Complementary Use of Qualitative and Quantitative Cultural Assessment Methods

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The organizational cultures of two small manufacturers were analyzed using qualitative and quantitative assessment methods. This article describes not only how qualitative and quantitative data contributed to the validity of the results through triangulation but also how the qualitative and quantitative research paradigms were used in a complementary fashion to produce a more complete understanding of the organizational cultures. Using methods from both research paradigms enabled a greater understanding of cultural artifacts and behaviors but more important of the underlying cultural values and assumptions. Based on this experience, it is recommended that qualitative and quantitative methods be used to produce more robust results than could be accomplished using a single approach for cultural assessment.

Keywords: *organizational culture; mixed-methods research; cultural assessment*

Organizational culture can be assessed using either qualitative or quantitative research methods. Although qualitative and quantitative methods are often described as mutually exclusive, in a recent study of the effects of organizational culture on the implementation of cellular manufacturing, it was found that using a mixed-methods approach was beneficial. The purpose of this article is to describe the details of the cultural assessment techniques, compare the strengths and weaknesses of the qualitative and quantitative approaches, and provide advice for other researchers who are considering using a mixed-methods approach. It was discovered that a mixed-methods approach was valuable in two significant ways. Using qualitative and quantitative data allowed for triangulation of cultural factors, thereby reducing bias and increasing

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validity. Combining the qualitative and quantitative paradigms, in a complementary fashion, led to a deeper understanding of organizational culture, enabling analysis of the values and assumptions driving behaviors within the organizations.

Review of Methods Literature

The distinction between quantitative and qualitative research methods occurs on two levels. First, it is used to distinguish between different types of data or evidence. Quantitative data are "the numbers" collected through surveys or other measurement techniques. Qualitative data are "the words" collected through interviews, focus groups, participant observation, or related methods. The second level of difference is much grander; quantitative and qualitative methods are presented as two entirely distinct research paradigms.

The focus of qualitative and quantitative research is different. According to Morgan and Smircich (1980), the appropriateness of using qualitative or quantitative techniques depends on the underlying assumptions of the researcher and the nature of the phenomena to be studied. Based on these distinctions, the combination of qualitative and quantitative methods appears to be inappropriate, yet mixed-methods research is not uncommon.

According to Greene, Caracelli, and Graham (1989), there are three purposes for mixed-methods research: (a) triangulation, to corroborate data and obtain convergent validity; (b) complementarity, to more fully explain the results of analyses; and (c) development, to guide further data collection, sampling, or analysis. Although mixed-methods research is not new, considerable confusion persists due to differing interpretations of terms, particularly with respect to triangulation and complementarity. Some researchers use a very broad definition of triangulation that encompasses complementarity, whereas others, like Greene et al., distinguish the two as distinct purposes.

Articles written by Jick (1979) and Stake (2000) exemplify the broad definition of triangulation. Jick presents an example of qualitative and quantitative methods being used in conjunction to produce a more holistic or contextual description of the phenomena under study. He points out that the use of multiple measures can uncover a unique variance that may not have been revealed through a single method. The term *triangulation* is used by Jick to mean not only examining the same phenomenon from multiple perspectives but also increasing understanding when new or deeper insight emerges. Similarly, Stake maintains that triangulation is the use of multiple perceptions or observations to provide verification or clarify meaning. He explains that "no observations or interpretations are perfectly repeatable" (pp. 443-444); thus, analyzing the phenomenon from different perspectives automatically serves to clarify meaning.

A more common and narrow definition of triangulation is that it is a vehicle for cross-validation when multiple methods produce comparable data (e.g., Yin, 1994). The definition of triangulation used by Greene et al. (1989) is consistent with this narrower, common view, and they use the term *complementarity* to distinguish the additional purpose of clarifying meaning or more fully explaining results. A similar distinction between triangulation and complementarity is made by Sale, Lohfeld, and Brazil (2002). These authors argue that the qualitative and quantitative research para-

digms cannot be combined for the purpose of triangulation because the two paradigms are not studying the same phenomena. Because of the distinct assumptions underlying each mode of inquiry, the phenomenon of interest is intrinsically different. "For the quantitative researcher, a label refers to an external referent; to a qualitative researcher, a label refers to a personal interpretation or meaning attached to a phenomena" (p. 48). However, Sale et al. do believe the two research approaches can be combined if done for complementary purposes. They give the example of a qualitative study of the "lived experience" of burnout being used to inform a quantitative "measure" of burnout (p. 50).

