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ABSTRACT

This symposium on human resource development (HRD) and small manufacturers consists of three presentations. "Toward a Model of Technical Assistance for Small Manufacturers: The Role of Performance Technology" (Dale C. Brandenburg) reviews literature documenting the need for technical assistance to small manufacturers, especially as it relates to deployment of new technology. It concludes that explicit use of principles of performance technology would enhance identification of problems and set forth implementation strategies that provide solutions. "Understanding Technology Diffusion in Northeast Oklahoma Small-to-Medium Sized Manufacturers" (Brenda Solomon) reports a study to understand how change and use of Internet technology have led to an emphasis on the employer as a trainer. "Human Resource (HR) Practices in Mexico and the United States: Selected Manufacturing Companies" (William R. Venable) identified similarities and differences in HR practices of successful small export manufacturing companies. Findings are that predominant practices in American companies were training, compensation and benefit packages, and selective staffing; those in Mexican companies were training, literacy education and company-sponsored activities; HR practices in American companies were directed more toward specific job performance; and in Mexican companies, they aimed more at general personal growth and human relations. (YLB)

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Toward a Model of Technical Assistance for Small Manufacturers: The Role of Performance Technology

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The purpose of this review of the literature is to document the needs for technical assistance to small manufacturers especially as it relates to the deployment of new technology. This analysis draws the conclusion that the explicit use of the principles of performance technology would greatly enhance the identification of problems facing small manufacturers and set forth implementation strategies that provide solutions to these problems.

Keywords: Performance, Small Manufacturers, Modeling

This paper addresses a historical, systemic-oriented perspective on efforts to improve the competitiveness of small-sized manufacturing firms. While it is well-recognized that the growth of small firms is vital to economic growth in the United States and that some form of external technical assistance is needed to sustain this growth, only minor attention to models or theories of technical assistance have been investigated and validated. Small firms face many barriers to competitiveness that include a wide range of needs from lack of information, to inability to implement new technology, to scarcity of resources. Among these numerous challenges, the one offering the greatest opportunity for leverage and growth is the deployment of new technology, where new technology is broadly defined to not only include machines and software, but enlightened methods for management of the enterprise. The results of the review indicate that while technical assistance efforts remain uncoordinated generally, considerable evidence suggests that regional infrastructures are supporting the increase of such outreach efforts. An examination of the approaches used in technical assistance indicates a number of salient features of performance technology, especially a systems approach to implementing new technology. How performance technology might assume a greater role in technical assistance to small manufacturers is the subject for consideration.

For the purposes of this discussion we will adopt a comparatively simple, yet conceptual definition of performance technology as " a fundamental commitment to the identification of organizational performance problems and the development of the most appropriate solutions" (Dick and Wager, 1995, p. 35). Performance technology brings a holistic framework to the analysis of issues impacting human performance that are fundamentally interdisciplinary. These disciplines include psychology, industrial engineering, training and development, ergonomics and human factors engineering, organizational development, compensation and benefits, and learning and cognitive science.

Theoretical Framework

The theoretical framework used to review of the literature of technical assistance to small manufacturers over the past fifteen years begins with the establishing the importance for improving the competitiveness of such companies. The review is drawn from two primary fields: industrial modernization and economic development. Industrial modernization is the term usually applied to methods and resources deployed to improve the competitiveness of manufacturing companies through external or internal interventions. Economic development relates to the environmental conditions where manufacturing companies are located – the relationships to customers and suppliers, government policies and incentives, geographic proximity to resources. The perspective for analyzing the potential relationship between small manufacturer technical assistance parameters and a performance technology framework is a summary of existing literature, results of professional networking and personal experience. A history of the technical assistance movement in the United States lays the groundwork for understanding its fundamental needs, environmental constraints, proposed solutions, and relationship to an interdisciplinary view of performance technology. The crux of the argument for developing a conceptual framework for technical assistance begins with the understanding of the systemic issues that interfere with the economic growth of such firms. If the barriers to

manufacturing modernization and resulting competitiveness are systemic, one might argue that solutions to these barriers must also be systemic.

However, this examination points out that there does not appear to be an acceptance of a common infrastructure or framework to deploy these solutions. Thus, researchers seem to agree on the type of solution and recommend various approaches to technical assistance, but there is paralysis in the implementation. The consensus solution for manufacturing modernization appears to recommend a strategy (Modernization Forum, 1993) that addresses the following types of dimensions:

- Technology
- Markets
- Work Organization
- Skills -- managerial and front-line
- Finance
- Inter-Firm Cooperation
- Advanced Business Management Practices

These dimensions encompass a variety of disciplines that need integration for a systems approach to small manufacturing competitiveness issues. This perspective leads this writer to conclude that a systems view and interdisciplinary approach of performance technology offers a valuable model for the implementation of solutions to the competitiveness of small firms. This requires the deployment of mechanisms for organizational change in its performance infrastructure, thus performance technology offers a "method for designing the necessary performance system to achieve new levels of performance" (Rummler, 1999, p.47).

Research Propositions

The following research propositions guided the collection of documentation for this paper:

1. Why is it important to understand the issues of competitiveness facing the growth and development of smaller-sized manufacturing firms?
2. How can the barriers to competitiveness of such firms be categorized?
3. What are the alternative sources of technical assistance to small manufacturers and how well do they function in the United States?
4. What are the major conceptual approaches to technical assistance?
5. How does technical assistance relate to performance technology? Is there a role for performance technology theory and concepts in the development of a model for technical assistance?

Perspectives of Economic Development in Manufacturing

Although the number of US manufacturing jobs has decreased over the past two decades to about 19.1 million in 1993, the sector continues to generate a disproportionate share of secondary jobs -- about 4.5 times as many as the retail sector and about three times as many as the personal and business service sector (Baker and Lee, 1992). In addition, manufacturing's contribution to US Gross Domestic Product (GDP) increased 1.5% (Bureau of Labor Statistics, 1992) in the 1980's. Also, manufacturing accounted for more than 2/3 of American export earnings in 1991 with a little over 20% of the workforce as reported in 1992 data published by the US Dept. of Commerce.

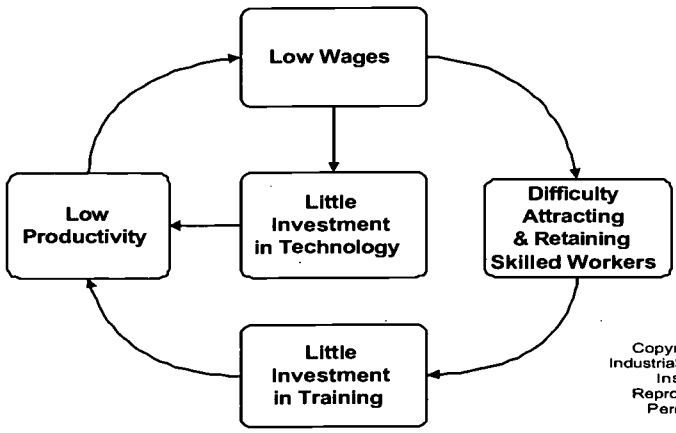
Why the Interest in Smaller Manufacturers?

A major shift has occurred in the size of manufacturing firms since the mid-1970's. From 1980 to 1990, the number of manufacturing firms has grown from 319,000 to 378,000 and 98% of these firms employ 500 or fewer workers. Concurrently, the number of employees in firms over 1000 employees decreased by over 20%, and this has helped spur the growth of smaller firms, especially those under 100 employees. Larger manufacturing firms reduced employment by over 1.2 million workers, and smaller firms added 2.2 million workers to yield an overall employment of 12.2 million US workers, 64% of the industrial workforce (Modernization Forum, 1993). While employment is a major factor in the importance of smaller firms, a more important statistic is the amount of value-added, accounted in aggregate form across firms. In aggregate form, such firms represent up to 60% of the final goods production costs, component, subassemblies and parts (Industrial Technology Institute, 1991) that determine the cost competitiveness and quality of US products.

