Role of Non-Interstate Highway Transportation in Enhancing Economic Development in Iowa

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Over the past decade, the state of Iowa has moved toward establishing a highway improvement programming process that attempts to balance engineering and economic considerations. In 1988, the state legislature directed the Iowa Department of Transportation (IDOT) to designate a network of commercial and industrial highways. During its 1989 session, the legislature established a clear mandate for IDOT to give this network the highest priority in programming future improvements. The research was initiated by IDOT to develop a methodology that could be used to factor economic development considerations into the programming of improvements for the network.

Iowa, like a number of other states, has experienced two trends in the past decade. First, since the 1970s, Iowa's primary highway system has accumulated a backlog of construction needs because of inflation, a reduction in motor fuel tax revenues (a result of the improved fuel efficiency of the motor vehicle fleet), and reductions in the share of federal highway funds allocated to rural areas. Second, an agricultural recession during the first half of the 1980s awakened business and government leaders to the need to diversify Iowa's economy.

The first trend is characterized by the state's decreasing ability to reconstruct and modernize its primary highway system. As documented by Iowa's last Quadrennial Needs Study (*1*,p.2), completed in 1986, backlogged construction needs on the primary highway system had grown to almost $3.4 billion. Prospects for overcoming these backlogged needs are not good; after maintenance, pavement preservation, and bridge repair and replacement requirements have been funded, the Iowa Department of Transportation (IDOT) has been able to modernize or replace only 40 to 50 mi of primary highway per year. At this rate, the state's 10,000-mi primary highway system can only be recapitalized every 200 years.

Realizing that Iowa did not, and would not in the foreseeable future, have adequate resources to satisfy all of its highway needs, in 1978 IDOT began developing a way to rate the primary highway system for improvement programming purposes. A four-level stratification of the state highway system was the result of this process, and it has been the basis for targeting funds to high-priority projects in Iowa since 1979 (*2*).

The second trend led to the emergence of economic development as a goal of the Iowa highway improvement program. The state's first effort in this regard, a program called Revitalize Iowa's Sound Economy (RISE), was established in 1985 (*3*). The Iowa legislature funded RISE by increasing the state motor fuel tax by 2 cents/gal, which yields approximately $33 million annually. Half of these funds are used to provide road improvements needed to attract new businesses to the state and to retain and support the expansion of existing businesses.

Only county and city governments are eligible to apply for these RISE funds, and they must provide a match to the fund contribution. In this manner, state funds provide leverage for other sources of support for local economic development initiatives.

The other half of the RISE fund is dedicated to regional development projects. These projects are intended to modernize and increase the traffic-carrying capacity of state highways. Regional-development RISE funds are used for new construction or pavement reconstruction, not for preservation, bridge repair, or maintenance purposes.

The RISE program and the four-level highway system plan represent the origin of the state's efforts to concentrate highway improvement programming in order to maximize the benefits earned from road investments and to foster opportunities for the diversification and growth of Iowa's economy. During its 1988 session, the Iowa General Assembly took the next step when it directed IDOT to designate a network of commercial and industrial highways. In addition, during 1989 the Iowa legislature strengthened its commitment to the commercial and industrial network (CIN) by directing IDOT to make the improvement of this network its highest priority and to explicitly consider the promotion of economic development in the state.

Research was initiated by IDOT to develop a methodology that could be used to factor economic development considerations into the programming of improvements for the CIN. Background is provided on the system currently used to program highway improvements in Iowa. The legislative mandate for creation of the CIN and the procedure used to designate this system are discussed. Existing research on economic development and transportation is discussed, and an explanation is given of the methodology being developed to analyze Iowa's economy as a basis for setting priorities for corridor improvements to support economic development. A preliminary statewide application of priority levels and guidelines for programming and scheduling projects is covered. Finally, a discussion is provided on research currently being conducted, a way to combine the methodology with standard highway improvement programming procedures, and alter-

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native procedures for incorporating equity considerations into the methodology.

IOWA HIGHWAY IMPROVEMENT PROGRAMMING PROCESS

Through the early 1970s, the main focus of the Iowa highway program was on new construction. As work on the Interstate system approached completion, the emphasis shifted toward preservation and rehabilitation. Before 1977, IDOT relied primarily on a 100-point sufficiency rating system to annually analyze each portion of the primary road system and develop a list of potential projects. This rating system considers roadway safety, service level, structural adequacy, and geometrics. Any segment found to have a rating of 50 points or less is considered to be in critical need of improvement.

However, as Iowa began to experience funding problems during the 1970s, the State Transportation Commission decided to look for a way to ration highway investment dollars more effectively. In 1977, IDOT initiated a study that resulted in the stratification of the primary highway system into four levels: A (Interstate), B (high-service-level principal arterials), C (low-service-level principal arterials), and D (non-principal arterials). Nineteen service characteristics—such as population, retail sales, manufacturing employment, and access to airports, railroad terminals, motor carrier terminals, hospitals, and institutions of higher education—provided the basis for stratifying the system. In this manner, Iowa began to incorporate economic development considerations into the process of programming highway improvements.

Since 1979, sufficiency ratings in combination with the four-level system map have provided the basis for identifying potential primary highway modernization and reconstruction projects. This combined method of evaluation has permitted IDOT to better focus resources toward the more heavily used portions of the state's primary highway system. This focusing of resources is accomplished by setting increasingly restrictive sufficiency rating thresholds to qualify for funding, progressing from the top to the bottom of the four-level hierarchy.

