also participants in larger work systems in which they perform other activities including communication, sense making, decision making, thinking, and physical actions. The distinguishing characteristic of information systems is that their business processes are mostly or entirely about information and the products and services produced consist of information.

Projects also represent a special case of work systems. They are work systems that are designed to produce a particular product and go out of existence.

Overlap between Information Systems and Work Systems They Support

In addition to being work systems in their own right, information systems typically exist to produce products and services used by other work systems that may or may not be information systems. The distinction between an information system and the work systems it serves is important because there are many possible relationships and forms of

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[4] This is one of many possible definitions of information system. Other definitions range from views of an information system as the processing of information on a computer through statements such as "an information system is a database" or "an organization is an information system."

overlap between the information system (IS) and the work system (WS). These include [Alter, 2002a]

- A comparatively small IS provides information for a WS but is not part of it. Example: An IS that collects production data and creates a file of production data used by the accounting department in its work system for closing the books.
- A comparatively small IS is a dedicated component of a WS. Example: A real time dispatching system that helps manufacturing workers decide which lot to process next in a factory.
- A WS is primarily devoted to processing information and the IS and WS are almost identical. Examples: billing system, payroll system, loan approval system.
- A single IS overlaps with several separate WSs. Example: An IS for sales call tracking might be used by the sales force for tracking sales progress and by the finance department for financial projections.
- A large IS tsupports a number of different WSs and might be larger than any of them. Example: An airline reservation system used for deciding what flights to take, booking reservations, setting yield management policies related to overbooking flights, and analyzing frequent flyer promotions.

The approach for designing either an information system or a work system it supports should depend on the degree of overlap between the two systems. For example, if a work system is largely an information system, the design of the work system would largely be an information system design effort. On the other hand, designing a work system and a related information system separately might be more effective if their business processes overlap minimally or not at all.

Organizational Culture, Work Systems, and Information Systems

Figure 4 illustrates a view of culture, work systems, and information systems that places information systems squarely in the background. It starts with a simplified version of Figure 3 and adds the information systems. Based on the previous paragraphs, the work systems and information systems are portrayed as partially overlapping. The representations of the information systems and the phases of building and maintaining the information systems have the same form as those for the work systems because information systems are also work systems on their own right. The information systems are in the background behind the related work systems because they support but do not perform the activities that organizational culture influences directly, such as communication, decision making, and coordination.
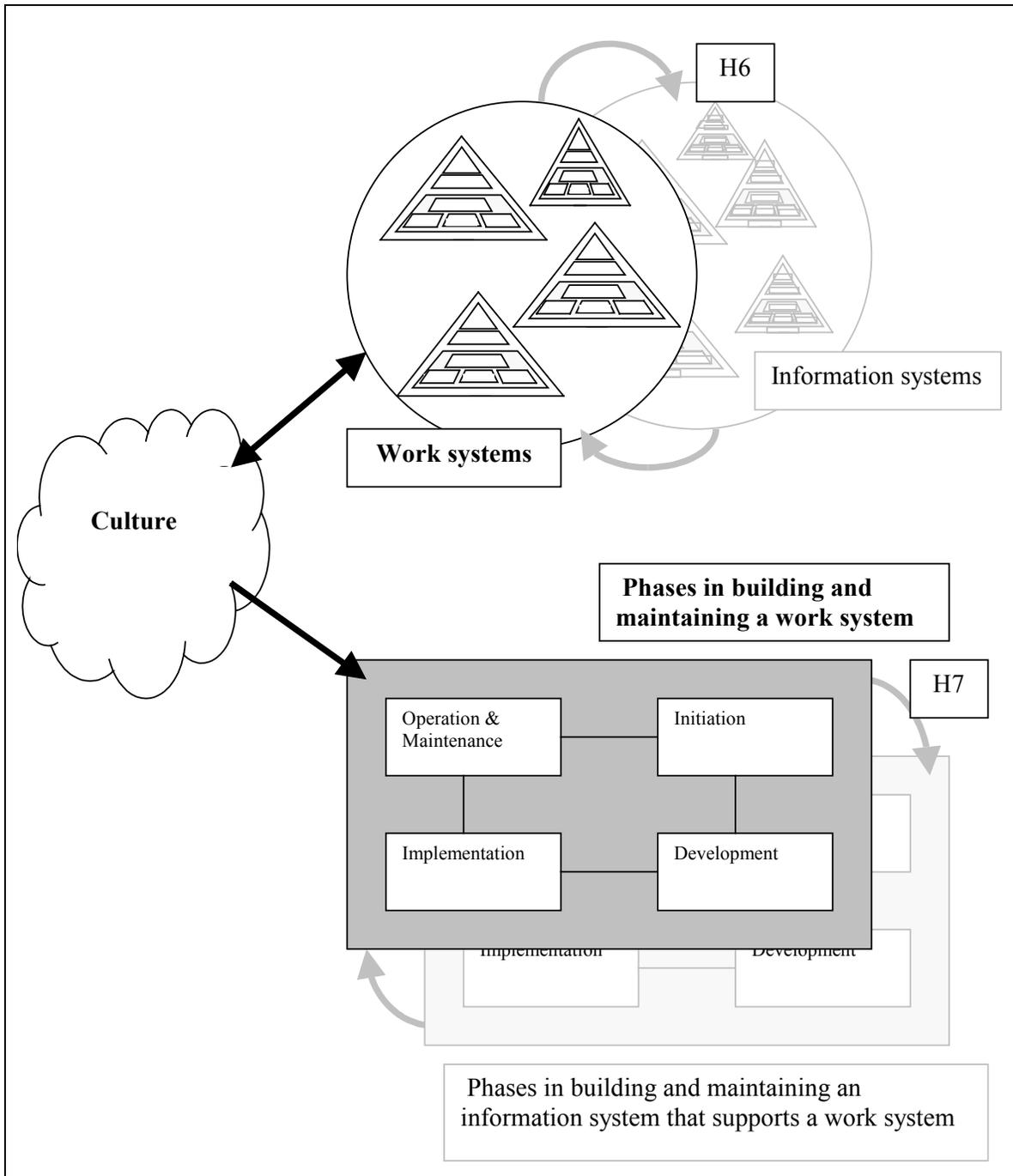
Figure 4: Impacts of Culture on Information Systems are Less Direct than Impacts of
Culture on the Work Systems They Support