An overall picture, given in Figure 1, depicts a number of the major components representing the never-ending cycle that small manufacturers typically encounter. It is derived from studies of hundreds of firms with data collected from the Performance Benchmarking service developed by Dan Luria (1993).

Figure 1

The Vicious Circle Confronting US Manufacturing



While there are a number of reasons for differences in competitiveness between large and small firms, many industrial researchers and economists blame a low adoption rate for new technology as a primary difference. To provide three examples, approximately 40% of firms with 250 employees or less have adopted the use of computer-aided design (CAD) compared to 74% of firms with more than 500 employees (Industrial Technology Institute, 1990). Comparative figures from the same database for computer numerical machines (CNC) used for cutting and shaping metal and other materials are about 30% for small firms vs. 77% for large ones. A more dramatic difference derived from that data is in the use of machining cells (a set machines with different functions grouped to complete a process) where it is 9% for small firms and 36% for large firms.

Needs, Barriers, and Opportunities Facing Small Manufacturers

There have been numerous studies conducted over the past 20 years examining the needs of smaller manufacturers (Manufacturing Studies Board, 1986; Organization for Economic Co-operation and Development (OECD), 1993; Frostbelt Automation, 1990; Shapira, 1990) as well as compendiums of tools and methods developed specifically for assessment of the small manufacturing context (Brandenburg, 1994 and Shapira, 1993). However, the study viewed with most credibility is the one performed by the National Research Council (NRC) in 1993.

The NRC study identified five broad needs determined from reviews of the literature, focus groups with small manufacturer owners/managers, interviews with industry association executives, interviews and site visits to both small manufacturers and service providers, and data sources provided by local government agencies. The five broad barriers to competitiveness or needs can be categorized as follows: disproportionate impact of regulation; lack of awareness; isolation; where to seek advice; and scarcity of capital.

The first NRC identified barrier is based upon a much greater economic regulatory compliance impact requiring a larger percentage of capital investment from small firms than for larger businesses. The regulatory environment imposed by national, state, and local initiatives include issues on trade, environment, employment, work place safety, health care and liability. As a result, small manufacturers seldom have the time or the resources to keep up with all the latest regulations as well as address them in a systematic way.

The second area of need reflects the general consensus that small manufacturers are often unfamiliar with changing technology, production techniques, and business management practices. This is often brought home heavily with regard to the implementation of new technology because it is likely to require "systems methods" interfacing across different functions of a

firm. The integration of these functions entails understanding issues not only with the technology, but the work skills and support structure of a company -- issues that require considerable time and energy of management.

Isolation, the third barrier, results from firms having too few opportunities to interact with similar companies facing similar issues. Suppliers do not often have the opportunity to interact with their major customers or to benefit from the membership in a cooperative supplier improvement program (like many Japanese suppliers do). Recent benchmarking efforts of one manufacturing assistance institute has shown that more than 50% of more than 500 companies surveyed believe they can be ranked among the top 15% of all such suppliers. While this result is a statistical impossibility, it illustrates the limited knowledge many companies have of their relative standing in their own industrial groups.

For owners and managers of smaller companies, the difficulty of high-quality, unbiased information, advice, and assistance is the fourth barrier. Equipment vendors cannot be relied upon to provide unbiased advice, and they have a significant portion of external contact with small company management. Generally, the company accountant or the company lawyers are the external consultants most mangers trust. Yet their range of knowledge can be limited with regard to technical problems, replacing equipment or upgrading the skills of their workforce. The public sector offers a wide variety of confusing, uncoordinated, and competing services -- universities, economic development groups, community colleges, and government agencies.

The fifth of the identified barriers, scarcity of capital, means that operating capital and investment funds for modernization efforts are difficult to obtain. Regardless of the presence of manufacturing firms in a given community, is nonetheless surprising that many bankers do not understand manufacturing. On the other hand, many small company managers have a difficult time producing a solid business plan in a format the financial community can accept. A more recent phenomenon resulting from the mergers of local banks, has led to centralized decision-making where the known character of small company management is no longer part of the investment equation.

Conceptual Foundations for Technical Assistance

In order for manufacturing in the US to remain competitive, it is generally agreed that continuing investment in new technology is required, and this investment is a critical need for smaller manufacturers (Shapira and Youtie, 1997; Swamidass, 1997; Kelley and Helper, 1997; Shapira and Rephann, 1996). What is generally less accepted is that this investment requires a concomitant investment in human resources and associated strategies. Thus, most experts have purported a systems approach to the implementation of new technology.

One quasi-government agency that has continually advocated this approach is the Manufacturing Studies Board. "Realizing the full benefits of AMT (advanced manufacturing technology) will require systematic -- not piecemeal -- change in the management of people and machines ... a critical mass of interrelated changes is required in seven areas of human resource practices: planning; plant culture; plant organization; job design; compensation and appraisal; selection, training, and education; and labor-management relations (Manufacturing Studies Board, 1986, p.2)."

Their results from 16 case studies indicated the following conclusions for supporting a successful implementation strategy for AMT (1986, p. 55):

- the planners must give high priority to address the issue of employment security
- there must be a compelling business rationale, especially if accompanied by high performance expectations
- more profitable when human resource issues are understood and addressed in the planning stage and every subsequent stage in design, approval and implementation
- more effective when management has formulated a guiding philosophy dedicated to improving the plant culture
- require an openness to learning from one's experience and that of others, especially management and union
- unprecedented efforts to communicate thoroughly to employees and their the competitive realities of the business, conditions requiring AMT and plans for implementing
- a variety of initiatives to promote positive culture for employee relations and labor relations
- employee participation in implementation activities
- early assignment to the project
- broad training that begins before assignment to the project
- systematic, periodic evaluation of the effectiveness of AMT.

One conceptual approach that embodies the majority of these parameters and includes at least a salient endorsement of performance technology is HI-TOP (High Integration of People, Organization, and Technology) developed by Majchrzak, et. al., (1991), which proposed to eliminate the independent, asynchronous planning generally found in the deployment of new advanced manufacturing technology. The goals of this analysis are threefold:

- indicate what people and organizational capabilities are needed for a given technology plan

- identify if the appropriate people and organizational capabilities are likely to be in place in the organization, and
- suggest technology plan, organization, and people changes if needed capabilities are missing.

The result is that surprises are reduced and needed changes to technology, organization and people are identified in time to be smoothly implemented. While this approach not only makes sense conceptually, and it has been validated and proven in organizations like Digital Equipment Corporation and Hewlett-Packard, it has yet to show viability with smaller manufacturers. The reason for this lack of adoption is the significant resources it requires to complete all processes of data gathering, collection, analysis, and synthesis for planning and replanning.

A number of different solutions for the dilemmas and needs of smaller manufacturers may be proposed. These solutions might take the form of methodologies, economic development policies, theories of technology deployment, and various other implementation strategies. A brief historical summary of these solutions in terms of technical assistance strategies is provided next in order to gain a current perspective on alternative implementations.

History of Technical Assistance in the United States

The closest analogy to technical assistance currently characterized as industrial extension or outreach is the US Department of Agriculture's Extension Service. In cooperation with land-grant universities and state and local governments, there are approximately 9,600 full time county extension agents that disseminate new information, demonstrate new techniques, and offer technical assistance. As a technology transfer mechanism they are regarded as a huge success to their customer, the American farmer, in the 20th century.

Prior to 1988, there was no US national program for manufacturing assistance similar to that for agriculture. Instead there were a wide variety of state, local and privately sponsored programs performing some version of technical assistance, primarily for smaller manufacturers. There have been a number of reasons stated for the lack of national effort, but primary among them was unwillingness for the US to have an "industrial policy". Such a policy many argue (Osborne, 1988) would have the government picking winners and losers and would be the antithesis to a free market economy. Some of the state-sponsored industrial extension programs have had long and considerable success. A notable example is the program begun by Georgia in 1960 that has been held as a model for longevity and consistent state support. The Georgia program has a set of statewide offices and a technology center located on the campus of Georgia Institute of Technology. In the mid-1960's, the Pennsylvania Technical Assistance Program (PENTAP) was initiated and expanded later into the programs known as the Ben Franklin Centers and subsequently to its current form as Pennsylvania Industrial Resource Centers. In the late 1970's and throughout the next decade, there were numerous other programs initiated notably in Maryland, Massachusetts, Michigan, New York and Ohio.

