JOB TRAINING NEEDS

IN MINNESOTA

November 1, 1984

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Resource Material Collected

Attachment A: Technical Skills Study

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I. Executive Summary

The charge given to the Job Training Issues Team was the assessment of current and future training and retraining needs of Minnesota workers and employers and the design of a more effective linkage between state and local agencies and non-governmental organizations. Concurrently the Study Committee on Technical Education was to examine the need for technology education programs in Minnesota by reviewing existing data on the availability of programs and the need for graduates in those technology programs as determined by private industry and government sources.

Initial investigations by both committees indicated that available labor market information lacked the precision for making recommendations, was not applicable at the substate level where program decisions are made, and did not include identification of the skills or competencies that would be necessary in the occupations identified. With the primary importance of such data, it was decided to merge the two committees for an assessment of current data and for possible recommendations of an appropriate design of job skill needs forecasting for Minnesota.

Findings indicated that though there were a number of independent collections of data related to job projections, industry monitoring, tax revenue forecasting, currently integration of this valuable data basie is not occurring. Additionally, education and training systems are seeking more specific data on which to do their planning in order to operate more effectively and efficiently. Finally, the responsibility for an on-going process for collecting, analyzing and disseminating information on the human resource needs of Minnesota employers must be put in place.

Recognizing the separate but related charges to the original committees, the combined Issues Project Team recommends:

- 1. The funding of a Technical Skills Study by the Department of Economic Security, Research and Statistics, to focus on the needs being generated by the impact of high technology. Cost of this would be absorbed in part by the Research and Statistics Office and supplemented with \$1,000 by adopting the Issues Team recommendation. A six-month timeline is anticipated.
- 2. The funding of Future Job Opportunities in Minnesota Research Proposal by Dr. David Birch of the Massachusetts Institute of Technology. The product of this research would be a "road map" that describes what job opportunities will be available over the next 5 to 10 years, what jobs are likely to vanish, and how best to make the transition from the old to the new. Cost of the research, coordination and updating would be approximately \$125,000. A twelve-month timeline is expected.
- 3. The funding of an implementation process which would integrate the labor market information into existing career guidance and program planning processes throughout Minnesota through the Minnesota Occupational Information Coordinating Committee. To provide for implementation, \$50,000 is recommended. A twenty-four month timeline is appropriate.

Finally, the Issues Project Team's experience of trying to identify current available information, and its discovery of the wealth of data collected but currently unable to be integrated, results in its urging the further investigation of a policy that would provide coherent direction to and analysis of research on the Minnesota economy.

II. Background History

The State of Minnesota with the rest of the nation is experiencing the most rapidly changing economy in its history. Nationally, over twenty-five thousand companies declared bankruptcy last year, while half a million new companies opened their doors. In the past, when both the economy and technology moved at a slower pace, it was possible for growing businesses to employ the workers who lost jobs in disappearing industries. That is no longer possible. The kinds and levels of skills are changing. At a time when government is perplexed by the presence of displaced workers, businesses are claiming jobs go unfilled, and expansion is limited by the lack of an appropriately trained workforce. The need exists to more accurately and completely extract job skill needs from business to provide education and training institutions with the information for appropriate curriculum development, and to provide workers with an improved basis for job training selection. While the economy and changing markets have impact on employment needs, special attention must be given to the impact of technology in the work place. This impact must be addressed both in terms of appropriate technical education including math/physics and science programs as well as in terms of consequences for the broad range of employment.

Charge

Concurrent with the establishment of the Job Training Issues Team was the creation of the Study Committee on Technical Education. The charges given to these two groups were different but related. The charge given the Job Training Team was the assessment of the current and future training and retraining needs of Minnesota workers and employers and the design of a more effective linkage between state and local agencies and non-governmental organizations.

The primary focus of the Study Committee on Technical Education was to examine the need for technology education programs in Minnesota. This committee was established in response to Governor Perpich's request to develop a strategy and policy framework for technology education in Minnesota. The Governor asked each of the higher education systems and the Minnesota High Technology Council to appoint representatives to this committee.

The charge to this group was to review existing data on the availability of programs and the need for graduates in those technology programs as determined by private industry and government sources. Later phases of this work activity might involve the development of specific recommendations to the Governor, and the Legislature on needed program initiatives. The State Planning Agency, the Department of Finance, and other agencies such as the Department of Economic Security were to be involved in the needs assessment process.

The Job Training Team required labor market information as a start, then, more specific focus on skills needed in training. Design of improved linkage depended on structure of information collection and dissemination.

The Study Committee on Technical Education needed to review existing programs and the need for graduates as determined by private industry and government sources. Lack of knowledge about current labor market information as well as conflict in projections demonstrated the need for improved data base prior to the recommendation about programs.

With the primary importance of such data, it was decided to merge the two committees for an assessment of current data and for possible recommendations of an appropriate design of job skill needs forecasting in Minnesota.

Several months after the committees joined to review data processes, the Commission on the Future of Post-Secondary Education in Minnesota presented its findings which included the recommendation that the state initiate a state-sponsored project which will assume leadership for linking projected employment needs with the capacity of educational and training programs to serve employers. "Minnesota must more closely link the employment needs of the state with our educational programs. We must cut down on our response time from projected employer need to availability of skilled personnel. If Minnesota can establish a more sensitive, more future-oriented job projection system than other states, we shall have a distinct and important competitive advantage. Moreover, we shall have greater control of our economic destiny."

Analysis Method

The combined committee was composed of the listed members and the agencies they represented:

David J. Berg University of Minnesota

John Cosgrove Department of Economic Security

Cyndy Crist Office of Science & Technology

Douglas Easterling Community College System

Dean Russell Hobbie University of Minnesota

Valerie Jerich Department of Economic Development

John Malinka Minnesota High Technology Council

Dale Nelson Department of Finance

Rudy Pinola Department of Economic Security Dick Ramberg Minnesota Council for the Handicapped

Bruce Reddemann Department of Finance

Mike Stetzler Austin Area Voc. Technical Institute

Bill Stock Vocational-Technical Education System

Barbara Stromer State Planning Agency

Paul Thomas Minnesota Higher Education Coordinating Board

Adrian Tinsley State University System

Monica Manning, Chairperson Minnesota Job Skills Partnership This group met over a period of four months to discuss the status and needs for occupational projections as they related to system, institution and agency planning. Some of the presentations were made by committee members who are involved in either employment research or who carry significant responsibility for education program planning.

