

Do Meta-Standards Help Pave the Rural High Road? Firm Strategies Surrounding ISO 9000 Certification

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Introduction

A critical concern in rural areas is whether the large number of manufacturing jobs created over the past half-century will remain there for long in the next century. Increased globalization combined with incessant technological progress suggest that the low-skill, routinized labor process of traditional rural manufacturing will either move offshore in search of lower labor costs or become obsolete. While the traditional cost advantages of rural production are being eroded by globalization, it is often assumed that rural manufacturers will be unable to develop capabilities needed to participate in the New Competitive Environment—i.e., capabilities to deliver exactly what is demanded, exactly when demanded, with zero defects.

If rural manufacturers fail to develop competencies in this new way of doing business, then the outlook for these establishments and their workers is dire. Prescriptions in the rural development literature often admonish localities to follow “high-road strategies.” These strategies include investment in human capital and physical and technological infrastructure allowing local businesses to compete on the basis of design, delivery, and quality, in addition to price. Firm capabilities become the basis for comparative advantage rather than a narrow focus on price, with its concomitant downward pressure on wages. Despite the considerable developmental advantages that the “high-road” provides over the “low-road” alternative, there is as yet little evidence of where and when they are successful.

But arguably the most critical requirement in this new business environment is the demonstrated ability to perform as promised. Additional investments in physical and human capital may be important components in this transformation, but alone, they are not enough. Plants must be able to “Say what they do and Do what they say” in a manufacturing discipline that is maintained through time. Having highly skilled workers and advanced machinery is no guarantee that a firm will consistently apply a coherent set of processes. Lacking this, firms cannot credibly claim to perform as promised.

Structuring and maintaining just such an organizational discipline are the principle objectives of the International Organisation of Standardization’s Series 9000 Quality Assurance Standards (ISO 9000). The framework of this discipline is simple, even though actual implementation may require a considerable investment of time and resources:

- document all work instructions, procedures and policies that affect quality
- adhere to these documented procedures
- on a periodic basis, demonstrate to a third party auditor that the organization “Says what it does and does what it says.”

However, it would be naïve to suggest that all establishments registered as ISO 9000 compliant are able to perform as promised to the satisfaction of their customers. Since ISO 9000 does not define any outcome standards, a firm may comply with the standards by documenting consistent procedures for manufacturing a poor quality product. Alternatively, depending on the rigor of the third party auditor, a firm may be able to register to the letter—but not the spirit—of the standards. In either case, registration would not indicate an ability to participate fully in the New Competitive Environment.

A critical concern is the prevalence of rural manufacturers that seek registration solely as a credential versus those seeking registration as a way to meaningfully demonstrate an ability to perform as promised. If registration does result in the substantive transformation of business practice, then there may be positive spillovers for wider rural development concerns.

This report summarizes discussions with quality control managers at 62 rural manufacturing plants within the TVA service area regarding the motivation for registration, changes in business practice required to conform with the standards, and the benefits and costs associated with registration. In terms of wider rural development concerns, the interviews also focused on three topics from the outset:

- changes in the relationships with workers and the value of the work experience
- changes in the geographic and industrial diversification of customer contracts
- changes in internal operating efficiency

In the course of the study, it also became apparent that registration may have other important implications for rural development. Documenting processes may be essential to establishing a reliable benchmark for meaningful continuous improvement processes. The interviews also suggest that low-skill intensive plants undergo the greatest transformation in preparing for their quality control registration. While both of these findings are suggestive, the study design was not well suited to a critical examination of these issues. But the study is able to confirm that these issues are productive avenues for further research and provides insight into how such studies could be structured.

Study Background

Rural areas within the Tennessee Valley Authority service areas having a relatively high prevalence of certified firms were chosen using the *ISO 9000 Registered Company Directory* (McGraw-Hill 1998) and data supplied by *Quality Digest*. Interviews with quality control managers in registered plants were conducted in the Tupelo, MS area; the Wytheville/Dublin, VA area; the Morristown/Greeneville, TN area; in the Blue Ridge region of Western North Carolina; in the Gainesville, GA area and in south central Kentucky. In all, 62 quality control managers were interviewed over the course of the study. In smaller plants, the owner or plant manager often played the role of quality control manager. Characteristics of the plants are summarized in Table 1 at the end of this paper.

It is important to remember that “representativeness” is not a productive objective for case study research, as the results do not strive for generality as is typical in quantitative research. Rather, the statistics provide the reader with information regarding the variation in context across the case study interviews.

The interview protocol was structured around specific topics of discussion. However, responses were open-ended. At the conclusion of each interview respondents were asked if there were other topics they thought were relevant to the subject not discussed in the

interview. A summary of the interview topics is provided in the Appendix 1.

The interviews ranged from 45 minutes to 2 hours with most interviews lasting more than 1 hour. The interviews were transcribed and coded using Ethnograph 5.0 qualitative data analysis (QDA) software to help organize detailed data on the quality systems at 62 manufacturing facilities. QDA facilitates the organization of large amounts of textual data that has been indispensable to the current research. However, the full capabilities of the QDA software for analyzing textual data are not exploited in the present report. The current interest is in reporting the range of responses and to identify any modal response. Additional coding and analysis of the qualitative data will allow examining the specific contexts that support specific decisions or particular outcomes to be completed in future work.

A Description of the ISO 9000 Quality Control Standards

ISO 9000 as a quality control standard is—strictly speaking—a misnomer. Rather, ISO 9000 is better understood as a process standard. The process, most simply, is to “Say what you do and do what you say.” The standards require documentation of all the actual processes involved in a given economic activity that may affect product quality. The value of the standards is to explicitly define the range of activities that must be documented, extending from contract review, through training and work instructions, processes for preventive and corrective action, processes for dealing with nonconforming product, statistical process control and extending to customer service.