These efforts were expanded in 1988 with the passage of the Omnibus Trade and Competitiveness Act. Along with revamping the old National Bureau of Standards into the National Institute for Standards and Technology (NIST) within the Dept. of Commerce, significant federal monies were designated to expand these programs. The overall plan was to establish a network of technology centers throughout the US to provide technical assistance to all types of small and medium-sized manufacturers. These Manufacturing Technology Centers were designated to serve particular geographic regions, and each major operational hub was funded initially at $6 million a year for the first six years of operation. State and private contributions or revenues matched all federal dollars.

As of this writing, the program known as the Manufacturing Extension Partnership (MEP) has 75 major centers and 350 satellite offices throughout the US, with at least one satellite operation in every state. MEP centers are designated to provide outreach services to firms with less than 500 employees. Under its new charter, NIST is charged with assisting industry improve technology development, process modernization, product quality and reliability, cost effectiveness, and commercialization. It is also authorized to provide technical assistance to state and local industrial extension programs and serve as link form those programs to other federally sponsored technology services. Notably absent from these efforts, however, are directives regarding a "systems deployment" of new technology incorporating organizational environment and people issues.

The MEP program recognized this shortcoming and established an alliance with the US Dept. of Labor to channel modest funding for a Workforce Working Group (Brandenburg, Shrader, and Wood, 1992; Great Lakes Manufacturing Technology Center, 1993). What occurs with the integration of technology and human resources supportive infrastructure within MEP is more dependent on center management than on federal policy. That is, many centers view the systems integration issue as a matter of best practice; other centers stick to their technology "roots" so that customer solutions always have an "engineering flavor".

MEP is not the only source of federal dollars for extension-like services. The US Department of Defense has long recognized the concept that US competitiveness in the defense business depends on the capabilities of a strong industrial base. One example was a project to establish a regional center for technical assistance in a geographic area heavily populated with small defense contractors (suppliers). The Program of Regional Improvement Services for Small Manufacturers (1993) or PRISSM

- providing valuable service to firms where the private sector is either unavailable or unwilling.

These organizations are often actively working to forge new relationships among firms and related economic and workforce development agencies at the regional level. Certainly an MEP center qualifies as one of these intermediary organizations. It would be a rare MEP center indeed that has all the capabilities to serve customer needs in their region. A good source for the nearest center can be found on the NIST World Wide Web homepage.

A second nearby source is a local community college, especially the business services or customized training unit. Most states have funds that target small manufacturers as an economic development strategy, which are generally delivered through community colleges. While many opportunities focus on training per se, there is a growing recognition for a wider involvement from organizational development and management specialists especially for medium-sized companies who do not have that internal capability.

A third source, possibly more difficult to locate, are organizations, generally membership-based, who serve a special or local clientele such as a group of unionized auto suppliers, an agency providing services to an industrial park, or a business owner's association in a subsection of an urban area. Most can be located through a county economic development office or a local chamber of commerce.

Contribution of this Research to HRD

Given the preceding discussion and history, what does this mean for performance technology in particular and HRD in general? First, because manufacturing technical assistance in the US is a recent but expanding field, there exist significant opportunities for investigating and learning of best practices with generalizable findings. Economic development efforts that involve "brownfield" redevelopments in distressed urban areas, the creation of business incubators to spur the development of high technology products and services, and the construction of industrial parks are three types of initiative that are commonly formulated. In these cases, as well as for the existing manufacturing technology centers, opportunities exist for theoretical contributions from research studies, application studies leading to tool development and testing, consulting activities, and commercial sales and product development. From the previous discussion, it can be determined that well-informed performance technologists have many tools, methods and approaches that are relevant to the needs of small manufacturer.

This writer concludes that HRD has a significant role to play to understanding and improving the methods by which technical assistance can be formulated and delivered effectively and efficiently. Such research and demonstration efforts will be fundamentally interdisciplinary, thus forcing integration across fields where academic cooperation is still rare. It can argued, however, that the resulting findings will have an impact not only on the field for HRD, but on the economic prosperity of US manufacturing businesses, employees and their communities.

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augmented the existing services provided by the Institute for Advanced Manufacturing Sciences (IAMS) in Cincinnati, Ohio. The PRISSM project was designed and developed with the full cooperation of General Electric Aircraft Engines, the major customer for many of these suppliers. Its purpose was to not only test and validate a methodology for improving the competitiveness of the small firms, but to initiate the development of a permanent infrastructure of supporting organizations in the region, select and train the field agents, and position IAMS to be a full partner in training the national movement of extension centers. PRISSM is an example where the US Air Force, in this case, recognized the validity of integrating organizational, regional and people issues into the effective improvement of small manufacturers.

Sources and Strategies for Technical Assistance

One perspective for examining how smaller manufacturers can obtain the assistance they need to become competitive is to review how free market resources interact with these firms. One source is the relationships that they have built with their major customers (which in many cases are only one customer). Unfortunately in the US, there exist strong adversarial relationships between larger customers and their suppliers especially in vertically integrated sectors such as automotive and aerospace.

Another potential major resource for smaller manufacturers is the US university system. University faculties are trusted for their integrity and objectivity, but are often criticized for their very specialized knowledge being too narrow to help the smaller company. Larger firms, on the other hand, are known to have numerous joint ventures and close working relationships with large universities. The products of these ventures tend to have a narrow, state-of-the-art focus, which is the opposite of the state-of-the-practice needed to benefit smaller companies.

A third potential source for assistance is the federal government. Historically, the federal government has maintained a fairly low level of funding prior 1988 for direct assistance to small manufacturing companies. Three federal programs of note are the Small Business Administration, especially their Small Business Innovation Research set-asides, the Trade Adjustment Assistance program for companies impacted by adversarial import conditions, and the MEP program discussed above.

Another potential source of private sector assistance is the US equipment and software vendors. But these vendors are more interested in selling product, rather than making sure it is the right solution for the problem presented. While many vendors are willing to sell to smaller companies, many private consultants and consulting firms do not. In simple terms, small companies just do not pay enough, the advice is too narrow, and they also do not have good tools to select the right consultant or vendor.

A final type of technical assistance is that of manufacturing networks, a primarily self-help system of cooperation among a group of firms. Many such networks are fostered or promoted with government cooperation, especially in Europe. Networks of small to medium-sized companies can take many forms from informal discussion groups to co-production networks. In the US, there is a growing interest in manufacturing networks (Bosworth, 1993; Hatch, 1995).

Conclusions and Recommendations

One conclusion that may be drawn from the preceding review is that the barriers and solutions to increased competitiveness to small manufacturing firms are more broad-based than just the appropriate application of engineering knowledge and skills. The types of recommended solutions include the interdisciplinary approach understanding how to integrate the technology, the organization, and the people to the establishment of regional supportive infrastructures. Anther conclusion is to recognize that many concepts of performance technology have been applied, but not explicitly, to the domain of manufacturing technical assistance. Most of the approaches cited have not consciously utilized performance technology principles and only a very few performance technology professionals been involved in their design or implementation. Nonetheless, the need for performance technology principles in integrating the technical, organizational and workforce issues has been clearly demonstrated. At a minimum, a systems approach to deploy new technology in small manufacturing firms has shown growing acceptance, but not widespread adoption, in the marketplace.

Given that the business of technical assistance to small manufacturers is in its relative infancy, there are no readily known paths to applying the tenets of performance technology to this marketplace. Because there exists a decentralized system in the US where no one organization has the franchise on this market, a best entry point is the regional third party or intermediary organization. Such organizations exist is various forms and most are of the membership variety, sometimes as a separate organization and sometimes linked to other organizations. A good source to understand the functioning of such organizations is given by Flynn and Forrant (1995).