The curved arrows between the work systems and information systems form loops that
are somewhat analogous to the structuration loop in Figure 3. In the top loop, work
systems determine the requirements for the information systems and the information
systems provide capabilities that help determine what the work systems can do. In the
bottom loop, the phases of building and maintaining any particular work system set the

context for how the information system is built and maintained, and the phases of the building and maintaining the information system are integral parts of the phases for the work systems being supported. The two new loops in Figure 4 lead to two additional hypotheses:

> *H6: Joint impact of culture and work system operation on information system innovations:* Information system innovations that fit both the work systems they attempt to support and the organizational culture encounter less difficulty than innovations that are poorly matched to the culture or the work systems or both.

> *H7: Joint impact of culture and work system change processes on information system change processes*: Information system change processes that fit both the culture and the change process for the work systems being supported encounter less difficulty than information system change processes that are poorly matched to the culture or the work system change process or both.

H6 and H7 are basically extensions of H3 and H4, which deal with mismatches between culture and the content of work system changes (H3) and with the process of creating and maintaining work system changes (H4). The additional factor in H6 and H7 is that the information system is a work system in its own right, but resides in the background behind the work systems it attempts to support. For information systems innovations and information system change processes, H6 and H7 describe the potential for a double whammy involving mismatches related to the organizational culture and the work system being supported. Individually or in combination, H6 and H7 explain some of the excessive difficulty that has occurred with many ERP implementations. In addition to difficulties related to cultural mismatch with the content of the desired work system change (H3) and cultural mismatch with the process of work system change (H4), H6 and H7 add further complication and confusion due to a mismatch between the information system, the existing or desired work system, and the organizational culture.

Table 5 illustrates some of the additional complications highlighted by H6 and H7. It presents one-sentence descriptions of typical system-related problems discussed in the IS implementation and usage literature. The corresponding entries in the second column are plausible explanations saying that at least part of the problem can often be found in a mismatch with organizational culture and/or a mismatch with the work system that is being supported.

Table 5: Hypothetical Examples of Culture-related Difficulties and the Plausible Explanations

Summary of hypothetical situation	Plausible explanation based on fit with culture and fit with existing work systems
A new model-based DSS for long range planning is not being used.	*Culture:* This type of model would fit best in a competence (NT) culture, but it is being installed in a control (ST) culture where the long range speculations about possibilities are not as valued as specifics about current reality. *Work systems*: The new model does not fit the existing work system for long range planning.