An inventory of current research was made while representatives of educational institutions outlined the kinds of information they needed for improved planning. Discussions about deficiencies in current data collection, utilization and dissemination followed. When it became apparent meetings of the full committee were too large to generate possible solutions, a sub-committee was directed to review the findings and develop a set of recommendations.

III. Findings

- 1. Industry and occupational projections are made by the Department of Economic Security, Research and Statistical Services Office. Long-term projections for five and ten years are made for the state and metro area. Results are published in documents and technical material is available for other analysts. Federal funding for this effort has been reduced. Federal analysis from the Bureau of Labor Statistics is no longer as available. Funds are available through the Governor's Job Training Council but how these funds will be used is not presently clear. The outlooks are primarily based on historical data and while analyses attempts to recognize other factors having economic impact, there is no direct relation to data bases in other state agencies. Data validity at the state level is not applicable to the substate level.
- 2. The Department of Revenue uses a model package to develop long-term (1995) forecasts of employment, personal income, consumer prices, and costs of production. These estimates are used in revenue forecasting of certain taxes and impact analysis of tax law changes.
- 3. The State Economist, located in the Department of Finance, develops a forecast of the Minnesota economy and major tax revenues for two to five years into the future. National economic forecast data is related to a model of the Minnesota economy.
- 4. The Department of Human Services, Bureau of Income Maintenance projects long-term (1990) levels of caseloads, costs and issues associated with major programs to financial assistance and health care funding.
- 5. The Department of Agriculture and Applied Economics at the University of Minnesota does state and substate analysis including occupational projections at the state level. The University of Minnesota-Duluth also conducts economic research regarding occupations.
- 6. The Minnesota High Technology Council completed a survey in 1982 on engineering needs and engineering technicians in the State of Minnesota.
- 7. The Minnesota Occupational Information Coordinating Committee provides a channel for the dissemination of materials related to labor market information, particularly as it related to educational programs.
- 8. Educational institutions have changed in the kind of data they seek. New career program proposals were most frequently supported by employer surveys conducted by the initiating institutions and corroborated by

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professional testimony. Most institutions do not regularly review current occupational data distributed by the Department of Economic Security.

- 9. Placement information from the various systems is inter-related, currently standardization is lacking as well as a medium for exchange of this information.
- 10. Since many educational institutions serve a particular geographic region, specific substate information is necessary to careful planning.
- 11. Training programs funded by the Job Partnership Training Act and the Minnesota Job Skills Partnership Board need regional data on labor demand and supply.
- 12. The impact of state economic development ventures is unknown. There could well be implications for jobs and skill needs in specific areas.
- 13. Extracting specific skill information from industry is on an ad hoc basis, sought by the developers of specific programs.
- 14. No one agency is responsible for the data base for researchers doing economic analysis. There are no set standards for data collection.
- 15. Business and industry to the extent they are engaged in strategic planning, devote resources to capital rather than human resource planning. Information is minimal on future skill mix needed by specific companies or industries.

Commentary

Several departments in the state are responsible for collecting specialized information which is concentrated in time and space. Individual state offices have interests in obtaining objective information on the state of the economy with regard to specific issues, like prospective state revenues, state demographics, probable impact of proposed new taxes, unemployment projections. This extensive data resource is not currently collected in such a way as to inter-relate the information.

Accurate projection of job training needs, including technical education, is dependent on understanding the nature of the economy. A state is a collection of place economies represented by municipalities and administrative areas which, also, form functional economic communities. In order to provide for effective communication with educational institutions, the information needs regional analysis (Maki).

The dynamics of the occupational market currently reflect several impacts. The business cycle formerly seven to ten years, is now closer to three to four years. The high technology industry is very volatile, with the high volatility based more on location than other changes. The impact of the military budget buying skills away from other areas must be understood. Many job slots exist due to job migration and not solely to new job creation. Federal and state policies have differing impact in regions.

Knowledge is limited about industry's present training capacity. This is particularly significant relative to older workers.

Labor supply information is critical to projecting occupations and training

requirements. The projected decline of labor force entrants by 1992 could change the mix (staffing pattern) with more part-time jobs merging to fulltime jobs. Also the age of the labor force could change the nature of the way educational programs might be offered.

- e.g. More attention to part-time programs to meet the needs of employed workers.
- e.g. More attention to the previous education of workers: some will need less training to move to other positions because they have more education to begin with. Others will need more developmental work to be prepared for technical training.

Finally, emerging occupations are difficult to identify. To monitor for them using only historical data is misleading.

Conclusions -- Needed Improvements

The charges given to the original committees led the combined effort to the search for existing useable data for decision-making regarding job training needs and technical education program needs.

- 1. It is apparent that there is a wealth of information collected for specific purposes by several state agencies, but no current way to integrate this data for purposes of assessing long-term trends in the state economy.
- 2. In order to project job and technical education needs, the economy of the state as a whole and of specified regions must be analyzed more minutely. What kinds of industries will expand or contract, what location decisions seem practicable, are important questions to be answered.
- 3. In the short-term, information must be acquired to provide the technical education committee a basis for recommendations on program planning in light of quantity and content.

Information is needed to project not only the demands of industry, commerce and government for a technically competent labor force, but with respect to these demands, there is a need to identify the specific skills and associated competencies that the education and training system must provide as distinct from those which industry can/should provide.

- 4. In the long term, the responsibility for an on-going process for collecting, analyzing and disseminating information on the human resource needs of Minnesota employers must be put in place. Such a process will be most effective if the whole economy is studied with projections in capital and human resource needs emanating from a thorough study. The rapidity of change experienced in the state, national, and international economy is unlikely to abate, so a sophisticated, continuing process is required.
- 5. In order to address these issues on a continuing basis, the need exists to pool technical expertise and create a stronger network for the effective utilizing of this expertise. The value of the kinds of research recommended can only be realized if there is institutionalization of using this information in the decision-making process.