From a conceptual perspective, these intermediary organizations provide a social infrastructure for the modernization process where the central theme is companies learning from each other. Among the benefits they provide are:

- helping firms to become more flexible, problem-solving enterprises;
- facilitating the thinking through strategic issues in a non-defensive atmosphere; and

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Understanding Technology Diffusion in Northeast Oklahoma Small-to-Medium Sized Manufacturers

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In recent years, small-to-medium sized manufacturers have become more concerned with understanding how change and use of Internet technology have led to an emphasis on the employer as a trainer. To be effective, each manufacturer has to have a voice in the design of its training. In order for small-to-medium sized manufacturing employees to implement Internet technology quickly and inexpensively, it is important to understand how and what motivates the employees to learn Internet technology.

Keywords: Technology Diffusion, Small Manufacturers, Self-Efficacy

Research problem

A need existed to better understand and identify effective technology diffusion training approaches by Oklahoma small-to-medium sized manufacturers toward training their employees on how to use the Internet to do business.

Research Questions

The following research questions were used to explore views, opinions, perceptions, and profiles of Oklahoma small-to-medium sized manufacturing employees regarding their usage of the Internet and e-mail.

1. How does the Motorola Software Diffusion Model (Basili, Daskalantonakis, & Yacobellis, 1994) compare to the Gatekeeper Technology Diffusion Model (Allen, 1977; Zelkowitz, 1996) for training employees in Oklahoma small-to-medium sized manufacturers?
2. What are Oklahoma small-to-medium sized manufacturing employees' perceptions regarding perceived ease of use, perceived usefulness, and self-efficacy related to the use of Internet technology utilizing a technology diffusion questionnaire?
3. What are the perceptions of Oklahoma small-to-medium sized manufacturing employees in the Computer Assisted Technology Transfer Project concerning the use of the Internet and e-mail?

The purpose of the study was to understand how change and use of Internet technology have led to an emphasis on the employer as a trainer in Oklahoma small-to-medium sized manufacturers. This emphasis has stimulated a paradigm shift. To be effective, each business has to have a voice in the design of its training. In order for small-to-medium sized manufacturing employees to implement Internet technology quickly and inexpensively, it is important to understand how and what motivates the employees to learn Internet technology. This involves a concentration on the human element and the use of adult learning principles. Understanding what conditions and circumstances are needed to transfer Internet technology for small-to-medium sized manufacturing employees is a major challenge.

Because of the lack of knowledge of diffusion of Internet technology among small-and-medium sized manufacturers, the U.S. Department of Defense funded a research project with the College of Education and the College of Business Administration at Oklahoma State University. The Computer Assisted Technology Transfer project focused on training Oklahoma small-to-medium sized manufacturing employees on using the Motorola Software Diffusion Model (Basili, Daskalantonakis, & Yacobellis, 1994), and the Gatekeeper Technology Diffusion Model (Allen, 1977; Zelkowitz, 1996) toward the diffusion of Internet technology. Manufacturers using the Internet technology were then encouraged to conduct business with the U.S. Department of Defense.

The two models selected were chosen because they could be modified to meet the needs of the research; could be applied to practical work environments quickly; were not strictly based on mathematical principles; were

flexible; had an evaluation component throughout the model's application; and could be easily implemented into a manufacturing environment. In addition to diffusion of Internet technology the study had several additional important components including model identification, selection, and implementation; questionnaire identification, modification, and dissemination; training design and implementation; quantitative and qualitative data collection utilizing a t-test to understand the questionnaire results; and observations and interviews.

The Internet is a valuable resource for small-to-medium sized manufacturers, and businesses spend large sums of money in order to produce more knowledgeable employees, who in turn will be more productive and bring more profits to the organization. More money is spent on workplace learning than on all of public higher education (Carnevale, 1989, p. 27). This huge commitment of resources towards workplace learning reinforces the importance of researchers' need to understand how manufacturing employees use Internet technology and how manufacturers can diffuse Internet technology into the manufacturing workplace quicker and for less money.

Although manufacturers may not be able to produce their own training program, they can encourage their employees to use Knowles' (1970) self-directed learning principles based on his adult education theory. By utilizing Knowles (1970) adult education theory employers can motivate their employees to learn what they need to know and at their own pace, which allows them to not only be self-directed and rely on their past experiences, but to be problem-centered rather than subject centered with little or no intervention by the employer (p. 48).

Research Design

This descriptive study examined Internet technology usage in Oklahoma small-to-medium sized manufacturers, and focused on employee acceptance and resistance specifically toward e-mail and the World Wide Web. The survival of small-to-medium sized manufacturers is directly related to their adoption of Internet technology as a regular part of doing business. Accelerating the adoption of Internet technology among small-to-medium sized manufacturers is in the nation's interest because these manufacturers have a major influence on the U.S. economy, and generate numerous goods that in turn generate numerous jobs.

This study involved the use of a technology diffusion questionnaire that was modified from previous questionnaires (Bagozzi, 1992; Compeau, 1989) focusing on software diffusion. Several affective feelings are involved when employees are trained on how to use Internet technology, including intimidation, lack of confidence, helplessness, competence, and confidence. These feelings were measured with a questionnaire and categorized into sub-categories of perceived ease of use, perceived usefulness, and self-efficacy. The questionnaire used a Likert scale to measure the employees' responses. Within each section affective questions were asked regarding their feelings toward the use of Internet technology. Each of these categories then had 6 to 10 items to determine which employees were more likely to diffuse the new technology. Employees who had lower confidence levels on the Likert scales in one portion of the questionnaire had similar confidence levels in other portions.

The questionnaire was pilot tested on OSU graduate students working on the CATT project. The questionnaire was given to each all employees' at 30 sites upon completion of their Internet training. The return rate of the questionnaire was 100%, and each questionnaire distributed was completed anonymously per company. The population for this study was 30 northeast Oklahoma small-to-medium sized manufacturers, defined as manufacturers with fewer than 200 employees. These manufacturers were selected because of their previous working relationship with the OSU-Okmulgee business incubation program representative through their involvement with the Northeast Oklahoma Alliance of Manufacturers, because of their willingness to receive the Computer Assisted Technology Transfer training at the manufacturers site, and because of their willingness to consider doing business with the U.S. Department of Defense in the future. Two manufacturers were corporate owned, and 28 were privately owned. The manufacturers produced a variety of items including boat trailers, an artificial sweetener, parts for larger manufacturers, bows and arrows for Olympians, screws and bolts, and special items requested from them. Likewise, the employees who participated in the training were diverse. They included engineers, secretaries, company owners, technology trainers, and front-office clerical help. Each company had no less than 2 employees participating in the training, and 1 company had more than 20. Some of the employees shared that they had bachelor degrees while the majority were less educated. Some employees spoke of their eagerness to get on the Internet, while others spoke of their apprehension about using new technology and accessing the Internet. The company owners or the plant manager in corporate owned companies selected who would receive the Internet training and access to the Internet on their work computer.

Results and Findings

Observations and telephone interviews were used to look at all employees after they had received Internet training. Quantitative data was collected from the questionnaire and qualitative data from interviews and observations were combined to describe Oklahoma small-to-medium sized manufacturing employees' views on implementing the Internet into their work environment. Several themes were identified through qualitative data collection including: (a) access, (b) resisting technology, (c) technology acceptance, (d) technophobia, (e) clear payoff, (f) technology adoption, (g) scaffolding, (h) hand-holding, (I) tracking information, (j) acceptance by employees of the trainers, (k) interoffice communication, (l) implementing technology change, (m) prioritizing Internet opportunities, and (n) recreational versus personal use of the computer.

- Internet technology training outcomes were not influenced by either the Gatekeeper (Allen, 1977; Zelkowitz, 1996) or Motorola Model (Basili, Daskalantonakis, & Yacobellis, 1994) introduced during the study of Oklahoma small-to-medium sized manufacturing employees use of the Internet.
- Employees want to know why they should learn what the trainers are teaching rather than be concerned with perceptions regarding perceived ease of use, perceived usefulness and self-efficacy related to Internet usage.