Similarly, the consideration of portions of the primary highway system for preservation work, which involves safety improvements and resurfacing but only small changes in roadway geometrics, is based on both the four-level system map and a 100-point pavement condition rating (PCR) system, which focuses exclusively on roadway surface characteristics. Again, funds are targeted toward the high end of the primary highway system by varying PCR thresholds so different portions of highway can qualify for improvement. For example, for the B-level system, a PCR of 60 or less qualifies a portion of highway for resurfacing; for the C- and D-level systems, PCRs at or below 50 and 40, respectively, are required to be considered for preservation improvements.

As a result, from 50 to 60 percent of non-Interstate primary highway investment has gone to the B-level system since 1980, 20 to 30 percent to the C-level system, and only 15 to 25 percent to the D-level system.

The formal programming of improvements begins in January each year when the Office of Program Management and the Office of Advance Planning prepare a candidate list of projects using the process previously outlined. These candidate projects are then submitted to IDOT's six district offices for review. The general public is given the opportunity to review staff proposals, submit their own project requests, and present their views to the State Transportation Commission. This year-long review process culminates in December with the publication of a 5-year Transportation Improvement Program.

Finally, in addition to attempting to make the most efficient use of highway program resources, state law requires that primary road service be equalized in both rural and municipal areas. Therefore, a review of the geographic distribution of highway system improvements is made periodically to assess how different areas of the state have fared. This analysis of service equity also uses highway sufficiency ratings, which are compared by district and between rural and municipal areas. Following these reviews, adjustments are often made to the highway improvement program to equalize service throughout the state.

Therefore, over the past decade Iowa has moved toward establishing a highway improvement programming process that attempts to balance both engineering and economic considerations. The recent action taken by the state legislature in creating the CIN represents the next evolutionary step in this process of recognizing the economic role of highways. In the following section, a discussion is provided on the legislature's mandate to create the CIN and on the ways that creation of this system can be expected to further change highway improvement programming in Iowa.

LEGISLATIVE MANDATE AND DESIGNATION OF THE CIN

In 1988, as part of the appropriations bill for IDOT for FY 1989, the state legislature directed the State Transportation Commission to "identify within the primary road system a network of commercial and industrial highways" (*4*). In the same legislation, IDOT was instructed to allocate a minimum of $30 million of primary road funds to the network each year, beginning with FY 1991. No statement of purpose, priority, or other direction for implementing the network was provided.

During its 1989 session, the Iowa legislature affirmed its support for the CIN by establishing a clear mandate for IDOT to give this portion of the state primary highway system the highest priority in programming future improvements. This supplementary legislation (*5*) clearly states that the purpose for developing the CIN is "to enhance opportunities for the development and diversification of the state's economy." The 1989 legislation further states, "The purpose of this highway network shall be to improve the flow of commerce; to make travel more convenient, safe, and efficient; and to better connect Iowa with regional, national, and international markets."

The State Transportation Commission initially designated the CIN in June 1988 and made additions to the network in October 1989. The following criteria were used to designate the network:

1. *Service to Regional Growth Centers*. The CIN includes linkages between 16 regional growth centers identified in Iowa

(mainly places with populations of more than 20,000 located in the center of 30-min to 1-hr commutersheds) and several major metropolitan markets outside Iowa. These outside markets include Chicago, Minneapolis, St. Louis, Kansas City, Denver, and Milwaukee.

2. *Continuity*. Continuity with routes considered to be major through routes by adjacent states was a criterion.

3. *Total Current Traffic*. Generally, a minimum standard of 3,000 average daily traffic (ADT) was applied.

4. *Current Large-Truck Traffic*. A minimum standard of 250 tractor-trailer/semitrailers (TTSTs) per average day was applied.

5. *Area Coverage*. Routes were added until nearly all locations in Iowa were within 25 airline-mi (about 30 highway-mi) of a route. Qualifying routes in adjacent states (e.g., I-90 in Minnesota) were included for analysis purposes.

The resulting system includes 2,325 mi (23.7 percent) of Iowa's 9,830-mi primary highway system, as shown in Figure 1.

The 1989 legislation codified the criteria used to designate the network and restricted its size to no more than 2,500 mi. The legislation also gave IDOT special powers to permit it to complete improvement of the network in a timely manner. For example, the law gave IDOT the power to preserve right-of-way for the future development of CIN routes, a power the department is not generally afforded for other types of highway projects.

Designation of the CIN is already affecting the programming of highway improvements in Iowa. Funds dedicated to this portion of the primary highway system are expected to far exceed the $30 million per year required by the state legislature. Investment on the network in 1990 alone is expected to approach $90 million (*6*). Furthermore, the transportation component of Iowa's Futures Agenda, the state's strategic plan, calls for at least 40 percent of the annual highway improvement budget to be invested in the CIN. Also, IDOT is currently developing a new five-level highway hierarchy to replace the four-level scheme discussed in the previous section. The major difference between the two hierarchies is the identification of the CIN as a separate level.

The following section explains how funding priorities and the scheduling of improvements within the CIN will be further refined. The methodology described draws on central place theory and other well-established methods of regional economic analysis. Because Iowa does not have an operational network model or current origin-destination study, a more mathematical approach is not possible. The regional economic analysis methodology is designed to address economic development needs while minimizing primary data research and using an economical approach to transportation system analysis.

RESEARCH FINDINGS AND CASE STUDY OF ECONOMIC DEVELOPMENT ANALYSIS METHODOLOGY

The most basic definition of state-level economic development is an increase in income and product generated within the state. Development occurs when productivity is increased or when the state produces goods and services for export or as substitutes for goods that would otherwise be imported.