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IV. Alternative Options

Currently available resources do not provide education and training institutions — or those who develop education and training policy — the specific kinds of information needed to address the needs of the work force. With the combined effects of changes in business operations as well as the demographics of the work force, more information is sought throughout post-secondary education to review current curricula and programs and to direct other development more appropriately.

It is helpful to consider this problem in two timeframes, the immediate and the long term. The Technical Education Committee needs information now to make productive recommendations on technical program requirements. Therefore, a solution that can be implemented on the short-term must be considered.

However, implied in the charge to the Job Training Issues Team and incumbent on the solution is a long term response that would provide information on the changing skill needs in Minnesota in such a way that education and training planners would continually have available the best projections to assist in updating and revising curricula and programs.

The following options were considered independently but could also be viewed as four increasingly comprehensive phases of creating an information system that would provide on-going, useful data for decisions regarding appropriate programs of education and training.

Option 1: To have the Department of Economic Security, Research and Statistics, conduct a Technical Skills study to identify the demands of Industry, Commerce, and Government for a technically competent labor force. With respect to these demands, the study would identify the specific technical skills and associated competencies that our education system must provide as distinct from those which industry provides. (See Attachment A.)

This option would generate information that focuses exclusively on the skills and competencies needed in <u>technical</u> occupations. It would be conducted as a written survey of approximately 200 businesses in 30 occupational categories related to <u>high technology</u> combined with follow-up interviews and possibly the development of case studies. The Research and Statistics Office of the Department of Economic Security would provide the leadership and have primary responsibility for conducting the research.

Budget Implications: \$1,000 (postage, printing & E.D.P.)

Option 2: To contract with Dr. David Birch of the Massachusetts Institute of Technology Program on Neighborhood and Regional Change for a research effort on Future Job Opportunities in Minnesota to provide a "road map" that describes what job opportunities will be available over the next 5-10 years, what jobs are likely to vanish, and how best to make the transition from the old to the new. (See Attachment B.)

This option would provide information to education planners in both technical

and non-technical areas. The study would be of 15 to 20 job categories, 55 occupational groupings, and would forecast job growth by industry group on a regional level within the state. The intent of this study is to identify job growth and decline based on observation of new formations, failures, decisions to expand or contract, or relocate by Minnesota business and industry within the context of the changing U.S. economy. Specifically, the research project proposes to provide answers to the following:

- 1. How many jobs of what kind will exist 5 and 10 years from now?
- 2. What occupations will these jobs require?
- 3. What will the skills required to perform those jobs?
- 4. For a person of a certain age with a certain amount of experience in a certain occupation, what career opportunities offer the greatest potential, and what kind and form of education and training offers the best vehicle for getting there, and
- 5. For the education and training establishment as a whole, where will the greatest need be?

Budget Implications:

Research Project:\$ 80,000State Coordination (.5000)25,000 (director of project)State Research Follow-up (.5000)20,000 (continuing basis)Implementation50,000 (see below)\$175,000

Discussion: Integral to the effective use of the research in both options is providing for an implementation process. Currently, the Minnesota Occupation Information Coordinating Committee is charged with the development of an occupational information system by federal vocational education and job training legislation. Expanding the membership of MOICC to include all systems of post-secondary education, the Governor's Job Training Council, the Minnesota Job Skills Partnership Board, and several representatives from business and industry would strengthen the network.

MOICC, the State Board for Vocational-Technical Education and the Department of Economic Security are conducting a project to enable education and training planners to analyze educational "supply" data with occupational demand data. As a part of the research process in both Option 1 and Option 2, MOICC could coordinate two kinds of panels to promote reliable use of the data generated. Review panels of selected representatives of business and industry would provide additional insight into the occupational skill projections. Review panels from education and training systems would address issues of training responsibility and planning.

Updating of the research information garnered in either Option 1 or Option 2 must be provided for. This updating demands a continuing information dissemination process. MOICC would be an appropriate agent for continuity of information sharing. In order to accomplish the systematic management of available information, data base access is necessary.

Budget Implications:

\$ 50,000 (see above Implementation)

Option 3: To create a Council of Economic Advisors from Government, Education and Business that would provide policy direction for economic research important to the state.

This Council of Economic Advisors, which could be an expanded version of the current Advisory Committee for revenue forecasting would carry the following mandates: review state revenue and other pertinent economic forecasts and analysis; develop an agenda for state economic research; supervise and develop guidelines for a centralized state data base system; review and analyze proposed legislation for its economic impact, and initiate and recommend studies, surveys, etc., where there is a current lack of data or analyses.

This option would provide for coherent analysis of the state economy recognizing that a study in any sector of research, such as labor supply and demand is not sufficiently valuable when treated idependently.

The development of a data base center would provide for the integration of information from the various data files to increase the value of the analysis. The individual agencies collecting raw data currently would continue to collect and analyze it for their specific mandated purposes. The data base center would be responsible for defining data needs, gathering and maintaining (perhaps in summary form) for use in economic analysis.

This option moves beyond maintaining a network which defines problems by creating a council to set policy in direction of research. However, its nature would limit its actual work. Research would still be carried out by specific agencies or by a consortia of researchers on a voluntary basis. The creation of the data base center would improve accessibility for independent researchers.

The Council of Economic Advisors could be located in the State Planning Agency with authority to advise and recommend research direction and with funding to promote new research initiatives on a grant basis to specific agencies or research consortia.

Budget Implications: Not determined

Option 4: To create a State Applied Economics Research Center, supervised by a Council of Economic Advisors, and having, as its core a Data Base Center.

The State Applied Economic Research Center would be involved in and conduct specific research on the state's economy as well as monitor and forecast state and sub-state economic activity. Such a center would: provide for continuity of research, provide objectivity of research removed from the political environment, reduce duplication of effort, focus on long-term analysis as well as short-term monitoring analysis and forecasting most commonly done, draw on the best resources the state has to offer.

The Council of Economic Advisors would retain the responsibilities listed in Option 3, and, in addition, organize and supervise the State Research Center.