To avoid problems inherent in the varying and abstract definitions of the term *triangulation*, Bogdan and Biklen (1998) recommend avoiding use of the term. The authors contend that a preferable solution would be for mixed-methods researchers to standardize their definitions of triangulation and complementarity, establishing and maintaining a clear distinction between the two concepts. Much of the debate and confusion surrounding mixed-methods research stems from confounding the differences between mixed-methods research that uses qualitative and quantitative data and mixed-methods research that encompasses both paradigms. The methodology employed for this research on cellular manufacturing mixes data and paradigms to produce more valid and robust results. Using qualitative and quantitative data contributed to the validity of the results through triangulation, and using a combination of the qualitative and quantitative research paradigms produced a more complete understanding of the organizational cultures through complementarity. The remainder of the article will define organizational culture, describe the research methods used for the cellular manufacturing (CM) study, and discuss how employing mixed methods had a significant impact.

Organizational Culture Perspectives

Values, Assumptions, and Behavioral Norms

The primary research objective was to identify key cultural factors that aided or hindered a company's ability to successfully implement manufacturing cells. Cultural factors were defined as values, assumptions, or behavioral norms. Schein's (1992) model of culture was used as the primary basis for organizing the analysis and describing the cultures. The three levels of Schein's model refer to artifacts, espoused values, and basic assumptions. According to Schein, understanding the basic assumptions of an organization is necessary to explain the artifacts and behaviors displayed, as well as the values declared. However, due to the difficulty of uncovering basic assumptions, an often-unconscious level of culture, behavioral norms were used as an additional type of cultural factor.

Behavioral norms are the ways in which organizational members are expected to act to "fit in" or "survive" within their organization (Szumal, 1998, p. 2). They are the unwritten rules that people are expected to follow. Shared behavioral norms lead to general patterns of work-related behaviors and attitudes that can be observed. This component of culture fits into Schein's (1992) model at the artifact level because behavioral norms are influenced by the shared values and assumptions within the organization.

View of Culture

According to Martin (1992), there are three social scientific perspectives that have come to dominate research on organizational culture: integration, differentiation, and fragmentation. From the integration perspective, it is assumed that content themes (e.g., norms, values, basic assumptions) can be identified that are shared by all members within the organization. Researchers using a differentiation perspective are suspicious of claims of organization-wide consensus and aim to identify subcultural boundaries. Within subcultures, content themes can then be identified. Finally, with the fragmentation perspective, the focus is on complexity and ambiguity. There are multiple interpretations that do not coalesce into a stable consensus. This research on cellular manufacturing was based on Schein's (1992) model of culture. Thus, the primary objective of the cultural assessment was to identify artifacts, values, and assumptions that defined a consensus within the organization. This approach fits within Martin's integration perspective. However, the assessment was done in such a way that the researchers were open to the possibility of subcultures emerging within the companies analyzed. Thus, the approach to cultural analysis was primarily from an integration perspective with some aspects of the differentiation perspective.

Method

A prospective exploratory case study approach (Yin, 1994) was used to examine the impact of organizational culture on the CM conversion process. The ultimate goal of the research was to identify key cultural factors that had a positive or negative impact on the process of converting from a traditional functional manufacturing system to CM. The research analysis and results are presented in a separate article titled "Cellular Manufacturing for Small Businesses: Key Cultural Factors That Impact the Conversion Process" (Yauch & Steudel, 2002).

Cultural assessment of the organizational values, assumptions, and behavioral norms was accomplished through qualitative and quantitative means. Of the three models for combined qualitative-quantitative research designs described by Creswell (1994), this research most closely fits the dominant/less dominant design, if considered from a data perspective. In this type of design, either the qualitative or quantitative portion of the study outweighs the other. This study relied most heavily on qualitative participant-observation data but supplemented it with quantitative survey results. If considered from a paradigm perspective, the research was primarily quantitative because the ultimate goal was to identify factors that could aid or hinder the implementation of CM for small manufacturers, a causal explanation generalized to a broader population. This distinction between the data and paradigm perspectives is addressed further in the discussion section, following an introduction to the two cases and a description of the methods used for cultural assessment.