However, economic development implies more than simply an increase in economic activity. Iowa's initial economic development plan noted, "How development occurs is as important as whether it occurs. The state might not, for example, wish to follow policies that attract only low-wage industry, even though doing so would increase total economic activity in the state" (*7*,p.3).

The basic premise of a state-level economic development effort is that state government can influence the course of a state's economy to achieve specified development goals. In this context, transportation improvements are one of a number of tools to help achieve these aims. The methodology proposed to guide improvements on the CIN is designed to support several generally accepted goals for Iowa (*7*,p.9). These include the following:

- Increasing the income of Iowans by increasing production and employment in the state,
- Diversifying the economic base to provide a stable foundation for long-term growth,
- Retaining and expanding employment in sectors that are currently a significant part of Iowa's economic base, and
- Supporting the rural economy of Iowa.

The assumptions made about the purpose of economic development and the relationship between transportation and economic development are key to devising an analysis methodology. The methodology proposed in this section is designed to be responsive to the findings of previous research on transportation and economic development.

Review of Previous Research

Early research on the relationship between highway transportation and economic development, which dates from the 1960s, focused largely on economic and demographic changes occurring after the construction of a section of Interstate highway. Research since 1980, on the other hand, has begun to explore the link between highway transportation and economic development, not simply economic change. However, little research has been done that identifies how best to target future transportation investment to encourage economic development.

Clearly, major highway system changes promote change in local and regional economies; however, whether transportation infrastructure investment causes long-term economic development remains in question. For example, in 1980 the National Council for Urban Economic Development could not identify any comprehensive study of the effects of highways on economic development activities (*8*,p.92). Furthermore, the literature in this field is often contradictory. Nevertheless, common themes do emerge.

The following observations provide the basis for Iowa's efforts to incorporate economic development considerations into its planning and programming of future highway improvements. The first seven are based on a paper by Plazak (*9*) and supported by a variety of research, as noted.

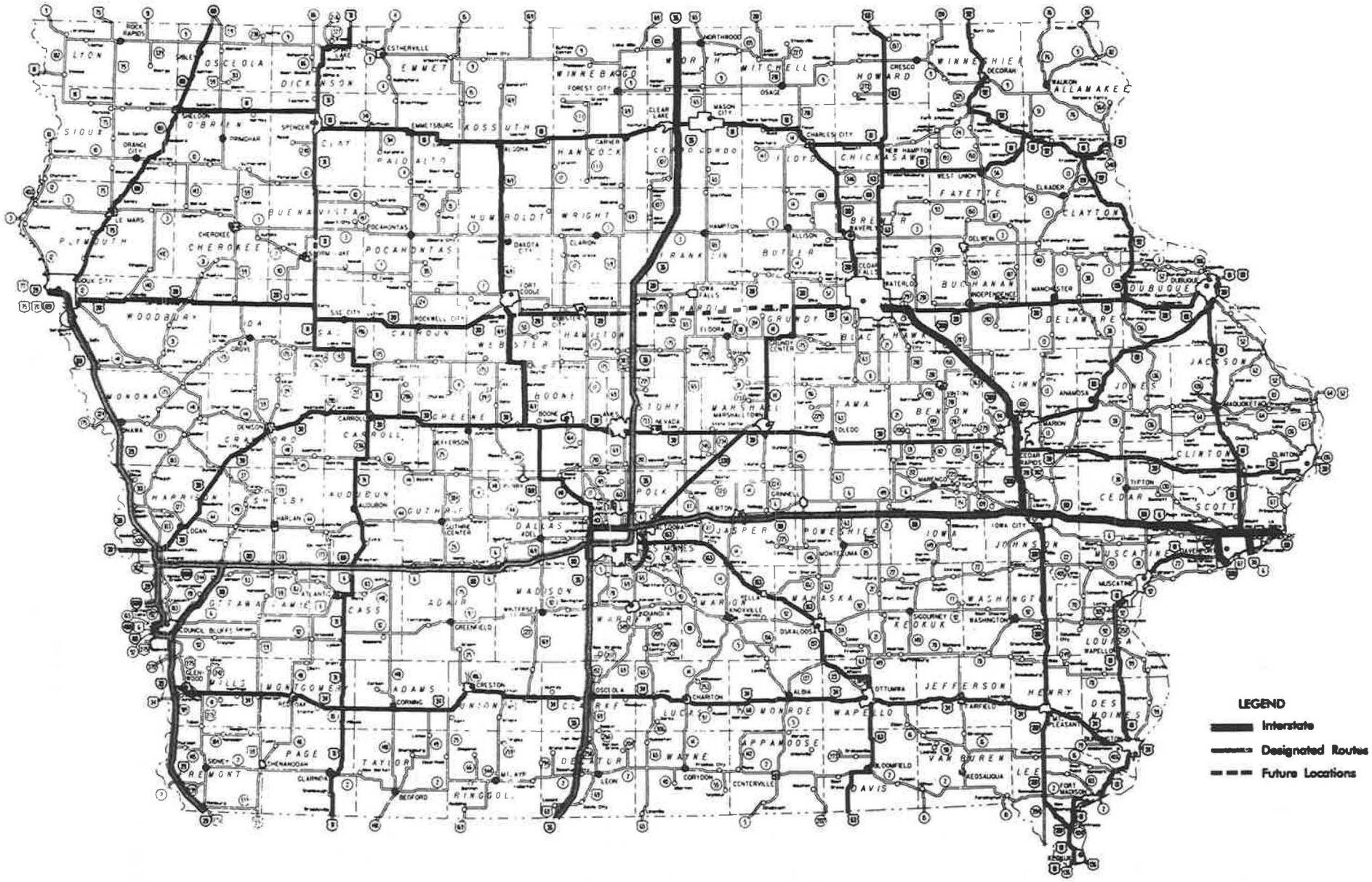

FIGURE 1 Iowa CIN.