Complying with the standards enforce consistency in how the firm operates across a wide range of activities. Consistency is critical “on the ground” as it is the first prerequisite for bringing a manufacturing process “under control” in the quality control sense of the term. This means that individual elements of the process are documented and adhered to so that it is possible to identify root causes of a nonconformance or performance failure.

This ability results in an additional value to the standards: with a process under control, adhering to the process as stipulated engenders accountability of the various parties involved. Nonconformance is no longer regarded as the result of idiosyncratic behavior—or the

compounding of inconsistent behavior over a number of departments or work groups. Rather, it is now possible to work through the stages of the process to determine whether a nonconformance stems from failure to adhere to a procedure or from a systematic weakness in the documented procedures.

The final value provided by the standards is transparency. An outside party viewing the quality manual is capable of assessing whether the processes and work instructions in place are adequate to ensure the level of quality specified in a contract. It is here that the seeming “vacuity” of the standards becomes moot. It makes no difference whether one believes that the documented processes are insufficient to provide a minimum level of quality. The only opinion that matters is that of the customer. The standards essentially give teeth to *caveat emptor*—ISO 9000 is not a warranty of good quality but it does allow the buyer to assess whether the processes in production are capable of meeting the quality specifications of a particular contract.

From the ISO 9000 Framework to a Quality System

Given the fact that it is possible to “go through the motions” of complying with the ISO 9000 standards without substantively affecting the quality control capabilities of a firm, it is important to outline the activities that put some flesh on the ISO framework. These activities—in combination with the ISO framework—do comprise a “quality system” and result in a transformation of business practice. This is particularly the case in the low-skill intensive environment that traditionally has not documented procedures and has been characterized by a hierarchical command-and-control management philosophy. These activities include means by which ownership of the quality manual and work instructions are imbued throughout the organization; interaction is facilitated within and across departments and work groups; and mechanisms for continuous improvement are built explicitly into the quality manual.

Ownership

The principal method for establishing ownership of the quality manual is to have workers directly involved with a particular task write the work instructions. In this way, the

work instructions become a reference of best practice that is often arrived at after considerable debate and evaluation among workers, between shifts, and between production and supervisory personnel.

In contrast, a management-imposed set of work instructions casts the instructions as subordinate, but essentially parallel, to the verbal authority of the supervisor. This latter case essentially extends the weaknesses of command-and-control management practices without deriving any of the benefits of documenting procedures. First, with no sense of ownership, adherence to the work instructions is again dependent on the persuasiveness or coercion of the worker’s immediate supervisor. Second, since they are imposed from above, the work instructions are not able to incorporate information generated by those actually doing the task. And finally, since the workers were not involved in the formulation of the work instructions they feel neither competent nor obligated to suggest improvements in the initial instructions.

By comparison, ownership that stems from the formulation of work instructions at the operational level usually results in a higher level of adherence with less supervisory effort, and incorporation of the richest source of local information. Ownership also provides a mechanism for continuous improvement stemming from lessons learned at the operational level.

Interaction

Interaction between departments and between the front office and the shop floor can also be satisfied with “lip service” to the standards without any real effect on the operation of the plant. Indeed, particular elements require a minimum level of interaction that may not have existed in traditional manufacturing practice. For instance, the contract review element requires that each department involved in fulfilling the requirements of a particular contract sign-off before production begins. However, firms identify a heightened level of interaction—beyond that required to comply with the standard—as critical to substantial increases in customer satisfaction. Examples of high levels of interaction include production engineering staff shadowing frontline workers to understand the minutia of a particular

manufacturing task. In another plant, human resources upgraded a low-status production job with a commensurate increase in training so those workers were better able to identify defects before shipping product to the customer.

Continuous Improvement

The ultimate objective of instilling ownership and facilitating a high level of interaction is to make the continuous improvement process as rapid as possible. It is here that the ISO standards—in the current version—are largely silent. However, many firms have made evaluation of continuous improvement processes an explicit part of their quality control manual. Initial drafts of the ISO 9000:2000 revision suggest that this will be an explicit element in the revised standard.

Continuous improvement processes typically require defining benchmarks to assess improvement over time, mechanisms that allow exploiting all sources of information within a plant to improve the production process, and some explicit means of assessing the level of customer satisfaction and its change over time. The component that has the largest effect on the nature of work on the shop floor is the ownership of work instructions. It is only if work is consistent that it is possible to assess potential improvements in the process.

Though ISO 9000 registration fails to be either necessary or sufficient for the establishment of continuous improvement processes, it certainly can facilitate this activity. As such, the ISO 9000 standards are analogous to many other enabling forms of “organizational capital” in modern firms. Just as implementing an accounting system is no guarantee that a firm will fully utilize the information generated and make better financial decisions, ISO 9000 registration is no guarantee the a firm will exploit the information generated by the quality system. However, the findings from the case study are suggestive of an especially valuable form of organizational capital embodied in the standards: the standards can help to focus attention. In an information economy, attention is the scarcest resource in an organization.ⁱ

ⁱ “What information consumes is rather obvious: it consumes the attention of its recipients. Hence a wealth of information creates a poverty of attention, and a need to allocate that attention efficiently among the overabundance of information sources that might consume it.” Simon, 1973.

Thus, understanding how a documented production system can make this scarce resource more productive will be essential to understanding how manufacturing establishments can prosper in this new competitive environment.

Findings Regarding the Three Research Hypotheses

This research was motivated by three potential impacts on the operation of rural manufacturing plants and initial findings are discussed below. While the findings generally support the contention that ISO 9000 certification does contribute to the realization of rural development objectives, the case study analysis helps to illuminate their relative importance.