Introduction to the Two Cases

The first step in selecting cases was to identify desired critical characteristics of the participating companies. It was determined that ideal companies would be new to CM so that CM will have had little or no previous influence on their organizational cultures. Also, management at the companies would already have made the strategic deci-

sion to convert from functional to cellular manufacturing, so they would be ready to implement one or more new cells. A proposal was mailed to 43 companies in 1998 (35 were members of a university center emphasizing manufacturing improvement; 8 others were selected based on a center member's recommendation or because of geographic desirability). An on-site meeting was held at 6 companies who expressed interest. It was explained to them that the authors would perform a dual role of consulting and research, providing them with CM analysis and improvement recommendations while also collecting data for the research. There was no cost to the companies other than their employees' time. Two companies agreed to participate following these meetings; they are identified with the pseudonyms Plastics Company (PC) and Beverage Equipment Company (BEC). Because this was exploratory and time-consuming research, it was decided that these 2 companies would be sufficient to learn a significant amount about the influence of culture on CM implementation.

PC is a privately held, nonunionized distributor and manufacturer of plastics products located in a suburban area in the Midwest. Their CM project focused on the thermoforming department, which employs about 15% of their total workforce. Financially, this department was described by management as "breaking even" in the recent past.

BEC, a small designer and manufacturer of food and beverage dispensing equipment (such as cappuccino, hot chocolate, and soup machines), is privately owned, nonunionized, and located in a small midwestern town. It has 11 major product families with many customized variations, resulting in thousands of component parts. Their CM project included all product families and the entire manufacturing process (fabrication and assembly). BEC employed approximately 55 people when the project began, dropping to 41 by the project's completion. The company was struggling financially due to increased competition and decreased sales. There were two layoffs in the 3 years prior to the project's start. While the project was taking place, the owners continued to restructure, with more layoffs occurring in the spring of 1999.

Research Timeline

Figure 1 shows the major events that occurred throughout the course of the research. As the methods are described in more detail below, it may be helpful to refer to the timeline.

Qualitative Cultural Assessment

Qualitative assessment of culture was accomplished through document review, participant observation, and group interviews.

Document review. The documents reviewed at PC included the employee handbook, sales literature, and the company newsletter. At BEC, the following items were reviewed: the employee handbook, sales literature, the company newsletter, and documentation for a performance measurement system.

Participant observation. Observations at PC entailed sitting in on meetings such as the weekly manager's meeting, attending a customer satisfaction workshop given to new employees, and observing production in the thermoforming area. Observations at BEC included sitting in on meetings such as the weekly production and engineering

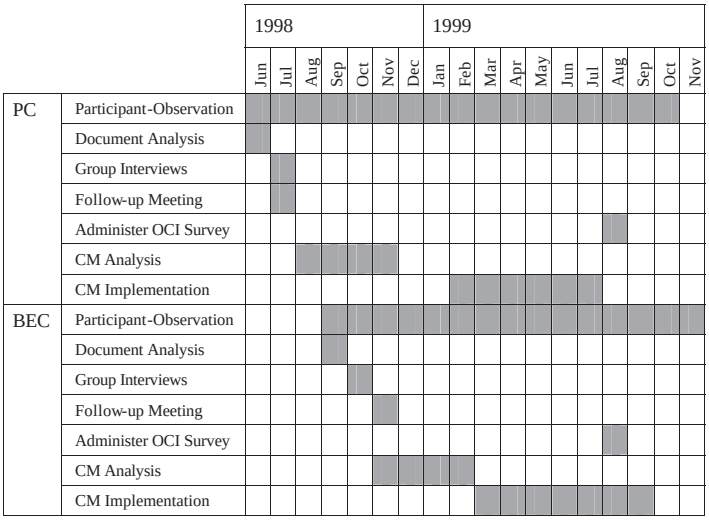

Figure 1: Research Timeline

Note. PC = Plastics Company; BEC = Beverage Equipment Company; OCI = Organizational Culture Inventory; CM = cellular manufacturing.

meetings, attending a monthly company-sponsored luncheon, and observing production in the fabrication and assembly areas. Participation at both companies came in the form of leading and conducting the CM analysis projects. Both companies intended to implement CM improvements. Data were collected and analyzed by the first author, and recommendations for improvement were made to each company. Following each company's selection of recommendations for implementation, active participation in the projects ceased, and an observational role was adopted from that point forward. Although even the act of observing can have an impact on the organization under study, a concerted effort was made not to interfere with their discussions or decisions.

