Manufacturing Assistance Program and Disaster Recovery Model
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ABSTRACT

A Manufacturing Assistance Program that serves as a post disaster assistance model is being developed by a partnership between Iowa State University (Ames, IA) and the Rock Island Arsenal, (Rock Island, IL) Manufacturing Technology Consortium (MTC) in conjunction with the U.S. Department of Commerce and Department of Defense for small and medium-sized manufacturing companies affected by a flood, tornado or other natural disaster in the Midwest. A computer database is being developed that is accessible through World Wide Web or over telephone line via modem equipped computer. This computer database contains comprehensive information about assistance organizations and how to contact them in the event of a natural disaster. The database includes sources of equipment and logical structuring of feasible process design/ redesign for some typical scenarios and markets. Telephone numbers of assistance organizations and names of specific individuals to contact at each organization are also provided. The database also lists government surplus equipment that could be obtained so that manufacturers who lost their machinery will not lose their entire businesses but will instead have opportunity to subcontract, replace or even upgrade their processes, including major machinery or other manufacturing capabilities.

1. Project Summary

The flood that devastated much of the Midwest in 1993 revealed an alarming lack of assistance for small- and medium-sized manufacturing companies. Without assistance, many lost customers and were unable to recover. The Manufacturing Assistance Program is a disaster assistance model that is being developed by a partnership between Iowa State University (ISU) and the Manufacturing Technology Consortium (MTC) for small- and medium-sized manufacturing companies affected by floods, tornadoes, or other natural disasters in Iowa and Illinois. In addition, the model incorporates information from 11 other states affected by the 1993 floods.

The program is aimed at helping victims of a natural disaster to recover more quickly by providing the telephone numbers of assistance organizations and the names of specific individuals to contact at each organization. The model also provides the names of (1) companies as well as state and federal government agencies that have surplus equipment and (2) organizations that will provide training on new equipment and procedures and will consult objectively with business owner and managers about the unique problems they face as a result of the disaster. This above information is stored on databases located at both ISU and at the MTC. The databases are available via an easy-to-use computer program that will run on any platform. The training and consulting will be conducted by MTC, ISU, other land-grant universities as well as community colleges.

2. Project Description

2.1. Objectives

In this project, the investigators are implementing the Manufacturing Assistance Program (MAP), a disaster assistance model being developed by a partnership between Iowa State University (ISU) in Ames, Iowa, and the Manufacturing Technology Consortium (MTC) in Rock Island, Illinois (in conjunction with the Department of Commerce and the Department of Defense). The model incorporates information from the states of Arkansas, Iowa, Illinois, Kentucky, Louisiana, Minnesota, Mississippi, Missouri, Nebraska, North Dakota, South Dakota, Tennessee, and Wisconsin. The primary objective of this effort is to provide the
means for small- and medium-sized businesses to maintain their customer base and recover from natural disasters. The partnership will evaluate the recovery process used to assist manufacturing enterprises adversely affected by the floods of 1993, which devastated a nine-state region. In addition, the partnership is developing a computer database that details available resources, for example, assistance organizations to contact following a natural disaster and provides sources of replacement manufacturing equipment. The disaster assistance model could be implemented anywhere in the United States; however, assistance delivery mechanisms will vary depending on the geographic region and individual states. The intent is to identify existing resource providers and provide a mechanism for cooperation, while providing aid to the affected manufacturers within a two- to three-week period after the disaster occurrence. Where mechanisms for implementation exist, duplicate mechanisms are not being created.

2.2. Project Leadership

The MAP is being developed through Engineering Research Institute (ERI) Technical Services at ISU and the MTC at Rock Island Arsenal (RIA) in cooperation with the Center for Industrial Research and Service (CIRAS) at ISU.

2.3. Expected Significance

Although devastating, the floods of May 1993 taught a very valuable lesson for the future: Be Prepared! A large number of people helped in many ways to provide food, water, and other essentials to people in dire need. Unfortunately, however, very little assistance was provided to meet the specific needs of small-scale manufacturers.

Many small- and medium-sized manufacturers were destroyed because their equipment was damaged in the floods and they could not recover fast enough to fulfill current orders; as a result, their customers went elsewhere for manufactured components. To help prevent that outcome in the future, a computer database is being developed that contains comprehensive information about assistance organizations and how to contact them in the event of a natural disaster.