New communication tools were supposed to support broader participation, but previous, somewhat narrow communication patterns persist.	*Culture:* The assumption underlying the project was that greater participation is valued. The communication tools were installed in a competence (NT) culture that values access to the most knowledgeable expert more highly than broader participation. *Work system*: The existing work systems had narrow communication patterns
The implementation of an ERP system was encountering substantial resistance.	*Culture:* Although this was a control (ST) culture, the type of culture in which ERP fits best, changing procedures in this type of culture requires a great deal of explanation about why the procedures need to change and what effects the changes will have. *Work system:* The ERP software made it more difficult to perform some of the tasks within the existing work system.
A management information system that provides complete, real time information for managers seems to be very controversial.	*Culture:* It was installed in a collaboration (SF) culture in which information was shared extensively. Providing information for managers rather than for teams was contentious because it seemed contrary to the culture. *Work system:* The existing work systems for managing the organization did not include close monitoring.
A new DSS software suite provides numerous capabilities that are not being used.	*Culture:* The organization had a control (ST) culture that encouraged conformance to existing procedures. The new software was designed to support experimentation with new ways to do things. *Work system*: The work system did not use the capabilities the in new DSS suite and the participants saw little need to use them.
"We tried to cram ERP down their throats and they wouldn't swallow."	*Culture:* This happened in a competence (NT) culture that valued independence and expertise more than conformity and consistency. *Work system:* The current work system allowed groups and departments to operate autonomously.

VI. Conclusion: Conflict Avoidance or Conflict Management?

Almost anyone is the IS field would probably agree that an organization's systems should fit with its culture and that any significant mismatch between a system and an organization's culture usually spells trouble. This generalization makes sense on its face, is consistent with structuration theory, and is supported by numerous surveys and case studies that attribute system rejection or at least major difficulties to a mismatch between the organization's culture and the intended system functions.

As a step toward making organizational culture more visible in systems analysis and design, this paper tried to "connect the dots" between systems and culture by theorizing about the mechanisms through which systems and culture interact. Theorizing about these mechanisms is important if our understanding of systems and culture is to move beyond vague assertions that systems should fit organizational culture and frequent regrets about

problems and failure caused by non-fit. In particular, theorizing in this area might lead to understandings and methods for anticipating problems and taking corrective actions in the many situations where changes and innovations are needed despite their inconsistency with current organizational culture.

This paper developed seven hypotheses about systems and culture by combining a holistic view of organizational culture with a holistic view of systems in organizations. The holistic view of organizational culture was Schneider's characterization of four distinct organizational cultures based on two dimensions of Myers Briggs personality types. The holistic view of systems in organizations was Alter's work system framework and work system life cycle model. The work system ideas provided the basis of Figures 3 and 4, which illustrated the hypotheses. The characterization of cultures led to generalizations in Tables 3 and 4, which showed how differences in organizational culture might lead to specific preferences or tendencies regarding typical activities in organizations and regarding processes for changing systems. In combination, these ideas were used to explore the general form of relationships between systems and culture and to identify specific areas of potential fit or non-fit between cultural variables and system capabilities.

An underlying assumption throughout the paper was that use of holistic views (rather than a set of separate variables such as those in Table 1) is more effective as the basis of theorizing and more useful to practitioners because it provides richer models with broader implications. Although the two holistic views formed the basis of what we hope was a plausible argument, we offer no proof that these are the best holistic views for exploring the relationship between systems and culture. Schneider's four cultures cannot possibly encompass every factor that might be relevant in distinguishing different organizational cultures, but we believe it is remarkable that a theory-based 2 x 2 framework has so many implications for preferences and tendencies in organizations (e.g., Tables 3 and 4). Just as the complete Myers Briggs model includes four variables (2 x 2 x 2 x 2) that provide much more richness in understanding personal preferences and tendencies, it would certainly be possible to add variables to Schneider's model or to start from a different model. Similarly, other holistic views of systems in organizations might have been used. The main advantage of using the work system ideas was the inclusion of consistent, linked models of how a system operates during a particular period and how it evolves over time. We do not know whether different holistic views might have led to a richer set of hypotheses and a richer set of ideas for framing issues related to systems and culture.

Taken in its entirety, this paper argues for a number of main points:

    1. **<u>Relevance of system operation and system change</u>**: Organizational culture affects both how systems operate and how systems change over time.

    2. **<u>Indirect impacts on information systems</u>**: The direct impacts of culture are on work system activities such as communicating, performing operational tasks, managing, making decisions, coordinating, and performing knowledge-related

tasks. Impacts on information systems per se are less direct because most of the impacts occur at the work system level.

3. **<u>Indirect impacts of information systems</u>**: The impacts of systems on culture occur primarily through work systems in combination rather than through any particular work system, especially if it is comparatively small. The culture-related impacts of information systems occur mostly through the work systems they support and are largely accounted for in the work system impacts.

4. **<u>Excessive effort and resources, rather than failure</u>**: Mismatch between systems and culture sometimes contributes to difficulty or failure of systems or system-related projects. Because the measurement of success or failure depends directly on how high or low one sets the bar, it is more useful to think of the impact of a mismatch in terms of the amount of excess time, effort, and resources required to attain a given level of success. In general, the greater the degree of mismatch, the greater the excess effort. When the mismatch is extreme, the amount of effort required for success may be so high that the intended system or system changes are abandoned as impractical.