Group interviews. Participants for three group interviews (upper management, middle management/functional support personnel, and shop-floor employees) were chosen from each company. Table 1 summarizes the demographic characteristics of the 22 PC and 24 BEC participants.

The primary purpose of the group interviews was to get input from employees and managers about unique aspects of the organization by asking them to explain the meaning of various cultural artifacts. The interviews were semistructured; the starting point was a list of artifacts and questions to ask each group (see the appendix for a sample of the artifacts and questions used), but if other issues were raised, those were also addressed. The list of artifacts was based on initial observations of the organization, with the hope that the selected artifacts would lead to discussion of the organization's values and assumptions. The choice of some artifacts was influenced by Schein's (1992) culture categories. For example, when questioning PC about meetings regularly starting late, the intent was to provoke discussion about the nature of time, and at BEC, bringing up the issue of separate parking areas was intended to reveal assumptions related to group boundaries. Many of the same artifacts were addressed in

Table 1
Demographic Summary of Group Interview Participants

	Plastics Company (PC)	*Beverage Equipment Company (BEC)*
Gender	16 men, 6 women	11 men, 13 women
Age (years)		
Range	23 to 57	23 to 60
Average	38.7	42.3
Race	21 White, 1 Black	24 White
Company tenure (years)		
Range	0.2 to 26	0.9 to 26
Average	9.2	8.3
Job level		
Top management	7	4
Middle management and support	7	10
Shop-floor workers	8	10

all three group interviews at a company, but in some cases, only one or two groups were asked to comment on a specific artifact.

Input from the group interviews was used to identify each organization's basic cultural assumptions. To present the assumptions, Schein's (1992) format for cultural paradigms was used. The paradigm is designed to show the key assumptions of the organization, as well as their interconnections, because it takes a combination of assumptions to explain the day-to-day behavior of organizations.

Member Checks

To validate the cultural paradigms, they were presented to management and employees at a follow-up meeting. The purpose of the follow-up meetings was to review the cultural paradigm with a cross-section of the participants to clarify and refine the cultural assumptions and obtain input on whether they thought the assumptions would aid or hinder their efforts to implement CM. At the time, each paradigm was presented as a set of assumptions that pertained to all members of the organization. The assumptions were later reconsidered to clarify the distinctions between employees and managers. Each of the assumptions was then assigned a reference group (employees, management, or both).

Quantitative Cultural Assessment

The Organizational Culture Inventory (OCI) (Cooke & Lafferty, 1987), a cultural assessment tool from Human Synergistics/Center for Applied Research, was used as an additional measure of organizational culture at each company. The OCI is designed to provide a snapshot of the organization's culture by measuring 12 sets of behavioral norms (referred to as cultural styles). The OCI instrument has been tested for reliability and validity and found to be a dependable means of assessing the normative aspects of culture (Cooke & Szumal, 1993; Xenihou & Furnham, 1996).

Respondents, answering questions on a paper-and-pencil survey, are asked to consider to what extent they or people like them are expected to follow certain behavioral norms to fit in or meet organizational expectations. The answers range from 1 (*not at all*) to 5 (*to a very great extent*). The combined results of survey respondents show the shared behavioral expectations that operate within the organization. The survey contains 120 total items, 10 items for each of 12 cultural styles. The survey was administered at each company to a random sample of managers and employees that had been employed there at least 6 months. To ensure that all surveys were completed and returned, the first author facilitated the survey sessions. At PC, the quantitative assessment was accomplished by administering the OCI to 26 employees selected randomly from 74 eligible employees. The surveys were administered in four sessions held the same day. At BEC, 17 employees, selected randomly from a pool of 41 eligible employees, completed surveys that were administered in two sessions about 10 days apart.

Audit of Cultural Assessments

An independent reviewer, an industrial engineer with research training and experience in qualitative methods, audited the cultural assessments for PC and BEC. The objective of the audit was to increase the validity of the analysis by obtaining an unbiased view from someone who did not participate in the project. The auditor was presented with case evidence from PC and BEC (directly from interview transcripts, observation notes, or OCI results) that supported the cultural evaluations. After reviewing the evidence, the auditor found it to be compelling. Thus, he agreed with and validated the assessment of each company's culture.

Discussion

The strengths and weaknesses associated with qualitative and quantitative assessments of culture are summarized in Table 2 and discussed in the following two sections. The third part of the discussion elaborates on the significant impact of using mixed methods for this research. The discussion concludes with advice and suggestions for other researchers conducting cultural assessments.