The first issue is saving lives. Therefore, initial contact people include such agencies as the Red Cross. Other organizations of particular use to manufacturers in need of assistance include the Society of Manufacturing Engineers (SME), Small Business Administration (SBA), and Federal Emergency Management Agency (FEMA). Access numbers for reaching them plus local government agencies are also included in the database. This database also lists government surplus equipment that could be obtained so that people who lost their machinery will not lose their entire business. It also lists organizations that will consult objectively with business owners and managers about whether to replace or salvage equipment and organizations that will provide training on new equipment or procedures.

2.4. Plan of Work

This project is aimed at transferring information, state-of-the-art technology, and training to small-and medium-sized manufacturing companies affected by natural disasters. The model will serve as a first step to relieve victims of a disaster by providing information for immediate needs such as whom to contact and where assistance is available. It will also provide ongoing support throughout the cleanup and recovery process. Moreover, this project can be seen as one involving many concepts and applications of industrial and manufacturing engineering in terms of restoring and upgrading competitive manufacturing systems and not just replacing lost or damaged plant and equipment. In reference to the areas solicited for input, there are contributions to five activities: data collection, database design and implementation, training of personnel, documentation, and testing.

Data collection involves gathering information that a manufacturing company affected by a natural disaster might want to access. It also involves categorizing processes and hardware for small manufacturing according to product type and size, sales volume, type of material(s)
used, and level of technology. This will enable the organization of relief effort according to the types of industrial operations affected by the disaster.

For database creation, it is necessary that it be as easy to use as possible because the database will be used by people some of whom have little knowledge of computers. To create it, a Silicon Graphics Inc. workstation using a Mosaic information server is being employed. The system will also include a direct touch-tone telephone access system with a menu guided information path to assist the inquiring party regarding the prioritization of needs (e.g. building, processes, parts, materials, supporting equipment, etc.) and options based on type and severity of loss. The system will be accessible using wired telephone or cellular phone providing the maximum communication flexibility. Information paths are being designed for specific industries (e.g. woodworking versus machine shop) so that meaningful levels of priority and process specific needs for a given company can be established quickly.

The training of personnel can take place on location, at MTC, or at ERI. Both MTC and ERI offer fully operational workshops in a host of engineering disciplines. When a natural disaster occurs, disaster victims can obtain database information from the nearest land-grant university or community college.

A brochure is being developed that describes the database access procedure and other relevant information about the project. A log of revisions will be kept so that others who decide to emulate this project can benefit from experiences encountered. Documentation is being set up based on the collection and organization of manufacturing process information. This documentation will describe the key features and advantages of this system over past approaches to coping with disasters. Other valuable features of the system will include the use of total quality management and quality control techniques in temporary manufacturing systems to assure product quality even under adverse conditions, and the registration and certification of operators qualified to serve in the disaster relief program according to designated skills. For long term restorations, the system will provide information options for future choices based on sales volume, type of product, and current manufacturing process technology.

Finally, after the networking system and database have been established, it is necessary to test the system in order to determine how it would perform following an actual disaster. This can be accomplished through a series of tests in which disaster reporting and informational responses are simulated in the system based on initial reporting from selected participating companies. The use of pay phones and cellular phones will be tested along with conventional touch-tone calling. Results of the tests will be documented and the system will be refined and improved based on lessons learned from the tests in terms of call handling capability, response time, response completeness, and user evaluation. A simulated disaster will provide a realistic scenario to query the database and test the system. Those testing the system's capability can then judge whether the software is easy to use and make recommendations.

2.5. Specific Developments and Objectives

The current specific objective is to identify, contact and acquire information regarding equipment types and locations and also technical information regarding a broad range of current industrial processes and state-of-the-art developments in manufacturing.

Another objective is to develop total familiarity with the system architecture and skill in using and adding to the model in its present form and in providing recommended changes and adaptations, enabling it to meet anticipated operational requirements following a real disaster.

2.6. Possible Solution for MAP and Disaster Recovery Model

One possible solution for manufacturing companies who are the victims of the natural disaster is to have the manufacturing operations done by another producer, so that during their
recovery period, they do not lose their customer (manufacturing-products can still be done on the due date).

However, one problem must be avoided: the substitute manufacturers who produce the impacted company’s products might divert the impacted company’s business beyond the period of need so that customers could shift their business to the substitute company.