5. **<u>Impact of non-fit on benefits</u>**. If a current or planned information system's features and capabilities are inconsistent with the work system (and culture) it is supposed to serve, it is unlikely that the benefits will be substantial benefits unless the benefits are specifically related to changing important aspects of the work system (or culture).

6. **<u>Content of change and process of change</u>**: Impacts of culture on systems and system-related projects can be viewed in terms of separate issues related to content and process. The process issues concern whether the process of operating, building, or implementing the system is consistent with the surrounding culture. The content issues concern whether the goals, form, and operation of the system are consistent with the surrounding culture.

7. **<u>Adaptations and the invisible hand</u>**: The content of adaptations and experimentation tends to conform to the existing culture because adaptations contrary to the culture require too much effort.

The above points try to go beyond the easy generalization that systems should fit the culture, and that mismatches should be avoided because everyone knows that square pegs don't fit round holes. The easy generalization is insufficient because the competitive environment often dictates that systems and cultures must change regardless of whether the changes are difficult or uncomfortable. Truly valuable ideas concerning systems and culture involve ways to identify mismatches, anticipate the related difficulties, and then set a course for managing or ameliorating those difficulties.

Managing or ameliorating the mismatches requires identifying them before the difficulties escalate and developing approaches for attaining more favorable results even

if the current or proposed systems are inconsistent with the organization's current culture. Good diagnostics for identifying current or potential mismatches are certainly called for. Ideally, system-related research should provide help in identifying likely alignment and misalignment between organizational culture and system characteristics before systems are developed or implemented, thereby reducing the frequency of retrospective laments that "the system didn't fit the culture."

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Appendix 1: Definition of Elements in the Work System Framework

Business processes. The work performed within the work system can be summarized as one or more business processes whose steps may be defined tightly or may be relatively unstructured. Activities within each step may combine information processing, communication, sense making, decision making, thinking, and physical actions. As workplace researchers point out repeatedly, the actual operation of business processes often deviates from the idealized business processes that were originally designed or imagined. In addition, different participants may perform the same steps differently based on differences in skills, training, and incentives.

Participants. People who perform the work in the business processes are work system participants. Some may use computers and IT extensively, whereas others may use little or no technology. Whether or not particular participants happen to be technology users, when analyzing a work system the more encompassing role of participant is more important than the more limited role of technology user.

Information. Information includes codified and noncodified information used and created as participants perform their work. Information may or may not be computerized. Data not related to the work system is not directly relevant, making the distinction between data and information secondary when describing or analyzing a work system.

Technologies. Technologies include tools (such as cell phones, projectors, spreadsheet software, and automobiles) and techniques (such as management by objectives, optimization, and remote tracking) that work system participants use while doing their work. Even when substantially computerized, specific tools (such as cars) and techniques (such as use of checklists) may or may not be associated with IT in a particular situation. In terms of the framework, technologies are integral parts of the work system and their affordances (such as a cell phone affording mobility) are evident to system participants. In contrast, technical infrastructure includes computer networks, programming languages, and other technologies shared by other work systems and often hidden or invisible to work system participants.

Customers. People who receive direct benefit from products and services the work system produces include external customers who receive the organization's products and/or services and internal customers who are employees or contractors working inside the organization. According to TQM, a work system's customers are typically best able to evaluate its products and services. Customer satisfaction is often linked to the entire customer experience, starting from determining requirements and acquiring the products or services.

Products & services. Products and services are the combination of physical things, information, and services that the work system produces. They may include physical products, information products, services, intangibles such as enjoyment and peace of mind, and social products such as arrangements, agreements, and organizations. The terms products and services are used instead of "outputs" because that term brings too

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32

many mechanistic and computer-related connotations, especially when services and intangibles are involved.

Environment. Environment includes the organizational, cultural, competitive, technical, and regulatory environment within which the work system operates. These factors affect system performance even though the system does not rely on them directly in order to operate. The organization's general norms of behavior are part of its culture, whereas more specific behavioral norms and expectations about specific activities would typically be considered part of the business process.

Infrastructure. Infrastructure includes human, informational, and technical resources that the work system relies on even though these resources exist and are managed outside of it and are shared with other work systems. Infrastructure includes support and training staff, shared databases, telecommunications networks, programming technology, and the Internet.

Strategies. If they are articulated, the work system's and the organization's strategies may help in explaining why the work system operates as it does. Examples of work system strategies include assembly line versus case-manager and mass customization versus commodity or manual customization.