Strengths and Weaknesses of Qualitative Approach

The primary strength of the qualitative approach to cultural assessment is the ability to probe for underlying values, beliefs, and assumptions. To gain a full appreciation of an organization, it is necessary to understand what is driving their behavior. This type of underlying reasoning is typically not pursued with a quantitative approach. With respect to Schein's model, quantitative methods could be used to investigate artifacts or values but not assumptions. The other great benefit with a qualitative approach is that the inquiry is broad and open-ended, allowing the participants to raise issues that matter most to them. The qualitative researcher typically does not have a preconceived, finite set of issues to examine.

The major drawbacks associated with qualitative cultural analysis are (a) the process is time-consuming, and (b) a particular, important issue could be overlooked. For this research, 2 to 3 weeks were spent observing each company before conducting

Table 2
Strengths and Weaknesses of Qualitative/Quantitative Cultural Assessment

	Strengths	*Weaknesses*
Qualitative approach	Ability to probe for underlying values, beliefs, and assumptions	Time-consuming process
		An important issue could be overlooked; observations and results depend on interpretation(s) of a positioned subject(s)
	Broad, open-ended inquiry; participants can raise issues that matter most to them	
		An important issue could be overlooked; participants have more control over the process
Quantitative approach	Rapid data collection and analysis	Some respondents may not be able to read/understand the questions
	Facilitates comparison	Interpretation is not discussed; it is left to the respondent's discretion
		An important issue could be overlooked; focuses only on preconceived issues and concepts
		Assumptions must be made about the appropriate group or groups to sample, depending on the view of culture (integration, differentiation, or fragmentation; Martin, 1992)

group interviews. In total, involvement with each organization lasted approximately 1.5 years, enough time to personally verify the cultural assessments. The second potential problem is that a particular issue could go unnoticed. All researchers' interpretations are limited. As positioned subjects, personal experience and knowledge influence the observations and conclusions. Also, because qualitative inquiry is generally open-ended, the participants have more control over the content of the data collected. A critical issue to the researcher may not arise if it is deemed unimportant to the participants or intentionally covered up by them.

Strengths and Weaknesses of Quantitative Approach

The quantitative (survey) approach has two significant advantages. First, it can be administered and evaluated quickly. There is no need to spend time at the organization prior to administering the survey, and the responses can be tabulated within a short timeframe. Second, numerical data obtained through this approach facilitates comparisons between organizations or groups, as well as allowing determination of the extent of agreement or disagreement between respondents.

The weaknesses inherent in a quantitative approach also need to be considered. One major problem that surfaced with administration of the OCI during this research was the inability of some participants to read and understand the survey questions. There

were a few respondents for whom English was a second language, and 1 of them was assertive enough to ask questions about the meaning of words used in the survey. It was difficult to answer his questions without influencing his response to the survey item. Also, this was probably not an isolated occurrence—other respondents likely experienced problems due to language or reading abilities. Although the OCI is available in other languages, this problem was not anticipated prior to administering the survey.

A related problem with the survey was in the interpretation of the questions. Some respondents complained about not being sure how to interpret some of the questions, claiming that their answer would swing to one extreme or the other depending on the interpretation. This represents the most serious problem with a quantitative survey approach—no data are obtained about the underlying reasoning behind the answers. Without understanding the respondent's reasoning or logic, one cannot be confident that he or she interpreted the question the way it was intended. Furthermore, a thorough understanding of the organizational culture, at the deeper levels of values and assumptions, cannot be obtained.

As with qualitative methods, a quantitative assessment might also neglect an important issue but for a different reason. Because only the items contained on the survey instrument are examined, a unique observation related to the particular culture could easily go unnoticed.

A final concern is that prior to administering the survey, some assumptions must be made with respect to cultural integration. If one uses an integration perspective (Martin, 1992) and assumes that the culture is homogenous for the entire organization, it follows that the input you receive from a representative sample of employees is presumed to reflect that of the entire organization. If one suspects that there are subcultures, the survey must be administered to a representative sample from each one. A significant improvement could have been made for administration of the OCI at BEC if enough people from the fabrication (Fab) subculture had been surveyed to enable comparisons with the rest of the organization. If one begins from a fragmentation perspective, a survey such as the OCI is not going to reveal the desired complexity and ambiguity.