Option 4, as well as Option 3, goes significantly beyond job training research, but importantly includes occupational projection information with other studies

Budget Implications: Not determined

V. Recommendations

The Issues Project Team on Job Training Needs strongly urges the implementation of Option 1 and Option 2. Option 1 is a small scale study with a fairly narrow focus, but it is valuable as an initial project to see if the kinds of information it seeks can be acquired in a systematic fashion and disseminated to education and training institutions in a manner that promotes response in curriculum and program planning. The information generated should provide the Study Committee on Technical Education an improved basis for recommendations it might make about technical education program needs.

For a more comprehensive study that will address more broadly the skills and competencies needed by the labor force in Minnesota, the Issues Project Team urges the funding and implementation of the Future Job Opportunities in Minnesota proposal from Dr. David Birch of the Massachusetts Institute of Technology. The basis of this study, projected industry growth in Minnesota combined with its attention to the skill levels necessary in the jobs that will be created by the growth, is an initial response to the Team's concern that a more integrated approach must be taken to generate useful information for education and training policy.

The Birch proposal is based on a pilot project underway, "Jobs for Connecticut's Future." Progress in that project has been monitored, initial reports reviewed, and recommendations of how to make it most applicable to Minnesota are emerging.

The experience in Connecticut indicates a very significant aspect of the project design is the inclusion of the information implementation process from the beginning. Important steps to effective implementation include:

- 1. The commitment of the Governor to the project research and to its implementation by policy planners in state agencies and education and training systems in Minnesota.
- 2. The creation of a State Advisory Council which would assist in adapting the research design to Minnesota and coordinating the interests of the ultimate users of the information.
- 3. The creation of panels from business and industry to respond to preliminary reports of both occupational growth and necessary skill levels. The incorporation of this input significantly contributes to the accuracy of the final report.
- 4. The conducting of panels from education and training systems to review the preliminary report as modified by business/industry advise to begin the process of determining what sectors of education and training need to be responsible for the development of which skills at specified levels.

The final product of the project will be a report summarizing the findings and the software/data environment through which the State of Minnesota will be able to provide continuous updating. Project computers include transfer of the latter to our computers and instructions in its use.

Funding for this project would total approximately \$200,000. Included are the cost of the research itself, a one-half time Coordinator, a continuing onehalf time researcher to update the research base on a bimonthly basis, and the process of disseminating the information and its update through the Minnesota Occupational Information Coordinating Committee. In considering the responsible agency for coordinating this research project, the Issues Project Team recommends the following locations: State Planning Agency, Minnesota Higher Education Coordinating Board, Minnesota Job Skills Partnership Board.

Finally, the Issues Project Team concludes further investigation of Option 3, the Council of Economic Advisors, and Option 4, the State Applied Economics Research Center, is warranted. Time constraints precluded sufficient analysis of these options, but the findings and conclusions of the Team report indicate that policy direction and comprehesive planning of the range of economic research of value to the state should be addressed.

ISSUES PROJECT: EMPLOYMENT NEEDS AND EDUCATION

RESOURCE MATERIALS COLLECTED

Department of Economic Security/Research & Statistical Services

- 1. Minnesota Employment Outlook to 1985. January 1981
- 2. Important Minnesota Occupations by Industry. January 1983
- 3. Occupational Employment Opportunities and Educational Requirements. June 1983

Minnesota High Technology Council

- 1. Jobs in Technology... Report of the 1982 MHTC Technical Needs Survey. February 1983
- 2. Recommendations to the 1984 Legislature to Support Education in Engineering and Science in Minnesota, 1984

Minnesota Wellspring

- 1. Availability of Technicians for Employment in Minnesota Technology Intensive Businesses, October 1983
- 2. Availability of Technicians in Twin Cities Area High Technology Firms, October 1983

Division of Vocational-Technical Education

- 1. A Planning Proposal for High-Technology for Vocational-Technical Education, August 1983
- 2. Minnesota Vocational Follow-up. Continuing

Minnesota Board for Community Colleges

1. Task Force Report on High Technology in Instruction. January 1984

Technical Skills Study

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Attachment A

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Technical Skills Research (Department of Economic Security)

I. Statement of the Problem

- The State of Minnesota with the rest of the nation is experiencing one of the A. most rapid changes in its economy in its history. Nationally, over twenty-five thousand companies declared bankruptcy last year, while half a million new companies opened their doors. In the past, when both the economy and technology moved at a slower pace, it was possible for growing businesses to employ the workers who lost jobs in disappearing industries. That is no longer possible. The kinds and levels of skills are changing. At a time when government is perplexed by the presence of displaced workers, businesses are claiming jobs go unfilled, and expansion is limited by the lack of an appropriately trained workforce. The need exists to more accurately and completely identify and define the job skill needs of business to provide education and training institutions with the information for appropriate curriculum development and to provide workers with an improved basis for job training selection. While the economy and changing markets have impact on employment needs, special attention must be given to changes in technology and methods in the work place that dictates the kinds of skills and competencies required of workers.
- II. Background of Project
 - A. Job Training Issues Project: assessment of the current and future training needs of Minnesota workers and employers.
 - B. Study Committee on Technical Education: primary focus is to examine the need for technology education programs in Minnesota.
 - C. Post-Secondary Educational Institutions
 - D. Minnesota Job Skills Partnership Board
 - E. Governor's Job Training Council
 - F. Minnesota High Technology Council

III. Review of Issues

- A. Issues project requires labor market information which focuses on needed long term skill requirements of business, government, and commerce.
- B. Technical Education Committee lacked knowledge of skill demand that was essential to reviewing current programs and making recommendations.
- C. Minnesota High Technology Council sought a method to provide educational training institutions information on skill and competency needs in technical occupations in Minnesota.
- D. Businesses no longer have the luxury of waiting two to three years for education and training institutions to develop the appropriate curricula.
- E. Skills training that is not meeting occupation demand is a wasteful use of human and financial resources.
- F. It is evident that closer attention must be focused on which sector (public

Technical Skills Research

or private) carries the responsibility and/or has the capacity for various kinds of training if educational programs consistent with societal needs are to be formulated and adequately financed or supported.