Transportation Investment Alone Will Not Cause Development

Experience, common sense, and previous research all show that transportation investment alone will not cause economic development to occur. Even massive highway investment, in new freeways or expressways, for example, may only result in the relocation of existing business.

Factors that enable economic growth to occur include targeting growth on the basis of resources; local leadership, cooperation, and initiative; a well-thought-out and accepted strategic plan; available financing; adequate infrastructure; a trained and high-quality work force; and a supportive community and business environment.

Highway Investment Is Permissive

Investment in transportation, although unable to cause development, may permit otherwise impossible or unlikely projects to proceed. Highway deficiencies, such as narrow pavement, congested roadways, and embargoed bridges, may prove significant barriers to economic development.

Bottom Line Is Lower Transportation Costs

Highway user costs are mostly made up of vehicle operating costs (e.g., fuel, tires, oil, depreciation, maintenance, and repairs) and the value of travel time (e.g., truck driver wages). Pavement deterioration contributes to vehicle maintenance and fuel costs. [According to a 1984 study (*10*), 37 percent of the pavement on Iowa's highways is 40 to 50 years old and an additional 2 percent is more than 59 years old.] Hence, rehabilitation and reconstruction to maintain high-quality highways may be one of the best investments for economic development.

Relative Quality of Transportation System Is Important

Businesses make location decisions on a comparative basis, so communities and regions with transportation systems substantially poorer in quality than the norm may be placed at a serious competitive disadvantage. On the other hand, investing large amounts of money in transportation to improve a system to a standard well above average may not yield a commensurate payoff.

Proximity to raw materials and markets tends to be the major factor considered by heavy-manufacturing companies in making location decisions. This observation is supported by a variety of sources (*11–13*). Once the search has been narrowed down to a particular region, transportation access, services, and costs become major considerations.

Road With Lowest Operating Cost Is Not Always Four-Lane

Under conditions of low-to-moderate traffic, a good-quality two-lane road may result in operating costs and travel times comparable to those of a four-lane highway. Four-lane limited-access highway improvements generally promote economic development only if access to markets and resources located outside the state is improved. Both underbuilt and overbuilt infrastructure can reduce a state's ability to serve business needs at a cost that helps them to be competitive.

The Iowa Department of Economic Development (*7*,p.45) makes strong statements on this topic:

> While one might argue on the basis of equity that the state should upgrade roads serving smaller communities that are not near to metropolitan areas (in an effort to foster growth in those communities), doing so probably would not significantly bolster the Iowa economy. In fact, the costs of upgrading would add to the overall cost of government in Iowa and, on that score, decrease the attractiveness of the state. Furthermore, research has shown that upgrading two-lane primary roads to four lanes with limited access can actually render smaller, nonmetropolitan communities along the route worse off (*14*). Whereas a two-lane road may run through the community, providing visibility to its business, a limited access highway is more likely to pass it by.

Roggenburk and Mufti (*15*) concluded that the link to the Interstate system is critical for most industries for which the flow of materials and products is of significance. Also, Schwartz and Schwartz (*16*) found that the cost of transportation is far lower for industries located in cities linked to the Interstate highway system. Contradictory conclusions were presented by Briggs (*14*,p.9–3), who found that Interstates were not clearly associated with manufacturing and wholesaling.

Perceptions of Transportation System Quality May Be as Important as Actual Conditions

User costs and levels of service provided by two-lane highways may be comparable to those of four-lane roads, yet regions without four-lane service may be viewed as somehow isolated or inferior. Lines on a map may influence development location decisions, placing communities without four-lane access at a relative disadvantage.

Recent literature on the role of perceptions as a factor in business location decisions is scant. As noted by Bowersox (*17*), if the road was paved and in good condition, it was judged adequate. However, the sentiment that four-lane highways are critical for economic development to occur is still prevalent. This perception was confirmed by the Committee on Iowa's Future Growth (*10*,p.43), which concluded, ". . . we must also address the legitimate needs of those Iowa cities that are still not served by an expressway that connects the major markets inside and outside the state."

Needs for Highway Transportation May Vary Greatly Among Industries

For many industries, efficient truck transportation is vital. It is especially important for manufacturing industries, agriculture, and wholesale trade. For high-technology industries, quick access to air service and the ability to efficiently move employees to work each day appear to be more important concerns.

This variance in transportation needs makes an analysis of the current and anticipated economic structure of a region

critical. The failure to anticipate significant technological or marketplace changes can have major consequences. The location or potential location of high-growth industries with highway transportation requirements should be considered.

Economic Growth Will Primarily Occur in and near Urbanized Areas That Have Necessary Physical and Human Resources

By focusing transportation improvements on regional economic centers with growth indicators, including cluster communities that share area resources, a state can use transportation improvements to support those areas with economic growth potential.

Increases in highway expenditures do not generally lead to increases in employment other than temporary increases during construction. However, in the counties that are economic centers of the state, highway expenditures have a positive long-term effect (*18*); that is, employment increases more than it would for the normal trend of economy (*19*).

Greatest Economic Impact Will Result from Greater Access

From a statewide perspective, the greatest economic impact will come from creating better access to regional and national markets, better access to raw materials, and better access to the regional labor force for companies that use state inputs and produce exports or import substitutes.

Statistics show that every $40,000 in exports creates one job and that, for every job created by export industries, two additional jobs are created in the economy. Transportation service provides important support for export-related business.