Good technology training design is rooted in the idea that people learn best what they really want and need to learn (Wilson, 1998). Employees must be engaged in and in control of their learning experience through the training process. Employees of small-to-medium sized enterprises want to know what is in it for them. This is best accomplished by introducing a set of objectives and establishing goals at the beginning of the training. By establishing goals and objectives, the employer can quantitatively measure the adoption of technology in the small-to-medium sized manufacturer. For example, the clear objective of "you will learn how to open and save a file" lets people know whether they need to proceed. However, the unclear objective of "you will understand how interpersonal style can affect others" does not. Learners will not participate in training, which results in learning, unless they see a direct benefit of participating in the training. Learners need to understand how the training will benefit them personally or professionally before they will participate.

Many researchers take time to develop models but do not take the time to see if the models will work. Because of the lack of implementation of Technology diffusion models, being able to predict whether or not the employees will use the Internet technology is an important issue for researchers to further investigate. Regardless as to what model was used for the technology diffusion training, what mattered most was understanding the needs of each individual employee at the manufacturing site.

To understand each employee, the trainer had to implement various adult learning principles to encourage the use of the Internet technology. These principles were measured utilizing an instrument that had Likert scales to look at perceived ease of use, perceived usefulness and self-efficacy of each employee and their feelings towards Internet technology. The utilization of these adult learning principles allowed the trainer to better understand each learners' andragogical needs, and the employees were able to make meaning of the training (Knowles, 1970).

In order to understand what learning has taken place, it is more important to look at the individual than at the organizational structure. But, human resource development research focuses on the organization rather than on the employees' learning experiences. Research concentrating on individuals versus organizations can address what people want to learn and how they want to learn it. Knowles (1970) adult learning theory can help explain how employees who are self-directed learners and problem-solvers develop their own level of confidence in using Internet technology and can trouble shoot when it comes to doing Internet searches. When looking at individuals, the trainer can understand whether or not the new technology is being diffused into the work environment. However, looking at the organization does not give the trainer the whole picture because the technology may not be diffused in the manner for which it was intended. Employees are less intimidated by new technology when they can take control of their own learning environment and can immediately practice using the Internet technology at home. For example, one employee implemented the technology rapidly by purchasing a new home computer after participating in the training session, by working on material at home, and then by taking work-related information back to work with her to use.

- Employee perceptions are relevant and employers with meager means for employees to quickly
- adopt new technologies must look for creative ways for employees to adopt new technologies.
- Since adult learners learn what is meaningful to them, trainers must personalize learning experiences to be compatible with the organization's goals.
- Personalizing the learning experience quickens technology adoption rates among employees and allows employees to do their job better by understanding and using Internet technology.

- Employers and trainers need to look at adult learning concepts rather than theoretical models as the starting place for designing technology training. Training that is based on adult learning concepts that rely on the learner's technology perception concerning ease of use, usefulness and self-efficacy should result in the diffusion of technology more quickly and easily than previously done.
- Understanding how employees use their personal learning style in Oklahoma small-to-medium sized manufacturer directly influences the need for training that is easily implemented and contributes to the survival of the manufacturers.
- Small-to-medium sized enterprises that train their employees to diffuse Internet and e-mail usage are more likely to stay in business and increase production than those which do not provide training.

The key to implementing Internet technology is based on the individual employee's motivation to understand its usefulness. The process of technology diffusion is successful in Oklahoma small-to-medium sized manufacturers when they examine the employee's needs within the organization rather than relying on models to disseminate Internet technology. Such an examination involves assessing the employee's learning style, which allows immediate application of what the employee had learned. The immediate application of the technology also allows the employees to understand the relevance and importance of using the new technology at their workplace. Employees could then transfer the new knowledge to the organization and start a process of shared information with their employer and their co-workers. Such a process would result in an economic gain for the company because of increased productivity. For example, a few of the manufacturers in the study observed immediate results by implementing the Internet technology in the form of listing their company contact information on the Northeast Oklahoma Alliance of Manufacturers home page. One of the largest participating manufacturers was eager to train the majority of its employees because the main office had made a $4 million investment to implement a new accounting system using web-based technology.

- Employees desire training that emphasizes "what's in it for me" and which will allow them to utilize the new technology immediately.
- Models academicians develop often have limited use and are not user friendly because they cannot be implemented into a work environment.
- Employees want to understand how learning a new technology will solve a problem they currently have.

The study was conceptualized as a way to determine which of the two technology diffusion models, the Gatekeeper (Allen, 1977; Zelkowitz, 1996) or Motorola Model (Basili, Daskalantonakis, & Yacobellis, 1994), was most effective in training employees in small-to-medium sized manufacturers on using Internet technology. However, the actual experiences of the trainers and the training results indicate that the need for the training should determine the model selection rather than having the model selection drive the training. The results also exemplify the need for the trainers to understand the needs of the employees within the organization being trained, rather than the organization deciding what the employees need to know. The employees need to be involved in the training design and implementation to get the most from the training.

This study demonstrates that there is clearly not enough collaboration between academicians and practitioners. Academicians should strive to understand that small-to-medium sized manufacturers do not understand the importance and the use of technology diffusion models such as those used in this study. They do, however, understand the importance of Internet technology. Rather than academicians researching how theoretical models unfold, they should go into the field and talk to workplace training practitioners who are actually conducting training to formulate models. Instead of creating theoretical models in abstract terms, academicians should ground their models in the terminology of real practice and use practitioners as resources.

Most employees have a task-centered or problem-centered approach to learning, which Knowles (1970) correctly described in his theory of andragogy. This approach was evidenced when an employee participating in the study, without any direction from the employer, contacted raw material suppliers using e-mail to see if they had the material they needed to make a part. By giving meaning to the learning task (Knowles, 1970), the employee was able to implement the Internet technology with little or no effort and direction. Having employees connect with the Internet training by understanding how training could help solve their work-related problems and challenges motivated the employees to learn what they really need to know. Once the learning content is relevant to the participants' actual work, technology enables small-to-medium sized manufacturing employees to get to the next level of relevance by making learning on the Internet an internal part of the workday. By not confining training to scheduled events, it is always accessible as needed and just-in-time. This just enough and just-in-time learning is learning that is introduced to the employee when it will be most useful to them to implement (Wilson, 1998).

- Successful training occurs when the trainer is welcomed, accepted, and respected by the group involved in the study.
- The trainer must be empathetic toward the value of time of the Oklahoma small-to-medium sized
- manufacturer, because some employees may also be company owners and they may be losing
- money if they or their employee is not available to take customer phone orders because of their
- participation in the training.
- Employees need to understand the usefulness of the Internet technology that is being introduced before they will use it.
- Both personal and work-related learning takes place when employees are engaged with Internet technology that encourages new organizational relationships.
- The Internet has both personal and work-related elements that can be tied to training.
- Employees will feel as though they can contribute to the organizations success if they are encouraged to utilize the Internet to find unique opportunities for the organization.

A few of the employees who participated in the training adopted the Internet technology for their personal use. Manufacturing owners who participated in the training were more interested in the business aspects of the Internet, and employees of larger manufacturers found the Internet to be more entertaining when looking up such things as fishing fact sites, baseball information, or stock quotes. Employees looked up information on the Internet based on what was important to them, and most did not realize that they were learning in the process. Employees have different social roles that influence what information the employee decides to access via the Internet. Consequently, employee uses of the Internet varied and involved such things as planning a trip to Germany, hiring an international sales representative, and taking product orders from overseas. All of these uses deal with various individual and work-related aspects.

Technology trainers should integrate individualized Internet learning environments for employees by providing authentic tasks that legitimatize reasons to use the new technology (Wilson, 1998). Technology trainers should also integrate Internet resources into the work environment and cultivate informal, employee-directed uses. This will encourage the adoption of the use of the Internet and promote independent and collaborative inquiry, student-directed learning, and professional responsibility within organizations (Wilson, 1998). Employees also should be encouraged to adopt the Internet through a variety of incentives, policies, and practices, but keep to a minimum explicit mandates and requirements. Technology trainers should seek to create an atmosphere of expected and natural Internet participation without the feeling of coercion. One example could include letting employees have a say as to what information is put on the company's home page.