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IV. Goals/Objectives of the Study

- A. Identify the demands of industry, commerce, and government for a technically competent labor force.
- B. With respect to these demands, identify the specific technical skills and associated competencies that our educational system must provide as distinct from those which industry can/should provide.
- V. Tasks to be Performed
 - A. Identify and define the type of technical skills and associated competencies that workers must possess in order to develop, operate, and maintain sophisticated equipment, processes, and procedures that are essential in a modern technically oriented society for the production and distribution of goods and services.
 - B. Determine the level of technical skills and associated competencies that are necessary to perform the functions/duties required or expected of each worker in a technically-oriented society.
- VI. Methodology
 - A. Determine the levels at which the technical skills/associated competencies should/must be developed.
 - B. Develop a process of on-going surveys and possibly case studies of industry, commerce, government, and educational institutions to elicit current shortfalls in skills and competencies training and identify new skills that must be developed.
 - C. Interpret and disseminate the information acquired from A and B in a manner that provides policy-makers a basis for decision-making and provides education and training institutions a basis for further investigation of specific occupational requirements.
- VII. Implementation of Research
 - A. Establish objectives/information required
 - B. Formulate mechanism/methods for effectively and effeciently obtaining the information.
 - C. Determine data collection methods to be used.
 - D. Design surveys and sampling procedures to elicit information.
 - E. Questionnaire developed/administered/followed-up.
 - F. Measurement techniques selected
 - G. Data analysis techniques determined

Technical Skills Research

VIII. Procedures for dissemination selected. It is important that the information collected is presented in the most effective manner to provide non-technical users objective analysis. It is not the intent of this committee to become an advocate for who should do what training.

Technical Occupation:

Quantitative Measures of Demand/Supply

Employment Directly Related to Training	Employment Not Directly Related to Training	Employment Directly Related to Training	Employment Not Directly Related to Training
Technical Skills	Technical Skills	Technical Skills	Technical Skills
Associated Competencies	Associated Competencies	Associated Competencies	Associated Competencies

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ATTACHMENT B

FUTURE JOB OPPORTUNITIES PROPOSAL

Proposal To

the State of Minnesota

on

Future Job Opportunities in Minnesota

.by

MIT Program on Meighborhood and Regional Change

David L. Birch, Director

Future Job Opportunities in Minnesota

The U.S. economy is churning at an unprecedented rate. Each year we lose and must replace eight to ten million jobs just to break even. Compounding the problem is the prospect of displacement of 10 to 15 million manufacturing and agricultural workers and at least as many service workers as a result of automation, plant relocations, and domestic and international competition over the next 20 years.

This degree of churning offers great opportunity for change, and change is occurring. New firms grow to replace older, declining ones. In some cases, whole new industries are created -- like computer software or genetic engineering. In most cases, however, the rapid replacement of old firms by new ones takes place in well-established industries (like steel and textiles) where new techniques and technologies offer new opportunities to compete effectively [1].

The employment and training implications of this turbulence are enormous. New, growing firms require new kinds of people with new skills, while older, declining firms are laying people off -frequently in different locations. It is not at all uncommon in this new economy for one state to experience 3 or 4 percent unemployment rates while other states are running 10 or 12 percent unemployed, and for similar discrepancies to exist within states.

The problem is compounded by the fact that the growth in the labor force is slowing down. During periods of rapid growth (like the 1970's) adjustments can be made by altering the kinds of jobs schools prepare students for. In a decade like the 1980's, however, when 90 percent of the ending labor force is already in place at the beginning, redirecting the products of schools -- if done perfectly -cannot begin to cope with the magnitude of the problem.

For the individual, the 1980's and 1990's will mean less job security, a much greater need to prepare for more than one career, a much greater need for continuous reeducation, and possibly a greater opportunity for upward mobility. The individual's problem is determining what to prepare for and how to obtain the right education and/or training to remain competitive and economically healthy in the labor force.

The converse problem is faced by those providing education and training -- the schools, the trade unions, the corporations and the many specialized training schools and programs. They must decide what to offer, and to whom to offer it, to have the greatest positive benefit, and, in some cases, to ensure a future pool of eligible students.

Frequently lacking to both the consumer and the provider of education and training is a road map that describes what job opportunities will be available over the next several years, what jobs are likely to vanish, and how best to transition from the old to the new. The purpose of this project is to provide such a road map for the State of Minnesota.

Each state needs a different map, because each state is entering the "New Economy" from a different starting point -- a different mix of people and kinds of businesses. But the basic principals and the basic needs are the same. Minnesota needs to know:

- 1. How many jobs of what kind will exist 5 and 10 years from now,
 - 2. What occupations will these jobs require,
- 3. What will be the skills required to perform those jobs,
 - J4. For a person of a certain age with a certain amount of experience in a certain occupation, what career opportunities offer the greatest potential, and what kind and form of education and training offers the best vehicle for getting there, and

.

5. For the education and training establishment as a whole, where will the greatest need lie.

Once it is clear what must be done to rebuild the labor force, a long list of issues surrounding implementation arise. How should the effort be organized? Who should do it? Who should pay for it, and how? To whom should it be directed, and at what cost? How can people be motivated to anticipate change and prepare for it rather than being dislocated by it? These issues are crucial and complicated ones, and must be dealt with thoughtfully and astutely. They all require as a first step, though, an accurate road map.

Components of a Road Map

A well-designed road map consists of several parts, each of which can be checked and updated in its own right. We must examine jobs, occupations, competence, career opportunities, and educational need.

Jobs

Based on our experience to date, we have found that about 15 to 20 job categories are about right. In Connecticut, for example, we defined 17 (see Figure 1). The exact detail will probably vary from one state to the next. The importance of transportation equipment in Connecticut, for example, dictated that this industry be isolated and forecasted separately.

Our approach to forecasting job growth by industry group starts by breaking the state into more or less homogeneous areas (from an economic standpoint), the areas consisting of counties or small groups of counties.