In summary, the durability of the employment relation was not found to be an issue among the great majority of plants either prior to or following certification. However, the added costs of training required by the standards suggest that areas that are characterized by a high degree of worker loyalty will enjoy advantages in implementing the standards. The impact of certification on the number and breadth of customer contracts varied significantly across plants—a few see no effect, while a few credit certification with opening up whole new areas for their customer base with revenue increases of 30 to 70 percent. The dominant opinion is more tempered. Sales staffs recognize that ISO 9000 can aid getting the attention of potential customers, but they are much less convinced that certification is a determining factor in winning sales. Finally, firms are most likely to identify improvement in the internal operations as the biggest advantage of certification. This is due both to an increased level of interaction across and within departments in a firm and the ability to implement meaningful continuous improvement programs.

ISO 9000 and the Durability of the Employment Relation

Contrary to common beliefs and corroboratory data from the ERS Rural Manufacturing Survey regarding all rural manufacturing firms, the great majority of facilities interviewed claimed that labor turnover is not, and has never been, a problem. Most firms were confident that workers making it

through the typical probationary period would remain with the firm for an extended period. Of course, it is possible that plants likely to become registered may also have had more competent human resource management all along. These plants would be more likely to report a favorable rate of employee turnover than the average rural establishment. Examination of the Rural Manufacturing Survey results lends support to this interpretation (Table 2), where ISO registered firms are less likely to report employee turnover as a problem.

It should be recognized that only a slight majority does not identify turnover as a problem in the RMS. This may reflect the emphasis on more remotely located manufacturing facilities in the selection of case study sites. However, partitioning the sample into metro adjacent and nonadjacent firms does not support this hypothesis, as nonadjacent ISO establishments are less likely to report that turnover is “not a problem” compared to their adjacent peers. In contrast, there is a stark difference identified in the case studies: all of the firms located in the ex-urban fringe on the outskirts of Atlanta identified turnover as a serious problem but very few firms in more remote areas cited turnover as a problem.

The most productive way for interpreting these results is to suggest that firms that traditionally have experienced very low turnover may have a significant cost advantage in implementing ISO 9000. And these firms may be located in areas characterized by limited alternative employment opportunities. The reason for this potential savings is that the training requirements for all production operations in the plant must be fully stipulated and it must be demonstrated that all workers performing a particular task receive the full complement of training before they can work independently. Satisfying this requirement can mean that new workers are able to make a significant contribution to production only after several weeks or months on the payroll. Clearly, a firm experiencing, say, 40 percent employee turnover each year will have to allocate much greater funds to training than one experiencing 7 percent turnover, if they hope to maintain their certification. These requirements may become more stringent in the ISO 9000:2000 revision as a new requirement demonstrating “training effectiveness” is likely to be added.

The other conjecture related to the employment relation is that a higher level of commitment will reinforce workers’ interest in monitoring quality that is critical to modern quality control practice. However, the majority of firms felt that this interest was generated solely as a by-product of implementing the standards—there was no heightening of the level of commitment in the form of wages, benefits or by making a long-term commitment to employees more explicit. Rather, implementation of the standards resulted in greater accountability of front-line workers. Because the efforts of workers could be monitored more effectively, the greatest incentive was provided by workers’ desire to demonstrate that they were doing a good job. If “pride in work” is a strong value among many rural employees, then bringing the manufacturing process under control through ISO 9000 registration may be an effective way of mobilizing this value for the benefit of the firm.

An unanticipated benefit of the standards regarding turnover was the effect identified on professional employees in a number of plants. Certification and the accompanying continuous improvement programs that followed enhanced the attraction and retention of professionals. These workers are likely to have many alternative employment opportunities so retention is critical to the efficient functioning of rural plants. ISO 9000 registration can contribute to professionals’ beliefs that their efforts have resulted in systematic improvement in the organization and guarantee substantive voice in altering firm procedures. Both factors have instilled a higher level of loyalty with its commensurate decrease in turnover at several plants. In contrast, management systems in these plants prior to registration were often perceived as governed more by plant manager edict rather than by agreed upon rules of procedure—clearly, a work environment that would not generate much loyalty among skilled professionals.

ISO 9000 and the Diversification of Customer Contracts

In contrast to employee turnover, most quality control managers do believe that registration, of itself, has positively affected the marketing activities of the firm. However, there is considerable variation in the perceived impact of registration on sales.

It is instructive to first examine the experience of a small number of plants that credit no marketing advantage to ISO registration. These plants produce for final demand, selling directly to the public through distributors and/or large retail chains. For final demand plants that sought registration to improve internal processes, the lack of any marketing benefit has not been troublesome. However, several of the plants sought registration as a means to facilitate penetration of foreign consumer markets. Threats of ISO 9000 being used as a non-tariff barrier to sales in Europe seemed real after the 1992 EU accords. But these threats never materialized. As a result, some of these same plants are questioning the value of maintaining third-party registration.

Also relatively rare were plants that credited registration with a large effect on sales. Several machine and fabricated metal shops that sought certification to ISO 9000 experienced a marketing windfall after 1997 when the Big Three automakers required all of their tier 1 suppliers be QS-9000 certified.ⁱⁱ This standard in turn requires that tier 1 firms actively develop the quality control capabilities of their tier 2 and tier 3 suppliers. Contracting suppliers with an ISO or QS certificate became the least expensive way to demonstrate fulfillment of the supplier development element. Several of the plants that had no automotive contracts prior to 1997 saw business expand from 30 to 70 percent as tier 1 suppliers eagerly sought out certified firms.

Of course, the story is different for the tier 1 automotive suppliers required to meet the QS-9000 certification deadline set by the Big Three. Prior to QS, each of the Big Three automakers had their own supplier requirements regarding quality control processes. The advantage of QS-9000 is that suppliers now only have to maintain one set of quality control processes to supply any

of the Big Three.ⁱⁱⁱ Registration was required to merely maintain the current level of business. However, internal efficiencies introduced by standardizing quality control procedures have made it easier to supply all three automakers from one facility.