- Training modules are not as important to the employee as is the overall training environment and support provided after the training.
- Technology diffusion rate will be higher when the trainer is knowledgeable of the employee's affective feelings about the technology.
- Technology diffusion rate will be higher when the trainer conveys the risks and benefits to employees.
- Manufacturers can benefit financially when effective technology training is used.
- Technology diffusion rate will be higher when trainers understand the needs of the manufacturers receiving the training.

Overall, the Internet training was very successful for all of the small-to-medium sized manufacturing employees who participated. All but one manufacturer began to use the Internet technology that was introduced to them through the Oklahoma State University training. However, this implementation involved a certain amount of risk. One employee still preferred to look up information that was available on the Internet in the library because "there was too much information on the web."

- Employees perceptions regarding perceived ease of use, perceived usefulness, and self-efficacy are directly related to their feelings of confidence and competence toward Internet technology.
- Employees perceptions regarding perceived ease of use, perceived usefulness, and self-efficacy are useful in predicting technology diffusion.

Employees must emanate feelings of competence and confidence toward new technology after receiving training. If employees do not feel competent and confident about using Internet technology, they will be overcome with anxiety, and they will not diffuse the new technology into their work environment. Manufacturers with employees who scored high on the questionnaire's Likert scale exhibited confidence in using the new technology when they were observed. At one manufacturer one of their employees sought out the trainer to tell how much

money he was saving by using the Internet. In this way he exemplified not only that money can be saved, but also that he felt confident and competent with the new technology.

Small-to-medium sized manufacturers have a lot to gain by implementing Internet technology. Several of the participating manufacturers were already benefiting from their participation in the training and saving money by sending documents electronically instead of shipping them overnight. Research conducted by Amonsen, Moore and Taylor (1994) found that the benefit-cost variables were better predictors then psychological characteristics for predicting technology diffusion. By implication, when small-to-medium sized manufacturers understand how Internet technology can benefit their bottom line they are more likely to implement the new technology even if they are not comfortable with the new technology.

Conclusions

The technology challenge will continue for small-to-medium sized manufacturers, but through continued HRD research, researchers can translate what is known about learning and teaching how to use technology in the real-world training environment using new knowledge. This study contributed to the support of action learning activities, and helped define the effectiveness of training activities because despite great advances in technology training, the impact on the manufacturing industry has been less than spectacular with about 75% of all training still being conducted in the classroom (Wilson, 1998). In business, content, time, and financial resources often compete for priority when designing training utilizing technology. It is more crucial than ever for small-to-medium sized manufacturers to play a central role in defining and developing their own technology training for their employees. In order for manufacturers to do this, they need to form alliances with academia to help coach them through the beginning stages of this process and then forge ahead on their own. One method to disseminate new technology quickly and inexpensively would be to organize large group training sessions at one indigenous site. This would allow employees to form small learning groups of two or three people to help and to learn from each other. Such training would reach a large number of employees and could allow the researcher to measure the results quickly and easily (Wilson, 1998). This would also allow for learning to happen through experience (Dewey, 1938, p. 27). "An experience is always what it is because of a transaction taking place between an individual and what, at the time, constitutes his environment" (p. 41).

New HRD Knowledge

This study reminds HRD researchers and practitioners to look at the individual learner within an organization and not just the needs of the organization. Overall, this study reinforced the efficacy of adult learning theory by demonstrating that employers need to involve employees in the Internet training process, and suggests that technology can deliver effective training. While the Motorola (Basili, Daskalantonakis, & Yacobellis, 1994) and Gatekeeper Models (Allen, 1977; Zelkowitz, 1996) provided insight into the utilization of technology, adult learning principles were the key factors in explaining the employee's ability to learn to use the Internet technology. Thus, this research demonstrates that for effective technology diffusion to occur, the focus needs to be on the individual learner rather than on the organization. In a 1997 questionnaire conducted by the Instructional Systems Association, a trade group representing about 150 training suppliers and human resource training staff from nearly 90 corporations were asked to indicate their current use of technology versus future use of technology for delivering non-technical training in the next two years. They predicted a 33% increase in using the Interent and an 18% increase in using CD-ROMS for non-technical subjects (Cohen & Rustad, 1998, pp. 30-37). Employees are likely to implement a new technology for personal and work-related purposes when they are self-directed, utilize their past experiences, and serve as problem solvers throughout training. Although organizational goals are important, effective diffusion of a new technology results not from the specific diffusion model used, but from employers focusing on the preferences of employees' motivation to utilize the new technology.

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Human Resource Practices in Mexico and the US: Selected Manufacturing Companies

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Executives from 62 selected small export manufacturing companies were interviewed to identify similarities and differences in human resource related practices within their organizations. The predominant practices in the American companies were training, compensation and benefit packages, and selective staffing. The predominant practices reported by Mexican executives were training, literacy education, and company sponsored activities. HR practices in the American companies were directed more toward specific job performance, while in the Mexican companies they aimed more at general personal growth and human relations.

Keywords: Human Resource Practices, Cross Cultural HRD, Latin America

The study collected information about similarities and differences in training and human resource practices between successful smaller manufacturing companies in the South Central United States and South Central Mexico which export a portion of their products to other countries. Formal face-to-face interviews with key managers were conducted, audiotaped, transcribed, and analyzed.

The problem was that, while smaller companies comprise the largest and still growing proportion of the US economy and an even greater proportion in Mexico, there is little reliable information available about how these companies develop their human resources for organizational success.

The data available have been sparse and incomplete. And they have been gathered in so many ways and by such varying categories as to make them impossible to analyze or compare. There is little literature in the US and virtually none available in Mexico about smaller manufacturing companies related to training per se.

However, there is substantial literature related to so-called high performance work practices in the larger companies in the United States. The future of competitiveness for the American company is related to how well its workers are trained, how flexible and adaptable they are, and whether it is a high performance workplace. (Potter & Youngman, 1995). America's management paradigm has shifted to provide employees greater opportunity to influence the outcomes of work organizations. Through changes in the design of work and a renewed emphasis on the importance of training and development, selective staffing, compensation, and information sharing, management has begun to realize the effect workers can have on the attainment of organizational goals (Levine, 1995).

High performance work practices assist people to involve themselves in the decision making and problem solving processes of their work activities. Based on an analysis of previous research, some of the most frequently implemented high performance work practices are quality circles, work teams, job rotation, total quality management, crosstraining, employee committees, training and development, selective staffing, compensation, and information sharing (Young, Snell, Dean & Lepak, 1996; Marlow, 1998).

By allowing workers to influence their work activities, organizations can take competitive advantage of the human element. Creating work environments which fulfill human, social, and psychological needs allows organizations to reap the benefits of increased productivity, product quality innovation, and flexibility (Schutz, 1994; Mirvis, 1993; Marlow, 1998.)

Smaller businesses have always comprised the preponderance of the economy in the US and throughout the world. The inception of the North American Free Trade Agreement (NAFTA) may have provided an additional incentive for American and Mexican manufacturing companies to export. And successful companies provide information which is more likely be emulated or adapted for increasing success in other companies. These factors have led to the identification of the target population as key managers of successful smaller Mexican and American manufacturing companies which export.

The purpose of the study was to identify and compare the training and human resource practices of successful smaller manufacturing companies in Mexico and in the United States.

Research Questions

What are the training and human resource practices of smaller manufacturing companies in Mexico and the United States?

What are the similarities and differences between the training and human resource practices of smaller manufacturing companies in Mexico and in the United States?

Methodology

The methodology for the study was the conduct and qualitative analysis of interviews with top managers of smaller Mexican and American manufacturing companies which export their products to other countries. Transcripts of the interviews were reviewed through unstructured textual analysis. Qualities of similarity, frequency, and proximity, range of participant sources, and clarity of themes, thoughts, phrases and words were identified, sorted, and compared.