To avoid this kind of problem, it is possible to have a middleman; this middleman could be a government server, for example, Rock Island Arsenal. The manufactured products from substitute-companies would be sent to the middleman so that the substitute manufacturers would not know whose product they are making. The middleman could be any place, for example a nearby-warehouse with someone to take care of the orders so that transportation costs would not be high.

2.7. Publication Section

In the case of a natural disaster, news can come from different sources so that it may tell people different stories and result in confusion. To avoid this confusion, the disaster event can be published on the Internet. People could also contact publishers and news agencies, newspapers, television, radio, and also appointing the Internet address as a “base-source” so that by referring to this base-source, the news will have the same story published.

For now, these communications can be accomplished by announcing to small-and medium-sized companies that there exists a MAP and Disaster Recovery Model available on the Internet and providing them with the address. A “special-page” will be provided that any company can publish or use to provide information that the company wants other people to know. A list of contacted publishers and their addresses (for example Des Moines Register, Times, etc.) would also be provided so that news with a conflicting story could possibly be corrected or eliminated.

2.8. World Wide Web

Several steps are necessary to get into the MAP location on the Internet assuming either Mosaic or Netscape is already installed:

2.8.1. Go to File - Open URL
2.8.2. Click the pointer to the “Open URL” box and type “http://MAP1.eng.iastate.edu” and then press Enter.
2.8.3. MAP homepage is then available. Anybody can then click on any highlighted-word and go to deeper and deeper information about the MAP and Disaster Recovery Model.
2.8.4. To go back to the previous item, just click on “Back”.
2.8.5. To exit the program, go to File - Exit.

The following is an example of how to find information from Thomas Register (assuming either Mosaic or Netscape is already installed): Suppose MAP homepage is already available, then click on General Information, then click on Other Information about Manufacturers..., and finally click on Thomas Register. Now, Thomas Register homepage is available to use. Anyone can obtain the available information by just clicking the preferred highlighted word.

3. Results

The technical feasibility of the overall MAP has been demonstrated. The database structure and overall organizational and information network have been established and tested locally. Feedback on the MAP concept, overall design, practicality, user friendliness and need following a disaster has been positive from participating community colleges and universities as well as from manufacturing companies. A number of those who have explored the system have expressed encouragement for its development and the addition of information and specialized manufacturing technical assistance classifications to meet immediate needs. The overall MAP system concept is diagrammed in Figure 1.

Overall direction and database for MAP are managed through the Engineering Research Institute and the Center for Industrial Research and Service at Iowa State University and the Manufacturing Technology Consortium at Rock Island, Illinois. Participating partners in locating sources of assistance for manufacturers
include numerous community colleges and land-grant universities located in the 13-state region.

Another important result of the research conducted to date is the demonstration of how it is possible, using computer networking, to establish a major cooperative assistance program with practically no administrative cost and no need for a special dedicated organization, department or bureau to carry it out. Maintenance costs on the system are very low, averaging $1000 or less per month. These results have implications for the operation of other government sponsored assistance programs at a time when downsizing and cost reduction in operating government programs have become areas targeted for major economic and political reform.

4. Project Status

The overall model, database taxonomy and organizational networking infrastructure have been established. At the time of this writing, the system was about to undergo a series of simulated disaster tests to determine its ability to handle heavy traffic during an actual emergency. Regional conferences are being held to instruct manufacturers in the use of the Manufacturer's Assistance Program and to encourage them to add data regarding their specialty areas in manufacturing technology and production capabilities so that these could be known to a company needing assistance following a disaster. The MAP is being advertised by distributed brochures and on World Wide Web.

5. Conclusions

The following conclusions can be made at this time regarding the initial development of the program and model:

1. A manufacturing assistance and disaster recovery program utilizing regional industrial capacity along with existing state and federal infrastructures and networking using World Wide Web is feasible and can be developed in the very near future.

2. The proposed system database and disaster recovery model can provide significant relief in the form of alternate manufacturing capacity during the most critical period of production downtime following a disaster.

3. The loss of customers due to the inability to fill production orders during the first few weeks following a disaster constitutes the most serious and immediate threat to the loss of an entire business establishment for the small and medium sized manufacturing company.

4. The present system being developed for a 13-state midwestern and southern region can be extended to other regions covering the entire contiguous 48 states of the U.S.

Figure 1: Manufacturers Assistance Program System Diagram