The impact of ISO 9000 registration on the diversification of customer contracts is more intangible for the majority of firms that do not supply the automotive industry. In telecommunications and chemicals, registration has effectively become a “license to compete.” It is difficult to apportion any marketing advantage to certification when all your customers require registration and all your competitors comply. In industries where registration is less prevalent, registration is recognized as a somewhat reliable signal of quality control ability. But as customers have become more familiar with the flexibility of the standards—and as some plants have sought “registration to the letter but not the spirit of ISO 9000”—registration by itself fails to guarantee that an establishment maintains an adequate quality control system. As a result, ISO registration may increase the chances that a plant is short-listed as a potential supplier, but lacking registration does not exclude suppliers from the list. Thus, while plants generally believe that ISO facilitates selling the firm’s capabilities to new customers, the sale is ultimately closed on traditional criteria: price, delivery, and quality. The certificate, by itself, will not generate additional sales.

One area where the impact of certification on contract diversification is more definitive is the sale of intermediate products in export markets. The supply of many foreign contracts is more difficult without ISO 9000 certification as the standards make processes used in production more transparent to distant customers. In addition, the standards require that firms implement a procedure for responding to customer complaints in a timely fashion. If a supplier failed to comply with this requirement, the customer has some recourse in informing the supplier’s registrar of the nonconformance. Without certification, there may be no viable means compelling response to a complaint by a foreign customer.

ⁱⁱ QS-9000 is a sector specific interpretation of ISO 9000 developed by the Big Three automakers in an attempt to streamline the quality audit process in the automotive industry. QS-9000 was first published in 1994 and several firms registered to the standard as a proactive strategy. However, the Big Three required that all tier 1 (i.e., component manufacturers delivering directly to auto assembly plants) suppliers become registered by the end of 1997. As a sector specific standard it is in many ways more detailed and stringent than the ISO 9000 standard on which it is based.

ⁱⁱⁱ Although, the current version of the QS-9000 standards also include a sizable portion of OEM specific requirements. Thus, a single plant supplying Ford, General Motors and Daimler-Chrysler is still required to differentiate product by final destination.

In contrast to plants that sought certification to boost foreign sales of consumer products, intermediate producers often credit registration with increasing foreign business-to-business sales. The European non-tariff barrier threat of ISO has had more teeth in intermediate production due to product liability concerns of final producers (Hancké and Casper, 1996). In fact, several of the firms pursued registration because it was required for satisfying the contract specification for large European accounts. Estimates from the ERS RMS confirm that export activity is more common among rural manufacturers that are ISO registered compared with non-registered firms. Registered plants are also more likely to supply a customer on a just-in-time basis, to use just-in-time inventory management in its own facility, and to have electronic data interchange links with customers or suppliers. These rates are surprisingly similar to the percent of establishments engaged in export activity.

ISO 9000 and the Internal Efficiency of Firms

A striking finding from the interviews is that the great majority of firms feel that the internal benefits from certification significantly outweigh any external benefits. Some benefits emerge from the greater consistency in procedures used throughout the plant and through increased levels of interaction between departments. These potential benefits were considered from the outset of the study. However, in the course of the study it was found that the standards also establish a necessary framework for the development of meaningful continuous improvement processes. The contribution of both phenomena to the viability of rural manufacturing plants suggest that ISO registration may make considerable contributions to the rural development objectives of maintaining current employment and increasing worker productivity.

In assessing the contribution of registration to internal efficiency, most quality control managers, at least implicitly, differentiate between static and dynamic efficiencies. With respect to static efficiency, ISO 9000 is often seen as a drag on the firm. Throughput can suffer by the requirement to document all changes in the production system, all nonconformances and customer complaints, and the paper trails generated by traceability

requirements. Simply put, a documented system is not cost minimizing in a static sense. As long as nominal price is the only mediator of exchange, ISO registered plants will likely fail to win contracts.

However, the fact that nominal price can be a poor estimate of the real cost of a good is clearly demonstrated in just-in-time inventory management. Either shipment of a defective lot or failure to deliver on time can shut down production at the assembly plant, imposing much greater costs than would be true in production from stock. By eliminating inventory as a buffer against such performance failures, the capability to perform as promised through time becomes an essential part of the contractual relationship. Improvement in operations credited to ISO 9000 registration revolves around the increased capability to perform as promised. This capability has been augmented by the incorporation of richer sources of information in the design and improvement of production processes, a more systematic approach to assessing potential improvements, and a more systematic response to customer complaints that increases the organization's ability to learn from mistakes.

Preparation for a certification audit is often described as the realization of the informal or ad hoc nature of current processes and a concerted effort to transform this informality into a collection of best practices. At all levels of the firm, this requires employees to actively debate and evaluate individual methods to agree on those that are currently most productive. This debate stretches across workers within a workgroup, between the workers and their supervisors, between different shifts of the same workgroup, and between the shop floor and front office (e.g., production engineering or quality assurance may be drawn into the evaluation of rival methods). These debates may stretch across plants if sister plants within a corporation produce a similar product. The capability for organizational learning is thus greatly enhanced.

With the consistent application of this collection of best practices comes the ability to evaluate the potential benefits of a proposed modification. While process improvement has always been a goal of these plants, not having processes under control seriously hobbled these efforts. In most cases, a proposed modification will at best provide a marginal increase in

productivity. But with no reliable baseline of current practice, a verdict on whether or not the modification is an improvement will be elusive. It is only when an objective baseline measure is available that the costs of experimentation are substantially reduced, thus contributing to the dynamic efficiency of plants.

Procedures for dealing with customer complaints were also common to the case study plants prior to registration. However, these procedures were most times much less systematic than that required by ISO 9000. This more systematic approach ensures that all relevant groups within a plant are informed of a customer complaint, that actions taken to correct and prevent the nonconformance in the future have been documented, and that this document has been forwarded to the appropriate customer departments. In some instances, the customer may be required to acknowledge that any changes in procedures appear adequate to prevent the nonconformance in the future.