Impact of Using Mixed-Methods Approach

Two examples from the CM study help to explain the differences between qualitative and quantitative cultural assessments and the significant benefits that can be achieved using a mixed-methods approach. The examples are two cultural factors that were found to have a negative impact on implementation of manufacturing cells: Avoidance at PC and Rigid Group Boundaries at BEC. The Avoidance factor was identified through the qualitative and quantitative cultural assessments, whereas the Rigid Group Boundaries factor was only identified using the qualitative approach.

Avoidance refers to the tendency for organizational members to shift responsibility to others and avoid the possibility of being blamed; this behavior was found to be prevalent at PC. Although the behavior was observed prior to administration of the OCI, the survey results placed a clear label on the factor, explained the behavior more precisely, and served as triangulating evidence of the cultural characteristic. The essential element added by the qualitative analysis was the ability to reveal the beliefs and assumptions underlying the avoidance behaviors. From the viewpoint of employees, they feared being blamed for mistakes. As one support employee put it, "[Managers]

only seem to come around when there's something wrong" (Yauch, 2000). Management's tendency to identify and punish mistakes, while ignoring good work, often led employees to shift responsibility and avoid taking action.

From the viewpoint of managers, the reasons behind their negative behaviors were initially not as clear. Two key assumptions were revealed that help explain why managers at PC reinforced the avoidance behaviors of employees. First, managers believed that a job well done was just part of the job. At a meeting conducted with a vice president, plant manager, and supervisor in the spring of 1999, the plant manager admitted that he does not generally praise employees. He said that "most of what he sees employees doing is part of their jobs . . . they [employees] may think they're putting in extra effort, but I think it's part of their job" (Yauch, 1999). In general, the PC managers did not feel that extra attention or rewards were necessary for completing the job the employee was hired to do. Second, managers believed that the employee's peer group had more influence than management did. For example, in November 1998, a vice president stated in a meeting that employees "don't care what I think, peers create the standard" (Yauch, 1999). In the same spring 1999 meeting referred to above, managers said they wanted a "team atmosphere and peer pressure to take care of these things [employees hiding scrap and failing to address problems]" (Yauch, 1999). The managers at PC failed to appreciate their significant influence on the behaviors of employees. This assumption contributed to their tendencies to ignore good work and punish mistakes.

The avoidance behavior at PC had been observed prior to administration of the OCI, but the survey helped to label the behavior and provided additional, or triangulating, evidence of the cultural factor. In this example, the use of mixed methods served the purpose of triangulation if thought about from a data perspective. The qualitative and quantitative evidence were found to converge on the Avoidance factor. If considered from a paradigm perspective, the qualitative methods provided a much richer, contextual understanding of the underlying beliefs and assumptions. The interviews and observations not only revealed what behavioral norm was in place at PC but also why it was occurring from the perspective of employees and managers. This enhanced understanding would have been impossible to achieve if only the quantitative analysis had been done.

Rigid group boundaries exist in organizations where members have created barriers between distinct groups that make it difficult for people to move between and interact with each other. This cultural factor, identified at BEC, was not revealed by the OCI because the survey instrument does not ask questions pertaining to this issue. Instead, Rigid Group Boundaries was identified through two qualitative methods: participant-observation and group interviews. The Fab employees at BEC were notably distant from the rest of the organization. This was revealed by noting interactions between people and observing that Fab employees parked in a separate area, tended to stay in their work area, and did not mingle with other employees at a company luncheon. When questioned about this in a group interview, one of the company owners stated, "They've got their own rules . . . their own little group, they do their own little thing" (Yauch, 1999).

The only way the OCI might be able to get at the existence of group boundaries is if it is administered to a representative sample from different groups within the organization and their behavioral norms are revealed to differ significantly. Used in this fashion, the survey could provide a means of triangulation, if the results are consistent with

qualitative data, or complementarity, if the results are inconsistent. Some prior knowledge of the organization and potential subcultures would be necessary to accomplish this. For the administration at BEC, a random sample was selected from the entire organization. The random sample only included 1 individual from Fab, so it was not possible to do a comparison between that department and the remainder of the company. The OCI may be helpful at analyzing differences between groups once they have been identified, but the boundaries must first be identified using qualitative analysis or some other assessment technique.

Using a mixed-methods approach had a significant impact on this research from the data and paradigm perspectives. The following sections will focus the discussion on lessons learned and suggest ways that other researchers can capitalize on our experience with respect to timing, triangulation, and complementarity.