Interview Guide

A formal interview guide was developed in Spanish from the feedback of subject matter experts in Mexico. The experts were economists, academics, consultants, writers, and business leaders who were experienced with smaller manufacturing companies which export. The guide included descriptive questions about human resource practices, success, exportation, and demographics. The instrument was designed by the principal researcher, who is fluent in both languages. All items were identical equivalents in both languages, with the exception of one minor item which had no relevance in the United States and was deleted in the English translation.

Populations

Interviews were conducted with one executive from each of 62 successful manufacturing companies, or similar sized divisions of larger companies, which exported products. The companies were defined as "smaller" because they employed approximately 50 to 500 persons. There were separate populations of 31 companies each in the State of Puebla, Mexico and in the State of Oklahoma, US.

Each population was identified by criteria for success which were accessible in their respective countries. For reasons stated below, it was not possible to operationalize "success" in a common way across the two countries.

In Mexico, purposive and snowball sampling were used to identify participating companies. A research decision was made to purposively collect data from companies identified as successful by executives of other companies. Snowball sampling was chosen as the only way to get access to these executives, since a referral from a business peer was normally a prerequisite to entry for a data collector in Mexico.

Success was defined by the identification of a sample selected by reputation among peers. Since there were no data available from which to identify a population of successful companies by measurable criteria, it was determined that, while biased, selection by perceived reputation was likely to yield more subjects functioning at higher levels than selection with no criteria.

Initially, a few apparently successful companies were identified by officials at the Mexican university sponsoring this study whose owners or top managers were also board members, benefactors, or alumni of the university. These respondents were then asked to identify executives of other small exporting companies which they believed to be successful and who could be contacted with a referral from them. Those most frequently identified were invited to participate in the study.

Additional respondents would have been otherwise difficult to identify due to the frequent incompleteness, inconsistency, non comparability, and unreliability of statistics about companies in Mexico. They would have also been unlikely to participate due to their desire to hide or understate their success for fear of being targeted by the government or by either industrial or common thieves.

A wide range of industries representative of the manufacturing sector in the State of Puebla and South Central Mexico was incorporated into the interviews. These included rustic furniture (6); ceramics (2); clothing (7); marble and stone (2); plastic products (3); mechanical parts and appliances (2); snack foods (3); industrial chemical processes (2); and textiles (4).

In Oklahoma, the 31 participants were the companies which agreed to the interviews out of a population of 40 successful companies which had responded to a preceding mailed questionnaire sent to the entire population of 242 small manufacturers and processors in the 1997 Oklahoma Directory of Manufacturers and Processors.

Success for them was defined as having demonstrated a profit for each of the preceding five consecutive years, and having had virtually no employee layoffs during the same period of time. Forty of the 86 companies providing usable responses to the preceding questionnaire qualified as successful under these criteria.

A wide range of industries representative of the manufacturing and processing sector across Oklahoma was incorporated into the interviews. These included, among others, sound speakers, office supply forms, technical publications, energy resource exploration, petrochemicals, food chemicals, food processing, chemical textiles, metal forging, metal alloys, wire manufacturing, tool and dye making, electrical measurement devices, heating and air conditioning products, aerospace manufacturing, small parts manufacturing, commercial furniture, and components for commercial construction.

Procedures

Interviews in both countries were carried out by the same investigator accompanied by an assistant who audiotaped each interview with two mini cassette recorders and took written notes of verbal and nonverbal responses by interviewees. The interviewer and assistant discussed and compared their impressions of each interview at its conclusion. Each interview was followed by a tour of the facility which included an observation of production processes and of worker performance and interactions. This was followed by the development of a narrative of overall impressions about the company.

Audiotapes were transcribed verbatim on disc and hard copy by a transcriptionist who was trained by the interviewer to attend to the idiosyncratic aspects of these particular interviews. Transcripts were reviewed and checked against notes, and corrected with the audiotape where indicated.

In Mexico, the assistant and the transcriptionist were both local Mexicans and all transactions were conducted in Spanish. Transcripts were translated into English with the use of the software program Globalink Power Translator Pro v6.2. The translation was reviewed and corrected by the interviewer, and found to be sorely lacking. The transcripts were comprised of informal, colloquial, Mexican Spanish, much of which is expressed more as a series of idioms than of words. In the end, the interviewer relied upon the original Spanish transcripts.

In the US, the assistant and transcriptionist were from Oklahoma and southern Kansas, and all transactions were conducted in the same was as in Mexico, with the obvious exception of the language used.

Results

Most of the American companies had at least one full time person in charge of human resources, and the larger of them tended to have more human resource people. The staff sizes ranged from one part time person to eight full time members. In Mexico, Some of the companies had designated a specific area of human resources, but many did not. Where the specific area was designated, it was usually focused more upon maintenance duties related to hiring, payroll, and absenteeism than directed to human resource practices. The human resource administrator was sometimes the chief accountant, the director of operations, the bookkeeper, the union negotiator, or the owner.

Virtually all companies provided training to their employees. The American plants implemented mostly internal technical training and internal and external management development. Several specified problem solving related skill training for workers and managers. Several also collaborated with local vocational-technical schools to provide or to expand technical and computer related training opportunities to their employees. Only four manufacturers specifically identified cross-training as one of their high performance strategies. Job rotation was, surprisingly, only mentioned by one firm.

In Mexico, training and development for workers was mostly of the "on the job" variety. Workers were assigned as assistants to more knowledgable employees until they were recognized as able to function independently. Some plants encouraged workers to attend school on their own time, and a few had made specific arrangements for transportation to basic literacy programs. Managers were sometimes reimbursed for higher education expenses, and many of the top managers participated in management development seminars in Mexico and in the US.

Formal programs directed to the development of specific work related skills were less common in Mexico. However, in a marble and stone company the top managers provided direct training to the workers. Many were taught to operate two machines simultaneously which had previously each been operated by one person. This job redesign training was provided for workers who volunteered and were selected. They were rewarded with an approximately 50% increase in salary. Most of these workers were also crosstrained on other machinery. The plant manager in this case was an industrial engineer who had received additional training in the US.

Regarding compensation, nearly all participating US companies recognized the importance of providing competitive wages in order to attract and retain the best employees. Pay ranges varied from a low of minimum wage to $9 per hour in a component design and assembly plant to a high of $10.50 per hour for receptionists and $26 per hour for maintenance mechanics at a chemical food processing plant.

The latter paid very high wages for its location, but seemed more than willing to do so in exchange for the opportunity to hire the best workers available. And the former, which might have fit the description of "bottom feeder" for its low wages, claimed to be sufficiently competitive in its area because of additional forms of compensation. In fact, it cited several workers who had left for moderate wage increases elsewhere but had returned because of other benefits, including a supportive psychological climate. Variations of compensation across companies included profit sharing, a profit bonus pool, merit increases, and bonuses for exceeding production quotas and for perfect attendance.

Compensation in the Mexican companies ranged from minimum wage to from two to four times minimum wage, depending upon the perceived need for a stable workforce and the value to the company of skilled or trained employees. A form of profit sharing was present in a few plants where management indicated that its presence had affected production in a positive way. Medical benefits varied from none to very moderate. Most workers were relegated to services in the state run social security hospitals. Retirement benefits were required by the government but were quite modest. Other benefits not required by the government were rare.

Since salaries and benefits were usually not very far above the minimum legal standards in Mexico, approximately ten percent or less of that in the US, this "hand to mouth" condition left many workers dependent upon the good graces of their employer as the sole recourse for medical, legal, or financial assistance through crises. Employees often brought personal problems to the attention of the human resource person in the hope of intervention on their behalf. This form of employee help is very different from the American variety of employee assistance program.

In the US, selective staffing was given high priority in numerous companies. The importance of hiring persons with appropriate technical skills and a positive work ethic was emphasized. One plant conducted extensive testing of potential employees. Several others screened for potential permanent employees by doing initial hiring through temporary employment agencies and selecting the most promising from the "temps". Two firms stressed the value of efforts devoted to the retention of desirable workers.