It is no longer possible for plant or customer service managers to acknowledge the problem and vow “it won’t happen again,” with no systematic evaluation of the root cause of the problem. Rather, the complaint is now distributed to all work groups and departments that may be a source of the problem, a root cause is identified, and ideas on how best to prevent the nonconformance in the future are discussed and evaluated. The impact this has had on the ability of customer complaints to result in improvements in the production process is substantial. Many firms benchmark customer complaints and identify two important trends: 1) immediately after registration, customer complaints increase as it is discovered that the number “slipping through the cracks” prior to registration was substantial; and 2) through time, the number of customer complaints declines steadily. Rather than regarded as headaches that management will conceal, if possible, complaints are now seen as an opportunity to improve the manufacturing process.

Caveats

Table 4 derived from the RMS outlines some of the management practices that will form the basis of more detailed examination using the qualitative data. At this point, the table serves to illuminate several important caveats of this report. First, it may be that ISO 9000

registration is just one more manifestation of a latent modernization variable. Table 4 demonstrates that ISO registered firms are more likely to have adopted most of the nontraditional management practices relative to their unregistered peers. As a cross-section, the data are not able to inform whether ISO registration is transforming or self-selecting. The case studies uncovered ample numbers of firms from both categories. For establishments already possessing a good documented system, registration to ISO 9000 was fairly simple and provided a valuable credential to demonstrate publicly what they were already doing. However, other establishments sought registration as a way to bring a chaotic or unruly manufacturing process under control. Closer examination of these establishments in future work will provide insights into whether ISO 9000 aided the adoption of other nontraditional management practices.

In addition, the substantial share of unregistered plants implementing Total Quality Management (TQM) programs reinforces the idea that ISO 9000 registration is not a necessary condition for the development of meaningful continuous improvement processes. At the same time, it must be remembered that neither ISO 9000 registration nor self-reported use of TQM is sufficient for its development. Finally, the data suggest that the difference between registered and unregistered firms in the adoption of these practices is generally greatest among the low-skill intensive manufacturing plants. Possible explanations for this will be explored next.

Exploratory Findings ISO Registration and the Transformation of Low-Skill Work

The impact on manufacturing practice has been greatest in the low-skill intensive plants interviewed in this study. These plants were much less likely to have had documented procedures prior to registration. Recognition that production workers may contribute to improvement in production processes is also much less likely in the traditional low-skill intensive plant. Finally, the management culture in the low-skill intensive plant may be more likely to assume that effective plant management simply consists of compelling workers to follow the instructions of their immediate supervisor. The mass production archetype of Smith or

Taylor could be more faithfully followed in these plants compared to establishments using more highly skilled production workers. In contrast, implementing the ISO 9000 standards—arguably embodying the archetypes of Deming or Juran—in many cases required a significant shift in management philosophy.

This is demonstrated most convincingly by the changing patterns of authority prior to and after registration. In traditional practice, authority for the production worker comes from a single source—i.e., the immediate supervisor. This authority is most commonly in the form of verbal instructions. This management structure also lacked any formal mechanism for feedback between workers—who may learn valuable information about a particular task through the execution of the task—and higher levels of management responsible for determining how the task is done. The reintegration of execution and conception is seen as an essential element of manufacturing modernization that is essentially obviated by traditional management style in low-skill manufacturing.

In contrast, the pattern of authority after registration changed considerably. Most importantly, the work instructions—developed with the help of production workers—provide equipotent authority with the immediate supervisor. In addition, a formal conduit from the production workers to management for suggestions on how to improve the manufacturing process is provided through the corrective and preventive action procedures. Because these suggestions will often require an assessment by a number of departments within the firm, this mechanism is often the source of increased interaction within the plant.

With training requirements now documented, workers are more confident that they have received comprehensive training required to perform their job and supervisors are more confident that all of these skills have in fact been communicated to workers. With a process “under control,” nonconformance can be analyzed with respect to the system—of which workers are a part—rather than as a presumption of failure by worker or supervisor. It is not surprising that many quality control managers at these plants describe the current work environment as “much less threatening” than the one prior to registration.

Future Research

The case study research is suggestive of a transformation in work process, especially in low-skill intensive plants. However, conclusions derived from the statements of management regarding work on the shopfloor—though likely sincere—are prone to distortion. The one certainty is that any assessment of the impact of ISO 9000 standards on the functioning of rural plants by workers will differ from that of management. The critical question is whether this difference is large enough to contradict many of the positive effects on the quality-of-worklife claimed by management. But clearly, if the quality-of-worklife is the central concern, then workers are the only group that can address this topic authoritatively.

The most productive way to examine changes in worker perception of the quality-of-worklife would be to track several low-skill intensive plants as they work through preparation for the audit. Several of the low-skill intensive plants interviewed for this study have used worker surveys for several years now. This would provide a ready-made research instrument that could be supplemented with the issues related to authority, utilization of worker suggestions, and the integration of conception and execution identified in this study. Supplanting this information with interviews of individual workers would provide more convincing evidence of whether ISO 9000 registration results in an enlargement of traditional low-skill work tasks. Such research would also provide additional insight into productive responses to the “low-skill dilemma;” i.e., how to gradually promote all workers to more skilled, more meaningful work experience.

The requirement of a documented system for meaningful continuous improvement processes was also suggested in the case study research. Essentially, quality control managers provided examples of how documented systems facilitated the identification of problem areas, ensured the consistent application of processes to better assess the impact of modifications, and systematically facilitated an increase in customer satisfaction. However, given the importance of continuous improvement to the continued viability of all manufacturing establishments, a study designed to address the workings of continuous improvement in rural plants—as opposed to a collection of summaries after-the-fact—appears warranted. A comparative study

would provide the most leverage for assessing the value of ISO 9000 registration as a form of organizational capital that helps to focus attention on those areas most in need of the establishments' scarcest resource. Several of the plants in the study identified sister plants in their organization that had not sought registration to the standard. Such examples—especially in cases where registered and unregistered plants produce similar goods for similar clientele—would approach conditions of a natural experiment. Such pairs would allow analyzing the mechanics of continuous processes and the response to customer complaints controlling for many other confounding factors.