Advice for Other Researchers

Timing. For this research on CM implementation, a significant amount of qualitative analysis (11 to 14 months) was conducted before administering the OCI. This delay is a potential limitation of the research because the companies' organizational cultures might have changed somewhat during that period of time, especially since a change project related to CM was ongoing. One piece of evidence suggests that cultural change in this timeframe may not be significant enough to impact the cultural assessment. Research conducted by Cooke and Szumal (1993, p. 1312) on the test-retest reliability of the OCI indicates that cultural profiles are "stable over time," even when organizations are actively pursuing change. Cooke and Szumal caution, however, that this should not be interpreted to mean that cultural change is impossible. They found some positive cultural changes that were consistent with management development programs initiated by the organization in question. Despite the long delay between beginning the qualitative assessment and administering the survey, the OCI was an important means of triangulation for two of the cultural factors identified and had the potential to reveal additional cultural dimensions that the qualitative analysis might have missed.

The authors believe that the best approach for using qualitative and quantitative cultural assessments is to conduct a qualitative assessment first for a period of at least 2 to 6 months. Then, the knowledge gained from the qualitative assessment can be used to select the best quantitative instrument and administration methods. Which quantitative instrument is best depends on whether a researcher is aiming for triangulation or complementarity. If the primary goal is to increase validity, an instrument should be selected or developed that specifically asks about the cultural aspects of the organization that have been identified through the preliminary qualitative work. If the primary goal is complementarity, an instrument should be selected or developed that probes for new cultural factors. Selecting the OCI for the CM study enabled both goals, triangulation and complementarity, to be partially accomplished. The survey results reinforced some cultural factors and also highlighted additional cultural issues that had not yet been revealed. If aiming to achieve both goals, then the quantitative instrument selected or developed should contain some questions that directly overlap and some that do not.

The qualitative insights gained prior to the quantitative survey could also lead to changing the administrative procedures employed. For example, the OCI would have

helped assess the cultural differences between the Fab department at BEC and the remainder of the company. In hindsight, it would have been better to administer the survey to a representative sample of Fab employees for comparison purposes.

Sieber (1973) agrees that conducting qualitative fieldwork prior to survey research can significantly aid in the development of a meaningful survey. However, he also states that surveys can be helpful prior to fieldwork by identifying representative and unrepresentative cases. Researchers interested in organizational culture could benefit from using a survey as a selective device to identify cases that fit desired characteristics. A significant problem, however, could arise if a quantitative cultural assessment is done first: It could bias the qualitative analysis through knowledge of the results of the quantitative survey. If a survey is administered prior to the completion of qualitative observations and analysis, the results should not be revealed to those making the observations.

Triangulation. The key cultural factors found to have an impact on the implementation of CM at the two companies were revealed through a combination of qualitative and quantitative data collection techniques: group interviews, observation, individual interviews, and the OCI. Table 3 summarizes the key cultural factors identified and the cultural assessment technique used to reveal them. A separate article provides a detailed explanation of the key cultural factors and their impact on conversion to CM (Yauch & Steudel, 2002).

Two significant observations can be made regarding triangulation. First, Table 3 shows that the OCI was not used to identify any of the key cultural factors for BEC. This is because the OCI results for BEC did not show a predominant cultural style but rather a mixture of moderate expectations. For companies such as BEC, the OCI survey may not be the best assessment tool. In general, one or more of the data collection techniques may not add significant information to results or interpretation. Second, the OCI was instrumental in labeling the Avoidance factor at PC and helped verify and improve the depth of understanding for other cultural factors.

A researcher will most likely not be able to predict prior to his or her study what the best cultural assessment or data collection techniques will be. For this reason, using at least three different data collection methods is recommended to ensure that enough data is available for triangulation. The emphasis here is on quantitative and qualitative data being used for triangulation. Using mixed methods to acquire data can increase the validity of the results. From a paradigm perspective, using mixed methods can produce complementary results.

Complementarity. One of the things learned from doing this research is that assessing the complex nature of organizational culture makes it extremely difficult to work strictly within the quantitative or qualitative research paradigm. Using a combination of qualitative and quantitative techniques revealed different aspects of the organizational culture. Although the quantitative analysis identified behavioral norms for the organization as a whole, the qualitative analysis was necessary to get at the underlying reasons for this behavior. Thus, the use of mixed methods created a deeper understanding of the organization.