Improving access to local markets, local services, and retail trade outlets is important but will have a lesser impact on economic growth from a statewide perspective. However, such improvements have potential for making a difference in the locations of local growth.

Economic Location Theory

Four general categories of location theory exist, each of which provides key concepts useful in developing a system of targeting transportation investment to support economic development. These categories include industrial location, central place, growth center, and diffusion theory.

Industrial location theory was first proposed by German economist Alfred Weber in 1909. The theory seeks to explain factors in industrial location from the perspective of an individual firm. Key concepts include the desire to maximize profits (or minimize costs) and the economies provided through agglomeration. More detailed discussion of the factors involved in the location of industry is provided by Alexandersson (*20*) and Webber (*21*).

Central place theory, initially developed by German theorists Walter Christaller and August Losch in the mid-1930s, links the disciplines of geography and economics to explain the location and features of smaller urban places that serve as central places for services and retail trade. This static theory postulates a hierarchy of central places located in a balanced, geometric fashion in order to serve the surrounding rural areas, or hinterlands. In general, central place functions will be service activities and will not include manufacturing that serves more distant markets and is unrelated to the needs of the rural region (*22*,p.20).

Growth pole or growth center theory is the most recent addition to location theory, first proposed by French economist Francois Perroux in the mid-1950s. Perroux conceptualized development as essentially occurring around poles caused by economic forces that lead to the clustering of economic activities and growth and toward an imbalance between industries and geographic areas. Dynamic sectors provide the driving force in the development of growth poles, and Perroux stressed the importance of entrepreneurial innovation in this growth process. Perroux's original concept of growth poles can be characterized as abstract, dynamic, unbalanced, and occurring in the economic space rather than in geographic space.

Diffusion theory maintains that growth occurs as a result of the filtering of innovations downward through the urban hierarchy and from the urban centers out to surrounding areas. The emergence of axes of high development between main urban areas is one channel of diffusion that is readily observable. In 1963, French economist Pottier contended that economic development normally tends to be propagated along the main transportation routes linking the most important industrial centers and that development therefore manifests itself in linear paths. His work serves to integrate theories of the effects of the transportation network with theories of urban hierarchies and geographic development poles (*23*).

These theories can be linked together as building blocks in a planning methodology for choosing the locations of highway improvements that can best assist in reaching Iowa's development goals. Research in the early 1970s discussed the existence of such bridging concepts, including the close relationship of economic growth poles and the city hierarchies of central places, and contended the theories could be regarded as complementary (*23*,p.179). Linking the key concepts—agglomeration, location dynamics, growth poles, diffusion, cost minimization, and service centers—provides a strong theoretical basis for planning efforts.

Development of a Methodology

To identify regional centers with potential for growth, Iowa's 954 incorporated cities and 99 counties have been analyzed on the basis of existing economic size and change (*24–27*). The resulting city and county rankings are the basis for identifying and ranking corridors in which transportation linkages can help Iowa achieve its overall development goals.

City Analysis

Two rankings of Iowa cities were developed to measure relative economic importance (economic size) and change. Four factors were considered in these rankings:

1. Population,
2. Community service level,
3. Number of manufacturing firms, and
4. Number of wholesale firms.

Community service level was specifically developed to reflect the current status of a community as a central place within a region. The community service level is based on the services believed to be important to provide a physical foundation for economic development. A six-level hierarchy was developed to categorize the extent of service provided by each Iowa community, with Level 1 providing the highest level of service. Each higher level in the hierarchy meets not only the requirements for that level but also the requirements for all previous levels. The requirements are as follows:

- *Level 1.* Three of the following are required:
  —Scheduled air passenger service
  —Daily newspaper
  —Television station
  —Post-high-school educational facility
  —Public high school

- *Level 2.* Three of the following are required:
  —Airport (with hard-surfaced runway, at least 4,000 ft long)
  —Radio station
  —Hospital
  —County seat

- *Level 3.* Three of the following are required:
  —Public library
  —New-car dealer
  —Physician
  —Daily or weekly newspaper

- *Level 4.* Two of the following are required:
  —Public or private high school
  —Bank
  —Funeral director

- *Level 5.* Both of the following are required:
  —Post office
  —At least 10 retail businesses

- *Level 6.* One of the following is required:
  —Post office
  —Less than 10 retail businesses

To measure economic size, the four factors were ranked using the most recent information available. The four separate rankings were then combined to obtain a single ranking that measures relative economic size.

To measure economic change, these same four rankings were considered along with rankings for change in population and change in number of manufacturing firms. Published information that could be used to measure change in the number of wholesale firms or in status as a community service center does not exist.

A comprehensive community economic data base was compiled during the analysis. The data base includes a wide variety of factors that were not considered in developing the rankings but are available for informational or comparison purposes. Data are included on retail sales and change, growth centers identified by various studies, community planning and economic development efforts, bank loan and deposit rates, rail service, county seat status, median age, and whether the county contains or is adjacent to a metropolitan area.

Existing community classification systems were considered in developing this method to evaluate economic size and change, including work by Borchert and Adams (*24*) and Berry (*25*), as well as a Bureau of Census scheme described by the Southern Iowa Council of Governments (*28*).

County Analysis

A similar method was used to measure economic size and economic change at the county level. Because a broader range of economic indicators is available at the county level, more factors were considered. A decision tree was then used to assign each county to a group showing its economic size and change status (see Figure 2). The following six factors were considered at the county level:

1. Population,
2. Total employment,
3. Labor force,
4. Retail sales,
5. Manufacturing employment, and
6. Wholesale employment.