Figure 1

Job Categories Used in Connecticut

1. Agriculture, Mining

2. Construction

3. Non-Durable Manufacturing

4. Printing and Publishing

5. Durable Manufacturing/Metal, Glass, Leather & Plastics

6. Durable Manufacturing/Machinery

7. Transportation Equipment

8. Transportation, Communications, Public Utilities-

9. Wholesale Trade

10. Retail Trade

11. Eating and Drinking Places

12. Finance, Insurance, Real Estate

13. Recreation, Repair

14. Business Services

15. Health Services

16. Professional Services

17. Education Services

For each area we combine three different sets of forces that lead to job creation or distruction. The first is inertia -- the tendency of the specialized structure of the area to perpetrate itself in the future in more or less the same way it has done in the past (relative to national trends). We take careful account of variations in this tendency during different phases of the national business cycle, recognizing that different kinds of economies respond differently to different parts of the cycle. We thus distinguish between growth, slowdown, decline, and recovery, mapping the performance of each area relative to the nation during these four kinds of periods. We rely upon some outside source or sources (e.g., DRI, Chase Econometrics, Wharton, etc.) to estimate what the nation as a whole will be doing, modified by our own demographically based estimates of overall employment growth during the 1980's and 1990's.

The problem with relying strictly on the past as a predictor of the future is the dependence on the assumption that the basic structure of the economy remains the same. And we know that this is not the case. On the other hand, if we look in fine enough detail at the present, we can see most of the seeds of the future. Our second major thrust, therefore, is to delve into our histories of 5.6 million individual business establishments (about 90 percent of all U.S. establishments) to observe what seeds are being planted. For each establishment, roughly every two years, we know its:

- 1. Sales,
- 2. Employment,
- 3. Industry,
- 4. Growth,
- 5. Age,
- Legal Status (Independent, headquarters, subsidiary, branch, etc.),
- 7. Who owns it,

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- What is happening to the family to which it belongs, and
- 9. Its location down to the street address.

By combining these data over time, we can observe new formations, failures, decisions to expand or contract, and decisions to relocate. By carefully aggregating the data for each establishment we can observe today which places are starting and nourishing the kinds of companies that will replace the ever-present losses, and which places are not doing so. We are thereby afforded a glimpse into the future by observing in detail the behavior of the "next crop." To the extent that it is or is not in tune with overall transitions in the economy, we can anticipate the extent to which an area's future will be better or worse than its past from a job standpoint.

Finally, by observing the recent formation and growth of all firms in all other areas of the country, we have come to realize that the factors that in general stimulate growth today are quite different. from the determinants of the past. Telecommunications are becoming more important than roads and rail lines and harbors. High skill levels in the labor force are more important than low wages. Access to university-based research and development centers, and the pool of innovative students and faculty associated with such centers, is more important than access to cheap land or low-cost transportation. Efficient, well-run governments are more attractive than low-tax governments. Physical beauty and high quality of life are more important than immediate proximity to high concentrations of people and buildings. As the factors supporting and stimulating growth change, the relative advantages of different places change. Areas that for decades were declining are suddenly spurting ahead. Growth areas of the past suddenly level off or decline. In either case, an area's future cannot be assumed to be like its past as the ingredients for success change, and we must take account of an areas "ingredients" as well.

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The net result of balancing the inertia of the past with a careful analysis of the seeds of the future and the condition of the "soil" in which they are being planted (the area's "ingredients") yields an estimate of now many (and what kind of) jobs will be created in each area for the next 5 to 10 years. Were our understanding of the change process perfect, we could stop at this point. Change is full of surprises, however. Special events (like Arab oil embargoes and soaring interest rates) can change the picture rather suddenly and technological breakthroughs profoundly. Unanticipated (like satellite-based telecommunications coupled to inexpensive microprocessors) change radically which economic functions get performed where and by whom. So we must constantly check to make certain that we have not missed something, and make constant adjustments to reflect what we learn in the checking process.

Checking can be based on monthly and quarterly employment estimates published by the U.S. Census Bureau and the Bureau of Labor Statistics, and annual employment estimates produced by the U.S. Census Bureau. There are difficulties with both sources. The BLS monthly estimates are based on a relatively small sample (introducing some sampling error possibilities) and are validated against the full Labor Department data base only annually and after some delay. The Census estimates tend to be published two years after the date for which they are made (April 15, 1982 estimates are still not yet fully published in the summer of 1984), introducing what may be an unacceptable lag for many purposes.

The possibility for a much more accurate and timely feedback system exists. Each state operates an unemployment insurance (UI) program that collects extensive data on employment by establishment quarterly. With proper software, these data could provide an accurate and timely basis for estimating how many jobs of each type exist each quarter in each county of Minnesota and, more importantly, by tracking establishments in detail over time, we could observe how the "seeds of the future" were doing. In both cases, we would have timely feedback on our projection system, allowing for constant refinement and for

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more accurate estimates of the future as the system began to work. We would be happy to discuss how, as a separate effort, such a data base might be constructed and maintained.

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Whichever route is chosen, validation and refinement on an ongoing basis are an integral part of the job estimating process.

Occupations

The Bureau of Labor Statistics estimates what the mix of occupations for each job type is today and will be in the future. Many states modify and update these federally supplied estimates with survey data of their own, sometimes for subareas within the state.

Whatever source is used, the next step in building a road map is to convert our job estimates into occupational estimates. In general a great deal of occupational detail is carried in the conversion matracies mentioned above. For our purposes, however, a broader picture less cluttered up with detail is also useful. We propose the 55 occupational groupings described in Figure 2. Each group has been formed so as to contain workers with more or less the same degree of competence along dimensions we are about to describe. There are variations within groups, but generally we can talk about each group in terms of a competence profile, and can talk about moving from one group to another in terms of the need to alter some aspect of that profile through some form of education and/or training.