Of course, the type of research that will have the most concrete effect on the viability of rural manufacturing plants is the pragmatic research determining whether an establishment pursues registration. It is hoped that this report has been helpful in motivating consideration of the impact of registration on the viability of plants by both rural development professionals and the businesses they assist. However, as each organization is unique, the advisability of pursuing registration requires a careful consideration of all aspects of an establishment's operations. Appendix 2 provides several excerpts from the case study interviews, giving a flavor of the types of statements these quality control managers used to assess the standards. A more useful exercise for an unregistered establishment would be to identify registered firms in their area and talk to them about the challenges of passing a certification audit, the costs involved in preparing for an audit and the benefits registration can provide. Most of the quality control managers interviewed said they would welcome such inquiries from local firms that were not registered (with the exclusion of direct competitors being a common caveat). A useful link for identifying registered firms in a community is the International ISO 9000 Database maintained by Quality Digest that is available to the public at <http://www.qualitydigest.com/html/iso9000.html>.^{iv}

^{iv} Furnishing this reference does not connote an endorsement of the products or services of Quality Digest by USDA or the Economic Research Service.

Policy Implications

The opinion of quality control managers in the case study establishments suggests that we may expect to see an ever-increasing percentage of firms certified. This is because many managers believe that the lack of a documented quality system is a sure recipe for business failure over the next 5 to 15 years. Without such a system bringing the manufacturing process under control, efforts at continuous improvement will be ineffective. In this view, ISO 9000 will inevitably become more prevalent either through diffusion or attrition.

However, the barriers to wider implementation of quality systems are substantial, and the threat of insolvency is rarely explicit until very late in the game. Put another way, implementing a quality system will involve concrete, up front costs while any benefits will initially be intangible. Clearly, on first appearance the cost-benefit ratio does not bode well for diffusion of the standard in the sector. Perhaps the greatest hurdle is that implementation of a genuine quality system requires a fundamental change in the management philosophy common to many rural manufacturers.

The last point suggests that peer forums may be the only viable means of communicating the potential benefits of a quality system to managers in uncertified firms. Both the Manufacturing Extension Partnership and the Community College system in several states held workshops for manufacturing firms interested in learning more about registration to ISO 9000 or QS-9000. However, in the end the great majority of firms that pursued certification were those reacting to a customer or corporate directive. Anecdotes regarding heightened interest among manufacturing firms that are not under orders to become certified usually revolve around a homegrown plant that expanded operations immediately following certification. But this latent interest needn't require the demonstration of substantial external benefits.

All manufacturing firms that envision being in business in 10 years are constantly on the look out for practices or technologies that will give them an edge against their competition. Peer forums that are organized around the experiences of businesses in the local area are likely to be much more persuasive regarding the potential benefits of ISO 9000 registration than a seminar by a quality control consultant or community college instructor.

The public interest in coordinating these forums should be great, given the ability of ISO 9000 registration to facilitate modernization of rural manufacturing plants and thus contribute to rural development objectives. The most obvious public benefit—especially if the predictions of the quality control managers in this study are on target—would be to sustain employment levels in what is often a dominant sector in local rural economies. By bringing the manufacturing processes under control, registration allows continuous improvement programs to be informative and efficacious. More systematic response to customer complaints has resulted in both higher levels of customer satisfaction at these registered plants and the quicker identification and permanent resolution of problems in the production process. Greater interaction within and between departments in a plant—and the enhanced capability for horizontal learning across branch plants in a corporation—credited to registration also increases the competitiveness of these firms. The great majority of plants believe registration has made them more viable competitors in the long-term. This is clearly a benefit to both rural communities and their constituent firms.

Given the concentration of low-skill intensive manufacturing in the rural South, it could be argued that increasing the viability of this sector makes a dubious contribution to “rural development.” In this view, development is seen as a process of moving labor out of low-skill occupations and into higher skill occupations. But the experience of the low-skill intensive plants interviewed in this study suggest a response to the “low-skill dilemma” that may provide a smoother transition for workers while increasing competitiveness in industries that are generally thought doomed to stagnation. The most immediate development potential in low-skill work is through work enlargement that exploits underutilized skills. Registration did not materially affect the tasks performed in low-skill intensive plants, but it often raised the cognitive requirements of work. As such, these jobs were transformed from “dead end” careers relying on little more than movement by rote to low-skill careers on potential job ladders. In a registered firm, a worker’s ability to identify the root cause of a performance failure, to critically examine current procedures to identify possible improvements, and to understand how producing and delivering a product is dependent

on a large number of disparate tasks will be more highly valued.^v It would be Pollyannaish to suggest that ISO registration results in all workers climbing up job ladders. Rather, implementing a formal quality system makes it more likely that workers will rise according to their ability. The fact that a significant number of workers are unable, or unwilling, to perform cognitively more complex tasks suggests that abandoning the low-skill intensive sector is likely to impose significant long-term costs on a segment of the rural population.

The International Organization of Standardization is beginning to recognize an inherent weakness in marketing the ISO 9000 standards as a quality control system. Indeed, the first challenge in pursuing registration noted by many of the quality control managers in this study is convincing management that ISO 9000 is a management system. If there is no buy-in among upper level management, then registration is likely to have little effect on the functioning of the establishment. The initiative may soon degenerate into delegating responsibility to a single individual in the organization (i.e., the quality control manager) for “getting that little certificate.” Management may be willing to pay lip service to the standards but the commitment to the standards as a way to improve current business practice is lacking.