Four rankings were developed to answer the questions posed in the county decision tree. Rankings were made for manu-

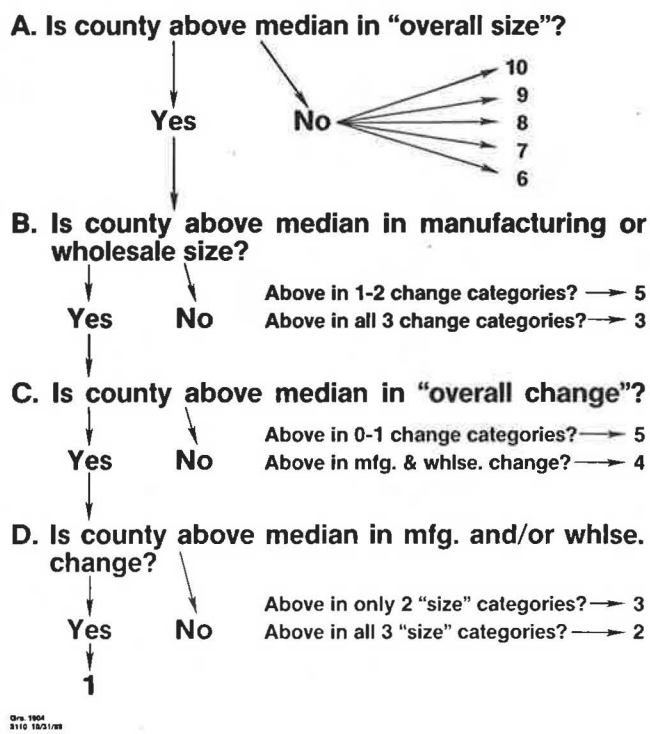

FIGURE 2 County decision tree.

facturing employment, wholesale employment, economic size, and economic change (which considered change in all six factors). The ranking of economic size was based on the most recent data available (generally 1988 figures), and the ranking of economic change was based on the 1980 to 1988 period (except in the cases of manufacturing and wholesale employment, for which 1988 data were not yet available).

As with communities, a wide variety of data was gathered that was not included in the decision-tree process but is available for informational and comparison purposes. These data include the percentage of residents with a high-school degree, percentage with a college degree, amount of value added through manufacturing, amount of capital investment in manufacturing, and value of shipments. Additional research on the linkage between these factors and economic growth or change is needed because these factors may be useful in predicting the likely locations for growth.

Combined City and County Analysis

As previously discussed, this analysis of Iowa communities and counties reflects a variety of economic development themes. These themes include the importance of economic size and resources as a basis for economic development, the linkage between manufacturing and wholesaling and transportation, and the relationships among communities that serve as central places and centers of growth and their surrounding areas.

Figure 3 shows the combined results of the city and county analysis in Iowa. The Iowa communities that are in the top 50 rankings of economic size are shown. The solid symbols indicate cities with a high rate of growth, whereas open symbols indicate cities with a lower rate of growth, or a decline in some cases. County groupings that result from applying the county decision tree are also shown. Only the results for those counties above the median rank in economic size are provided.

Finally, highway improvement priorities were developed. These priorities reflect the principle that highway investment can best support economic development by creating improved linkages between centers with growth potential. The priorities established are presented in Table 1.

Advantages and Disadvantages

The methodology responds strongly to the legislative mandate to improve the flow of commerce and to better connect Iowa with regional, national, and international markets. In addition, it provides a useful tool for describing local economies and providing information at a city and county level. It also provides a mechanism to encourage the maximum amount of regional economic development possible within the constraints of Iowa's current economy. The technique incorporates the concept of growth centers, while providing broader support for Iowa's rural economy. The technique is also adaptable to public input because it permits incorporation of other considerations and goals identified as important by local community and business leaders.