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Figure 2

Proposed Occupational Groupings

- 1. Engineers
- 2. Life and Physical Scientists, Mathematical Specialists
- 3. Engineering, Science Technicians
- 4. Medical Workers, Ex Technicians (other than below)
- 5. Nurses, Professional
- 6. Physicians and/or Surgeons
- 7. Other Health Technicians (other than below)
- 8. Licensed Practical Nurse
- 9. Technicians, Ex Health
- 10. Computer Specialist
- 11. Social Scientist
- 12. Teachers (other than below)
- 13. Adult Education
- 14. College and University
- 15. Secondary
- 16. Writers, Artists and Entertainers
- 17. Other Professional & Technician Workers (other than below)
- 18. Accounting Occupations
- 19. Buying Occupations
- 20. Lawyers & Kindred
- 21. Personnel & Employment
- 22. Sales Managers
- 23. Administrators, Public Inspector
- 24. Other Managers, Officials (other than below)
- 25. Managers, Restaurant, Coffee
- 26. Other Managers, Administrators other than below
- 27. Managers, Store
- 28. Wholesaler
- 29. Insurance & Real Estate Sales
- 30. Miscellaneous Sales Workers (other than below)

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- 31. Sales Clerks
- 32. Sales Rep., Non-Technical
- 33. Sales Rep., Technical
- 34. Stenos, Secretaries & Typists
- 35. Office Machine Operators (other than below)
- 36. Computer, Peripheral Equipment Operator
- 37. Other Clerical Workers
- 38. Construction Crafts Workers (i.e., Carpenters, Electricians, Plumbers & Pipe Fitters)
- 39. Blue Collar Work Supervisors
- 40. Metal Working Crafts Workers
- 41. Mechanics, Repairers, Installers (other than below)
- 42. Auto Mechanics
- 43. Printing Trades Crafts Workers
- 44. Trans., Public Utility Crafts Workers
- 45. Other Crafts, Kindred Workers.
- 46. Semi-skilled Metal working
- 47. Other Operatives, Ex Transportation (Semi-skilled Packing, Inspecting)

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- 48. Transportation Equipment Operators.
- 49. Cleaning Service Workers
- 50. Food Service Workers
- 51. Health Service Workers
- 52. Personal Service Workers
- 53. Protective Service Workers
- 54. Other Service Workers
- 55. Laborers

Competence

As the BLS has documented nicely [2], the overall mix of occupations will not change radically over the next 10 years. Some newer occupations, like data processing specialist will grow more rapidly than most, but will grow from such a small base that the affect on the overall mix will be small. The most rapidly growing occupations in absolute terms remain;

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- 1. Secretary
- 2. Nurses' aides and orderlies
- 3. Janitors and sextons
- 4. Sales Clerks
- 5. Cashiers
- 6. Nurses, professional
- 7. Truck Drivers
- 8. Food Service workers, fast food restaurants
- 9. General Clerks, office
- 10. Waiters and waitresses

Not reflected in this way of looking at jobs, however, is the competence required to do the job. The labels may not be changing much, but the skills and knowledge and abilities required to get the job done are changing very rapidly in many cases. What secretaries and clerks and telephone operators and travel agents and machinists and medical technicians needed to know 10 years ago is quite different from what they need to know now.

Futhermore, even if competence levels within job categories were not changing, the fairly rapid local shifts in industries are affecting what kinds of occupations and competencies in particular areas are growing and which ones will be vanishing locally. For both reasons, therefore, it is important to know not only what occupational slots will be opening but what competence is (and will be) required to fill them.

We define competence along five dimensions:

- 1. Psychomotor,
- 2. Intellectual/Cognitive,
- 3. Interpersonal,
- 4. Motivational, and
- 5. Factual Knowledge

This typology was developed by David McCelland and Richard Boyatsis at the McBer company -- an outgrowth of David McCelland's research at the Harvard University Department of Sociology.

Each occupation is "graded" on the degee of each kind of competence required to perform it. The scales for each competence dimension are presented in Figure 3. In combination, the grades for each occupation constitute a "competence profile" for that occupation which can be compared on a more or less consistent basis with the profiles for other occupations.

Figure 3

Competence Scales

Psychomotor

It is assumed that there are five fundamental levels of the psychomotor skill dimension. They are:

TO DO THE JOB EFFECTIVELY, IN MOST CASES, A PERSON MUST AT LEAST:

- Handle, feed, or otherwise perform bulk movement of goods (whether they are light goods such as paper, or heavy goods such as packing crates)
- Perform some manipulation of goods, requiring eye-hand coordination (i.e., five-motor control), but where the tasks are not timed
- 3. Perform some manipulation of goods, requiring eye-hand coordination where the tasks are timed (i.e., he/she must perform the manipulations within a pre-specified or determined time interval such as on a production assembly line passing in front of his/her work station)
- 4. Perform precision manipulations of goods, requiring detailed eye-hand coordination that is timed <u>or</u> requiring monitoring multiple physical events <u>or</u> performing multiple movements all coordinated and timed
- 5. Perform precision manipulation of goods, requiring detailed eye-hand coordination that is timed and requiring adaptive movements to respond to unique conditions which are not predictable or known in advance.

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Intellectual/Cognitive Dimension

It is assumed that there are seven fundamental levels of the intellectual/cognitive skill dimension. They are:

TO DO THE JOB EFFECTIVELY, IN MOST CASES, A PERSON MUST AT LEAST BE ABLE TO DEMONSTRATE:

- 1. Memory, in terms of object recognition/description
- 2. Memory, in terms of concept recognition/description
- 3. Diagnostic use of concepts, in terms of concept application and interpretation
- 4. Diagnostic use of conepts, in terms of concept application and interpretation requiring perception of causality
- 5. System thinking, in terms of perception of multiple causal relationships
- 6. Synthetic reasoning, in terms of concept formation through pattern recognition
- 7. Symbolic reasoning, in terms of concept formation through pattern invention

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Interpersonal Dimension

It is assumed that there are five fundamental levels of the interpersonal skill dimension. They are:

TO DO THE JOB EFFECTIVELY, IN MOST CASES, A PERSON MUST AT LEAST BE ABLE TO:

- 1. Work relatively alone, or merely in the presence of others
- 2. Work with others on tasks requiring interaction, coordination, or interdependence of activities
- 3. Work with others requiring influencing specific individuals to do something
- 4. Work with others requiring influencing specific individuals who are strangers or a group in an established pattern
- 5. Work with others requiring influencing a group of people as a whole

Motivational Dimension

It is assumed that there are six somewhat unique motivational orientations, or dispositions, relating to this dimension. They are:

TO DO THE JOB EFFECTIVELEY, IN MOST CASES, A PERSON MUST AT LEAST BE CONCERNED WITH:

- 1. Security (i.e., subsistence money, etc.)
- 2. Affiliative, desiring to be with others, working alongside or with others, getting to know people, and being able to interact with individuals on other than task-related matters.
- 3. Precise, desiring to be accurate, conscientious, and placing a great deal of attention to detail
- 4. Integrative, desiring to coordinate and orchestrate the work of numerous other individuals or groups
- Entrepreneurial, desiring to do new and innovative things, do things better than ever done before, seek opportunities to innovate
- Influential, desiring to lead, inspire, or stimulate others to do things

Note that there are two schemes co-mingled in this dimension. One theme is level of psychosocial maturity as found in developmental personality theories. The other theme involves the likelihood of putting extra effort into the job (i.e., what turns you on). Remember this dimension refers to intent, not necessarily behavior.