A common piece of advice from quality control managers interviewed for this study is that management commitment throughout the organization is required to realize any internal benefits from the standard. And the identified benefits extend far beyond an improvement in quality or a reduction in scrap. The benefits extend to any meaningful effort at continuous improvement that is inherently tied to making work experience more meaningful and to the continued viability of the rural manufacturing sector.

^v In one of the low-skill intensive plants, the quality control manager had begun work as a production employee. By working as an internal auditor he was able to demonstrate his innate ability to manage the quality system at the plant. When it came time to hire a new quality control manager, this worker made the increasingly rare transition from shop floor to front office. Although this example is exceptional, it does demonstrate that ISO 9000 registration may open more avenues for production workers to demonstrate their abilities to management.

Table 1
Characteristics of Case Study Plants and Comparison with Estimates of National Characteristics of Rural ISO 9000 Plants^{vi}

Plant Characteristics	N	% of Cases	Estimated % of All Rural ISO Registered Mfg Plants
Food Processing	0	0	1.52
Textiles	2	3.23	1.72
Apparel	0	0	0.20
Lumber	0	0	2.19
Furniture	4	6.45	0.78
Paper	3	4.84	6.30
Printing	2	3.23	1.90
Chemicals	4	6.45	15.08
Plastics and Rubber	3	4.84	8.95
Leather	0	0	0.20
Stone	0	0	3.04
Primary Metals	5	8.06	10.17
Fabricated Metals	8	12.90	13.80
Industrial Machinery	11	17.74	14.94
Electrical Equipment	8	12.90	9.97
Transportation Equip.	12	19.35	5.34
Instruments	0	0	2.86
Miscellaneous Mfg	1	1.61	1.01
Intermediate Production	55	88.71	N/A
Automotive Supplier	26	41.94	N/A
QS-9000 Certified	20	32.26	N/A
Final Demand	10	16.13	N/A
Export	26	41.94	67.90
Headquarters	13	20.97	30.41
Branch Plant	49	79.03	69.59
Plant Size:			
Small < 100 Employees	9	14.52	33.49
Medium 100 _ Emp. < 500	43	69.35	51.26
Large _ 500 Employees	10	16.13	15.24
Settlement Size:			
Adjacent 20-50k	4	6.45	18.82
Nonadjacent 20-50k	11	17.74	9.15
Adjacent 2.5-19k	15	24.19	27.98
Nonadjacent 2.5-19k	23	37.10	35.20
Adj. No Urban Pop.	0	0	4.15
Nonadj. No Urban Pop	9	14.52	4.69

^{vi} These estimates are computed using weighted observations from the ERS Rural Manufacturing Survey that was merged with the registry of ISO 9000 manufacturing firms supplied by *Quality Digest*.

Table 2
Managers' Perceptions of Employee Turnover as a Problem in Rural Manufacturing Plants

	All Rural	Not ISO	ISO	ISO Adj	ISO NonAdj
Major Problem	19.79	20.65	8.93	10.42	7.41
Minor Problem	38.14	38.41	34.72	31.34	38.17
Not A Problem	41.74	40.63	55.77	57.83	53.66
Don't Know	0.33	0.31	0.59	0.41	.077

Source: ERS Rural Manufacturing Survey, 1996

Table 3
Export Activity, Just-in-Time Supply and Use, and EDI Use by Rural Manufacturing Plants

	All	Non-ISO	ISO	ISO Adj.	ISO N.Adj.
Export Activity	47.41	45.75	67.90	73.37	63.55
JIT Supply	48.95	47.41	68.38	68.43	65.17
JIT Use	48.24	46.76	66.80	66.89	65.47
EDI w/Customers or Suppliers	27.69	25.01	61.54	66.76	56.27
Use Internet	24.93	23.62	41.35	41.10	41.62

Source: ERS Rural Manufacturing Survey

Table 4
Percent of Rural Manufacturing Plants Using Various Management Practices

	Low-Skill Intensive		Int-Skill Intensive		High-Skill Intensive	
	Non-ISO	ISO	Non-ISO	ISO	Non-ISO	ISO
Total Quality Management	37.06	75.00	45.27	66.67	46.20	76.92
Statistical Process Control	35.66	80.00	46.82	94.00	32.91	84.62
Problem Solving/ Quality Circles	51.11	84.21	55.01	78.43	51.10	58.97
Job Rotation	59.07	55.00	55.84	70.59	50.79	56.41
Self Directed Work Teams	43.17	75.00	49.72	49.02	51.42	43.59

Source: ERS Rural Manufacturing Survey

Low-, Intermediate- and High-Skill industries classified on basis of dominant share of production workers able to follow simple instructions, to follow complex instructions or diagrams, or to understand rational systems, respectively (see Dictionary of Occupational Titles).

Appendix 1

Topics Guiding Discussion of ISO 9000 Registration in Rural Manufacturing Plants

I. Establishment background:

- A. Nature of Products Made at Plant;
- B. Primary Customers;
- C. Primary Suppliers;
- D. Level of interaction or collaboration with
 - 1) customers,
 - 2) suppliers,
 - 3) headquarters;
- E. Advantages and disadvantages of operating in the community.

II. Motivation for obtaining registration to the ISO 9000 standard:

- A. Proactive strategy? Meeting requirement of customer? Meeting requirement of corporate policy?
- B. Did preparing for and getting registration match firm's expectations of costs and benefits?
 - 1) Unanticipated Costs;
 - 2) Unanticipated Benefits;
- C. Did the experiences of other firms influence your decision to become registered?