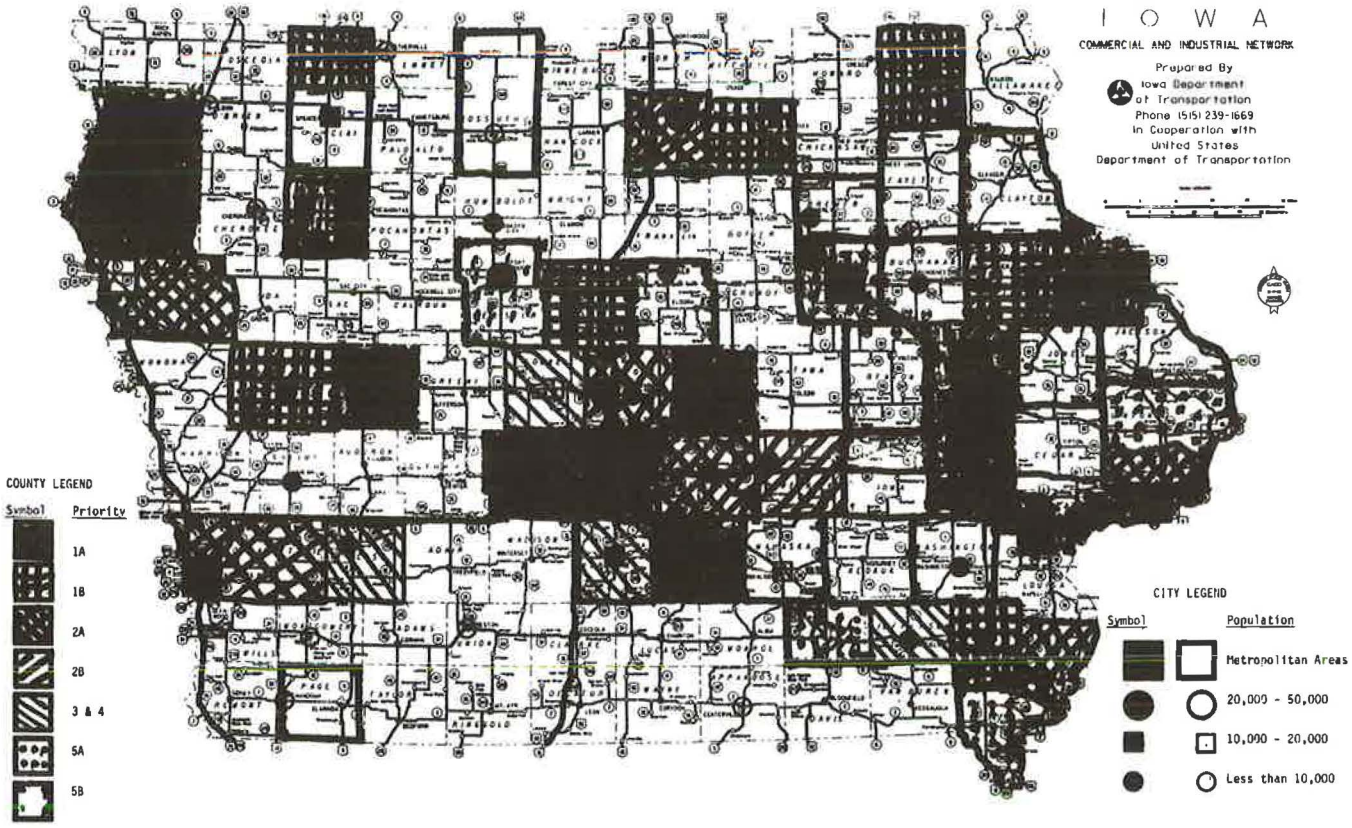

FIGURE 3 Iowa CIN city and county economic analysis.

TABLE 1 DESCRIPTION OF PRIORITY LEVELS FOR CORRIDORS OF ECONOMIC IMPORTANCE

Priority	Connect Place	To Place
1	Connect metro areas	To regional markets
2	Connect metro areas	To each other
3A	Connect large, growing communities in large, growing counties	To metro areas
3B	Connect large communities with city OR county growth	To metro areas
3C	Connect mid-sized, growing communities in large, growing counties	To metro areas
3D	Connect large communities without city or county growth	To nearby metro areas
4A	Connect mid-sized communities with city OR county growth	To nearby metro areas and/or Interstate
4B	Connect smaller communities with city AND county growth	To nearby metro areas and/or Interstate
5A	Connect smaller communities with city OR county growth	To nearby metro area or Interstate
5B	Connect smaller and mid-sized communities without city or county growth	To nearby metro area or Interstate

NOTE: All remaining portions of the Commercial and Industrial Network were assigned to a level based on the current amount of traffic.

One drawback that Iowa has largely overcome is the heavy emphasis on collection of secondary data in developing the rankings. A variety of problems was encountered in the collection of both city and county data.

The need for consistent, comparable, and reliable data was perhaps foremost among the problems encountered. Sources of employment figures, for instance, include the U.S. Department of Commerce census data (every 10 years), the Economic Census data (every year ending in Years 2 and 7), the U.S. Department of Commerce County Business Patterns (annual), the Bureau of Economic Analysis data (gathered in Iowa through the state's Department of Employment Services), and the Bureau of Labor. Because employment data may be collected by place of work or residence; may be derived using statistical models; may or may not include self-employed, government, or farm workers; may contain different types of data breakdowns; and may experience periodic data collection and presentation changes, any reliable analysis of data must be performed with a thorough knowledge of the type of data being used and its limitations. These economic data problems present difficulties not only for economists but especially for transportation specialists, who may be considerably less familiar with government economic data. Data collection problems are insignificant, however, in comparison with the primary data collection needs required for more quantitative methods of analysis, such as developing a statewide transportation or economic model.

PRIORITY CORRIDOR LEVELS: SELECTING AND SCHEDULING IMPROVEMENTS

As previously discussed, the city and county analysis provides the basis for establishing priority corridors for improvement on the CIN. The priority levels outlined in Table 1 are presented in further detail in Table 2. Figure 4 shows a map of these corridor improvement priorities.

It is recommended that improvements be scheduled starting with the highest priority levels, radiating out from the larger Iowa cities. Within each level, the cities have been ordered by their ranking in economic size. This ordering is intended to be combined with cost-benefit analysis and considerations of regional equity in scheduling projects within a category.