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Factual-Knowledge Dimension

It is assumed that there are four fundamental lévels of the factual-knowledge skill dimension. This does not refer to "what" field of knowledge or body of knowledge is involved, but merely to the degree of factual knowledge. Factual knowledge refers to knowledge of a discipline such as economics or chemistry; knowledge related to an organizational function, such as manufacturing; knowledge related to a product or process, such as high-energy physics; and so forth. They are

- 1. No particular field or body of factual knowledge
- 2. Some specialized knowledge in a particular field
- 3. In-depth knowledge of a particular field or body of information
- 4. In-depth knowledge of several fields or bodies of information (i.e., you would have to go to multiple university departments to get formal background in the area)

Career Opportunities

People seeking work do not search for "net new jobs" or "net new occupations." They look for job openings. Job openings are created in three ways:

- 1. Net new jobs are created,
- People leave their jobs because they leave the labor force (due to death, retirement, or voluntary separation) and must be replaced, or
- 3. People leave their jobs to move on to another job within the labor force (call it "mobility").

Any one of these three events creates a job opening, or slot as we call it. It turns out that different kinds of occupations have quite different rates at which slots open up due to replacement and mobility. The job opportunities facing any particular individual are the sum of all three. Since individuals fill slots, not "net new jobs," we must estimate how many slots will be available for any particular occupation, not just how much the occupation will grow "net."

Knowledge of slot availability is only half the career-planning problem. The other half is knowing which slots to pursue. This is a complex issue, because it is a function of:

- 1. The earnings derived from the present job,
- 2. The competence required to perform the present job,
- 3. The age and years of experience of the worker in question,

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- 4. The competence required to perform all other possible jobs,
- 5. The kind of education or training required to move from one job to each possible available slot, and
 - 6. The cost of obtaining that education and training relative to the economic value (over the next several years) to be gained by putting the education/training to work on a new job.

The problem is bewildering to most individuals (if they ever think of it in its true complexity) because of the very large number of combinations of slots, ladders, education/training increments, and possible returns — and the speed with which the availability of slots is itself changing.

We propose to take a first cut at this problem by developing an "Occupational Handbook" in which we will estimate, for any person in a particular occupation of a particular age with a known number of years of experience, which slots in Minnesota offer the greatest opportunity in the future, considering:

- 1. The availability of those slots,
- The kinds of competence required to fill them (relative to the kinds of competence demanded in the person's present job),
- The economic return to be gained by making the shift, and
- 4. The amount and cost of education and training required to make the shift (relative to the return to be gained by making it) given the number of years remaining in the person's useful working life.

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It will not be a perfect handbook in the sense that the calculations will not be precise to the penny, because the data going into it will not be perfect. Nor, obviously, will it consider the person's own preferences for a working environment. Rather, it will be a "shopping list" of job opportunities that may well reveal realistic possibilities that the person has not considered, that will highlight dead ends to be avoided, and that will, at a minimum, be consistent with, and will incorporate everything we then know about, economic change and the economics of preparing for and holding different kinds of jobs.

We will rely in our calculations heavily upon:

- 1. 1980 Census Data, particularly the individual sample tape,
- 2. BLS estimates of replacement demand and mobility by occupation,
- 3. Research conducted by the Institute for Educational Leadership in Connecticut and elsewhere on the types and costs of education and training available, supplemented by similar data for Minnesota provided by the state agencies, corporations, trade unions, and other groups in the State involved in education and taining.

Education and Training Need

The "Occupational Handbook" will be oriented toward the individual and will be conditioned on the individual's particular circumstances. An interesting question remains: if individuals adjust to the world around them as the handbook suggests they should (and, eventually, as they must in order to survive) what aggregate demands are likely to be imposed on the education and training establishment as a result. Again, the perfect answer to this question cannot be obtained because many people will stray far from the optimum career paths, and many may move to some other state rather than solving their career problems in Minnesota.

Nevertheless, we should be able to make a rough cut at education and training need by examining the starting and potential ending point of each occupational/age/experience group in Minnesota, balance likely future available slots against the demand for them, make a rough estimate of how much of what kinds of education and training will be needed, and compare that with the present delivery system.

We will make no attempt to suggest changes in the education/training establishment. Our effort in this final task will be more to provide a summary of what we have learned about job possibilities for Minnesota citizens in a form that might be more recognizable and useful to the educational community.

Ena Products

This project will produce two end products:

- 1. An initial report summarizing what we have done and found to date, and, more importantly,
- A software/data environment through which constant updating of our findings will be possible, and which we would be eager and willing to transfer to your own computers and teach you how to use.

Schedule

We estimate that this project will take 12-15 months to complete, the main unknown being the extent of data collection and development in Minnesota. Intermediate products will be available for review, of course. We estimate that they will be produced on the following schedule:

Task	Completed by the
	End of Month
Job Projections	5
Occupation Estimates	6
Competence Estimates	7
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Career Slot Analysis	8
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Career Handbook	10
Jammanda Educational Maria	
Aggregate foucational Need	
Report Completed	12
Veborr compresent	14

Detailed Cost Estimate

Salaries and Wages

David Birch (Frincipal Investigator)	19,689
Research Associate/Programmer	2,917
Research Assistant	4,170
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Total Wages and Salaries	26,776
Employee Benefits (.385)	10,309
Materials and Services	3,000
Computer Time	4,000
Travel	4,500
Indirect Costs (.62)	30,123

Total Cost

78,708

Notes

- 1. See Birch and MacCracken, "The Role Played by High Technology Firms in Job Creation." (MIT Program on Neighborhood and Regional Change, 1984)
- 2. Max Carey, "Three Paths to the Future: Occupational Projections 1980-1990" <u>Occupational Outlook Quarterly</u>. Winter, 1981