III. Employment relation and ISO 9000:

- A. Preparation for Audit:
 - 1. Involvement of production workers in writing procedures;
 - 2. Effect on training procedures—differences across job descriptions;
 - 3. Effort required for workers to understand and adhere to procedures in quality manual;
 - 4. Extent of interaction across departments in writing quality manual for managers, supervisors, workers, work teams;
 - 5. Largest modification in operations required for conforming to standard.
- B. Implementing Standards:
 - 1. Responsibility of production workers for QC before conforming to standard;
 - 2. Responsibility of production workers for QC after conforming to standard;
 - 3. Has this change had any effect on working relationships in the firm: among workers, between workers and supervisors, between workers and management?
 - 4. Are there mechanisms for continuous improvement specified in the quality manual?
 - 5. Relative benefit of conforming to the standards vs. credential of registration.
 - 6. How frequent are third-party audits? Benefits and costs of these.
- C. Retention and Hiring:
 - 1. How has registration changed your hiring procedures? Selection, screening;
 - 2. How much training is required of production employees before they begin work on the shop floor?
 - 3. Was employee turnover a problem before registration? What percentage of production workers would leave the firm each year?
 - 4. Has the turnover rate changed appreciably after registration? Is it more of a problem? Have there been explicit attempts to improve retention?

IV. Customer relations and ISO 9000:

- A. Requirements:
 - 1. QC system specified in supply contract;
 - 2. Final QC performed in-house for JIT deliveries;
- B. Discursive Standard or Signal?
 - 1. Do customers see registration as a signal of a more competent or able firm? Or
 - 2. Do they see registration as confirmation that establishment is fluent in modern quality control practice;
- C. Impact on marketing efforts:
 - 1a. Describe portfolio of customer contracts **before** registration wrt location, industries, number and character (JIT, degree of specification, design or process collaboration, etc.);
 - 1b. Describe portfolio of customer contracts **after** registration wrt location, etc;
 - 2. How much of this change do you think is attributable to registration?
 - 3. How prevalent are customer performance audits? Do customers substitute ISO registration for their own audit?
 - 4. Has registration affected the export orientation of the establishment?

V. Internal operations of the establishment:

- A. What effect does registration have on the internal operations of the firm: e.g.,
 - 1. How departments interact?
 - 2. In diffusing potential conflicts?
- B. Have the formalization of work procedures had a positive or negative effect on the quality of work at the plant?
- C. Have management's assessment of the value of continuous improvement practices changed as a result of registration?
- D. Has your registrar kept you informed of the changes to the standard proposed in the 2000 revision? Do you anticipate the establishment will seek registration to the revised standard?

Appendix 2

Quotes from Quality Control Managers Regarding ISO and QS-9000

Assessment of Costs and Benefits

For a company that has no documented procedures, ISO 9000 provides a very good structure—a framework—to start a quality process. But it is just a start. If I was a business owner, making widgets and my business had grown where quality was necessary, ISO would be the first place I'd look in how to set up a quality program within my business. But by no means is it an end.

[ISO 9000 registration] is going to cost you some money up front. If nothing else it will cost to bring in a registrar. But there are other costs. Simply the time people aren't on the floor because they are in review meetings. Going through the writing of procedures, the paperwork, getting that information down on the floor. It takes a lot of time and effort. It is easy to see that expenses are going up. The pay back isn't as easy to see. And the payback doesn't come back to you on an easily identifiable basis. If we have improved things due to ISO it is very hard to put a finger on it and say, "This improvement is directly attributable to ISO." But I am just a firm believer that if you do the things it requires, and approach it conscientiously, you'll see some real improvement. It is just easier to look at costs and say, "This is what I spent on it." It is a lot harder to identify the benefit.

The improvements may have been done—sooner or later—but ISO shows your problems sooner so you can react sooner. I don't think it is a whole lot of money spent versus the benefits. The customers write your checks. Anytime you can keep customers happier, the better off you gonna be. ISO does that. Money versus improvement? I don't know if I can compare that.

Question: What advice would you give to a small manufacturing shop that was thinking about registration to ISO or QS-9000?

Never forget the link to the business. Do not see it as something different. It is like an operating system in a computer—you cannot separate the two. If they decide they want to have QS it has to be part of their business. If they don't see it that way it is just going to be a bother.

QS-9000 has had an impact. Primarily because it is easier to get things done when you have a QS flag to wave. "You've got to do this guys because that is what QS says." When you try to improve your own process from inside—without the man from outside—it is often much more difficult. Then you have to get into explaining, and showing, and that takes time. If you have a customer requirement...it is a lot easier to get things done.

Keep it simple. I think that is where most plants preparing for an audit have their problems. They go in with big ideas of how the system should be, and you get quality people who are a little overzealous. And you make it so complex that an employee can't see the benefit of the system. "Why do I have to do this?" It is stuff you should be doing anyway. Find a way to modify your system to meet the requirements of the standard and don't make it complicated.

Tailor your system to what you do. That is where the idea of having a consultant come in is a bad idea. Read and understand the standard that you will be audited to, meet the standard, but in a way that allows you to run the business the way you want it to be run. That means that if you do your accounting on the back of a napkin; if you make all contacts on the phone and keep records in your Daytimer, then that is how you do business and that is your system. It may not be the best way to operate your company, but if it works that is how you should do it.

Question: Do you think that a firm that tried implementing a continuous improvement program without a formal system like ISO 9000 would be spinning their wheels?

I am wondering how a firm could do it without a formal system. In making improvements you are fixing problems, identifying areas that could be better. If it is not documented I am wondering where would you look to find this information. If you have a documented system in place, you can look at the product and say, "We had these problems and these problems." How are you even going to know if it is not documented somewhere? And then you need a way to review the modification with a process that is formally in place. It would be a very difficult task without a formal system.

Tips for Getting Registered Quickly

For a firm that is under pressure to get registered quickly—or even as a way to learn quickly about what is required—you can have a pre-assessment audit up to one year prior to when you go for the certification audit. It is not considered consulting by the registrar but it will teach you a lot about what you need to bring your procedures into compliance with ISO or QS.

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