Sale et al. (2002) argue that mixed methods can only be used for complementary purposes and not for triangulation because qualitative and quantitative researchers are not studying the same phenomena. The authors agree with this statement because Sale

Table 3
Cultural Assessment Methods Used to Identify Key Cultural Factors

	Cultural Assessment Method			
	Qualitative			*Quantitative*
Cultural Factor	*Group Interviews*	*Observation*	*Individual Interviews*	*OCI*
PC				
Underorganization	X	X		
Avoidance	X	X	X	X
Lack of mutual respect and trust	X	X	X	
Crisis urgency	X	X	X	
Complacency	X	X	X	X
BEC				
Rigid group boundaries	X	X		
Overemphasis on core activities		X	X	
External customer focus	X	X		

Note. PC = Plastics Company; BEC = Beverage Equipment Company; OCI = Organizational Culture Inventory.

et al. make it clear that it refers to the distinction between research paradigms. The qualitative assessment techniques used for the CM study revealed different and deeper aspects of the organizational cultures at PC and BEC. Where triangulation occurred, as described in the previous section, it was done at the artifact level of culture. For example, there was converging evidence that avoidance behavior occurred. This level of culture can be examined by operating within the quantitative paradigm. It was only when examining the deeper levels of culture to explain why the behavioral norms and cultural artifacts existed where the research crossed into the qualitative paradigm, endeavoring to understand the lived experience of the research subjects. This blending of research paradigms was not fully conscious while conducting the research. It was only after reflecting on the results and the differences between the two paradigms that it became clear that both research paradigms were needed to accomplish the research objectives. Defining key cultural factors at the artifact level fit within the quantitative research paradigm, whereas the qualitative paradigm was needed to investigate the lived experience of managers and employees within the organization at the level of values and underlying assumptions.

Conclusions

The case studies at PC and BEC demonstrate why a combined qualitative and quantitative approach to cultural assessment, from the data and paradigm perspectives, produces better results than a single approach. The OCI was added to the research to strengthen its validity, specifically at the artifact level. The survey provided a means of triangulation for the measurement of behavioral norms and reduced the impact of personal biases on that part of the analysis. The set of cultural factors that was obtained by using qualitative and quantitative methods was more comprehensive than what would have been achieved through a qualitative assessment alone. The qualitative research—

our efforts to understand the lived experience of employees and managers and reveal the values and assumptions underlying their behavior—provided a deeper understanding of culture in these two organizations. By mixing methods at the data and paradigm levels, one can achieve a more complete understanding of the complexities of organizational culture. The results are more robust: Greater validity is accomplished through data triangulation, and greater cultural understanding, with respect to scope and depth, is attained through paradigm complementarity.

Appendix
Sample of Planned Group Interview Artifacts and Questions

Artifacts to Use in Group Meetings at (Plastics Company), Week of July 6, 1998

1. Certain doors are locked, require a special bar code to get through them. (upper management, middle management/functional support personnel, shop-floor employees)
   - Why are they locked?
   - Who is allowed to go through them, who is not allowed?
   - What other solutions to the "problem" were considered?
   - What does this say about [Plastics Company]?
   - What are the values or beliefs that led to this?
4. Meetings start late regularly. (upper management, middle management/functional support personnel)
   - Why do people regularly come late to meetings?
   - What does this say about them?
   - What does this say about [Plastics Company]?
7. Reluctance to make or enforce policies (e.g., can't make an overall policy for shipping charges when partial shipments are made; minimum billing amounts are not enforced). (upper management, middle management/functional support personnel)
   - Why is this?
   - What values or beliefs are implied?

Artifacts to Use in Group Meetings at (Beverage Equipment Company), Week of October 12, 1998

2. Separate parking area. (upper management, middle management/functional support personnel, shop-floor employees)
   - Is there more than one parking area? Who parks where and why?
   - Does this make them separate? Less a part of the [Beverage Equipment Company] team/family?
   - Does Fabrication (Fab) have a separate environment/climate/atmosphere?
3. Movement/flexibility on assembly line. (shop-floor employees)
   - What do you think of the movement from station to station or line to line in assembly?
   - What are the benefits and drawbacks of this?
   - Do you think it's good for [Beverage Equipment Company] to be flexible? Why?

5. Meetings start 5 to 10 minutes late. (upper management, middle management/ functional support personnel)
   - Do meetings start late regularly?
   - Do you think there is a problem with meetings starting late?

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