In Mexico, staffing was not done as selectively in most cases. However, many companies seemed desperate to find enough workers who could learn quickly and who would come regularly to work. A few plants had instituted a formal probationary period to precede year round employment, as they would often dismiss workers when the demand for their products was reduced by seasonal or other variations in the market.

One American company said that, after the implementation of work teams, its profitability had doubled. It regularly assigned potentially high performers to cross disciplinary teams which were given specific organizational or technical problems to resolve. Members worked together part time on their group projects while continuing in their regular positions. Surprisingly, only one other plant stated that it had incorporated team building activities.

On the other hand, work teams were present in several of the Mexican assembly plants, particularly in ceramics, clothing, and appliance manufacture. Some teams met weekly or daily to address issues of efficiency or specific assembly problems. Job rotation was present in several companies on a limited basis, as was crosstraining.

Related practices of the American companies included, in descending order of frequency, tuition reimbursement for additional education, on the job training, sponsored social activities, various forms of employee recognition, the conduct of performance evaluations, and conscious efforts to incorporate fun and enjoyment into the workplace environment.

Related practices in Mexico emphasized company sponsored celebrations on special occasions like national and/or religious holidays; periodic motivational speeches made by managers or invited presenters; field trips to recreational or cultural centers; and the posting or sponsorship of educational or personal development programs provided by other agencies in other locations after work hours. One exception to this pattern was the strong desire by several plants to meet the requirements of ISO-9000 in order to qualify for exportation into international markets, particularly the European markets which initiated and closely adhere to the ISO guidelines.

Other programs of the American plants, also in descending order, were low turnover, an emphasis upon fairness, the presence of an employee assistance program, an orientation toward the needs of employee families, the completion of requirements for the ISO 9000 Certificate, and the presence of an employee wellness program.

Low turnover proved to be a remarkably consistent statistic. Most of the US companies identified their turnover rates as at or below six percent. Some were below one percent, with one claiming that 34 percent of its employees had reached perfect attendance records over an entire year. Only three plants identified turnover rates of 10 percent or higher. The Mexican plants which employed highly skilled employees also had very low turnover,

while many which employed unskilled or marginally skilled workers had very high turnover, some approaching 100 percent. A number of these did fit the description of "bottom feeder", a company which pays the lowest wages possible and tolerate high turnover, or even encourage it in order to minimize employee benefits.

While all of these companies exported to other countries, most of the American ones exported a relatively limited proportion of their products, which they considered to be less important than their focus upon manufacturing and processing products for the domestic market. Most were not aggressively seeking an expansion of their international clientele, and only a limited number were making modifications to their processes or products for that market. Most responded to individual requests from international customers only as requested and only if such did not inconvenience production for their predominantly domestic markets.

By contrast, exportation by the Mexican companies ranged from less than five percent to virtually 100 percent, with most of them producing substantially more for the international than the domestic market. With few exceptions, either their primary market was international, or it was a top goal to make it so. The Mexican market was said by many directors to be relatively small and unstable and subject to uncontrolled inflation of costs.

One Mexican executive after another repeated the same mantra, that their mission was to provide a top quality product on time which met or exceeded the client's specifications. They said that the time had long past of promising products at a quality, quantity, or time frame in which they were not prepared to deliver.

Conclusions

Mexican companies carried out responsibilities for human resources in a manner directed more to short term survival or maintenance than to continuous improvement. According to comments by numerous directors, they were more focused upon finding enough employees to meet production quotas than upon increasing employee effectiveness. Few spoke about striving for an expanded or different human resource function.

The role of human resources in Mexico is often seen as encompassing employee relations and personnel accounting functions rather than implementing human resource practices. There was the appearance of a lack of connection between investment in employee skill training and increased competitiveness in many plants, based upon both interviews and observations. And Mexican companies claim that they find themselves challenged more and more by plants in China and Africa where the cost of labor is a smaller fraction of Mexican costs than Mexico's currently are of the US labor costs.

Training in the American companies emphasized human performance while in the Mexican companies it was more aligned with human relations. The former placed more resources in specific job proficiency, and the latter placed more resources in personal growth and motivational activities.

This emphasis of human resource programs upon recreational and caretaking activities more than developmental ones, and upon general more than skill based training, compromises the potential for improving worker productivity through human resource development. Examples from Mexico include a company promoting the study of English As A Second Language by employees whose work skills had not yet been assessed, and another intent upon acquiring ISO-9000 certification without having done a cost benefit analysis of such an effort. Resulting disillusionment could lead to a further reduction in, or abandonment of, more focused and cost effective investment in their people.

Plant tours and performance observations in the US generally demonstrated a psychological climate in which managers and workers communicated in a relaxed, collegial way. There appeared to be an ongoing effort to improve the processes and the products, and a collaborative approach to carrying it out. People seemed to feel valued, and to like the work and the workplace. Tours and work observation in Mexico generally demonstrated a less relaxed and more formal climate and a more paternalistic relationship between managers and workers.

Paternalism in the workplace competes insidiously with employee development and restricts its implementation. Treatment of workers as unfortunate, ignorant, or childlike does not support the value of investing in increasing their capacities to contribute to the organization.

Most Mexican company executives demonstrated a pronounced global orientation while most Americans presented themselves as relatively ethnocentric. The Mexicans embraced and were eager to expand their products for the international marketplace, while the Americans tolerated it as long as they did not have to make adaptations for it. If this attitude is widespread and persists in the American smaller manufacturing arena, it may result in an increasingly limited international market for its products.

Recommendations

Additional research should be conducted for the purpose of identifying the cultural adaptations necessary for the movement of employee training in Mexico from a human relations and personal growth focus to technical proficiency and professional development.

Additional research should be carried out to identify the cultural adaptations necessary for the movement of the human resource function in Mexico from a caretaking role to that of a facilitator of higher performance.

Additional research should be conducted for the purpose of determining whether there is relative reluctance by American smaller manufacturing plants to compete in the international marketplace and, if so, what the long term consequences may be.

Additional research should be carried out to identify the specific and differential skills needed by workers and managers from high context, as in hispanic, cultures and low context, as in anglo, cultures so that they can communicate effectively in specific international environments.

Contributions to HRD Knowledge

This research contributes to the knowledge base about the status of training and human resource practices in the small manufacturing sector in the "heartlands" of the United States and of Mexico. It identifies some of the similarities and differences in training and human resource practices between them. And it implies that HRD related adaptations may be required of practitioners on both sides of a cultural boundary.

Limitations

There were a number of limitations to the study, several based upon differences in the availability of information between the countries.

The identification of successful companies was highly problematic. In Oklahoma it was possible to locate a directory of all manufacturers in the state and to extract from it those which matched he size criteria and which exported products. Through a mailed survey, approximately 40 percent responded with information relative to specific criteria for success, and nearly 50 percent of respondents qualified. Slightly more than 75 percent of the qualifiers agreed to the interviews. By contrast in Mexico, no such organized data existed, although great efforts were expended to locate them. So the successful companies were identified purely by reputation.

True statistical sampling was not possible in either survey. In Oklahoma there was too much reliance upon a single source of identification of the population, followed by two levels of respondent self selection for participation. Respondent identification in Mexico was reputational and incidental, and access depended at times upon the acquaintanceship of a trusted third party. These are populations rather than samples.

Access to companies was more problematic in Mexico, and the availability of data within them was relatively more limited. This affected the balance of usable information between the two groups.

Participating manufacturers were limited to a single state in each country. Both Oklahoma and Puebla are traditional, conservative, and agriculturally oriented regions with attributed reputations for relatively pronounced individualism within their respective societies. (Read: "pioneer spirit" or "machismo".) At the same time, the attempt to generalize results nationally is heavily restricted by such regional variations. Neither state is typical of its entire country.

The study was limited to the perceptions of specific managers of specific smaller manufacturing companies which exported and which were located in the states of Puebla in Mexico and Oklahoma in the United States.

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