TABLE 2 PRIORITY CORRIDOR LEVELS FOR IOWA CIN IN OCTOBER 1989

DOT DISTRICT	COUNTY NAME	CITY NAME	POP GROWTH LEVEL	SERVICE LEVEL (1-6)	1986 POP	CITY RANK: W/ CHANGE	CITY RANK: W/O CHANGE	COUNTY SIZE RANK	COUNTY CHANGE RANK	COUNTY LEVEL
PRIORITY 1: Connect Metropolitan areas to Regional Markets										
Tier 1: Metro areas with growth (top 50 in change) in growing counties (county level 1 or 2)										
1	Polk	Des Moines	1	1	192,060	2	1	1	2	1A
6	Linn	Cedar Rapids	2	1	108,370	1	2	2	3	1A
6	Scott	Davenport	2	1	98,750	3	3	3	16	2A
6	Dubuque	Dubuque	2	1	59,700	4	6	6	33	1A
4	Pottawattamie	Council Bluffs	1	1	56,900	9	8	8	11	2A
6	Johnson	Iowa City	2	1	50,490	5	10	7	1	1A
Tier 2: Metro areas showing city or county growth, but not both										
3	Woodbury	Sioux City	4	1	79,590	187	4	5	45	2A
2	Black Hawk	Waterloo	2	1	70,010	7	5	4	74	5A
PRIORITY 2: Connect Metropolitan areas to each other										
PRIORITY 3A: Connect large, growing communities (≥ 20,000 population with city change in top 50) in large, growing counties (1A and 2A) to metro areas										
2	Cerro Gordo	Mason City	1	1	30,200	14	7	9	13	2A
1	Story	Ames	2	1	44,460	6	11	10	15	2A
1	Marshall	Marshalltown	2	1	26,070	10	12	13	10	1A
5	Muscatine	Muscatine	1	1	23,580	15	14	14	6	1A
1	Polk	West Des Moines	1	3	23,790	11	15	1	2	1A
6	Scott	Bettendorf	1	3	27,930	12	16	3	16	2A
6	Linn	Marion	1	3	20,570	13	18	2	3	1A
PRIORITY 3B: Connect large communities (≥ 20,000 population) with either city growth (top 50) OR county growth (1 and 2) to metro areas										
1	Webster	Fort Dodge	2	1	27,070	16	9	12	87	5A
5	Des Moines	Burlington	4	1	28,000	203	9	9	22	2A
2	Black Hawk	Cedar Falls	2	3	33,200	8	13	4	74	5A
PRIORITY 3C: Connect mid-sized, growing communities (10,000 to 20,000 population and city growth in top 50) in large, growing counties (1, 2, or 3) to metro areas NOTE: All connections are addressed in previous levels										
1	Polk	Urbandale	1	3	19,760	17	22	1	2	1A
1	Jasper	Newton	2	2	14,800	22	23	16	23	2A
1	Polk	Ankeny	1	3	16,730	19	25	1	2	1A
5	Warren	Indianola	1	3	11,670	24	31	37	4	3
PRIORITY 3D: Connect large communities (≥ 20,000 population) without city or county growth (city change below top 50; county level of 5) to nearby metro areas										
6	Clinton	Clinton	3	1	30,080	188	14	11	75	5A
5	Wapello	Ottumwa	4	1	25,290	224	17	19	77	5A

TABLE 2 (*continued on next page*)

TABLE 2 (*continued*)

DOT DISTRICT	COUNTY NAME	CITY NAME	POP GROWTH LEVEL	SERVICE LEVEL (1-6)	1986 POP	CITY RANK: W/ CHANGE	CITY RANK: W/O CHANGE	COUNTY SIZE RANK	COUNTY CHANGE RANK	COUNTY LEVEL
PRIORITY 4A: Connect mid-sized communities (10,000 to 20,000 population) showing city growth (top 50) OR county growth (1, 2, or 3) to nearby metro area and/or Interstate										
3	Clay	Spencer	2	1	10,970	18	19	33	79	5B
1	Boone	Boone	2	2	12,190	111	23	32	38	3
PRIORITY 4B: Connect smaller communities (~5,000 to 10,000 population) with city growth (top 50) AND county growth (1, 2, or 3) to nearby metro areas and/or Interstate										
5	Jefferson	Fairfield	1	1	9,570	23	22	40	28	3
3	Carroll	Carroll	2	2	9,450	21	24	20	27	1A
5	Marion	Pella	2	2	8,300	20	26	18	19	1A
3	Buena Vista	Storm Lake	2	2	8,530	28	27	21	20	1A
1	Hamilton	Webster City	2	2	8,380	39	27	28	18	1B
1	Poweshiek	Grinnell	2	2	8,430	27	28	26	26	2B
6	Johnson	Coralville	1	5	9,310	21	28	7	1	1A
5	Henry	Mount Pleasant	2	1	7,200	31	29	27	12	1B
2	Winneshiek	Decorah	2	2	8,000	27	30	30	7	1B
4	Cass	Atlantic	2	2	7,500	37	32	43	52	4
3	Plymouth	Le Mars	2	1	7,850	29	33	23	6	1A
2	Cerro Gordo	Clear Lake City	1	3	7,930	26	34	9	13	2A
3	Crawford	Denison	1	2	6,790	32	40	31	41	1B
1	Polk	Altoona	1	4	6,470	30	45	1	2	1A
1	Story	Nevada	1	3	6,270	35	47	10	15	2A
3	Sioux	Sioux Center	2	3	4,360	36	50	17	28	1A
PRIORITY 5A: Connect smaller communities (~5,000 to 10,000 population) with city growth (top 50) OR county growth (1, 2, or 3) to nearby metro area or Interstate										
2	Floyd	Charles City	4	2	8,560	248	29	42	24	1B
6	Jackson	Maquoketa	1	2	6,350	30	34	44	40	5B
5	Washington	Washington	1	2	6,820	45	35	35	58	5B
2	Bremer	Waverly	2	2	8,200	25	36	29	52	5B
1	Hardin	Iowa Falls	2	2	5,870	41	37	24	83	5B
5	Marion	Knoxville	2	2	7,920	78	38	18	19	1A
4	Dallas	Perry	2	2	6,650	65	41	22	14	1A
6	Buchanan	Independence	2	2	6,150	42	44	41	60	5B
3	O'Brien	Sheldon	2	2	4,710	57	46	53	49	9
6	Delaware	Manchester	2	3	4,860	54	47	46	34	1B
4	Shelby	Harlan	2	2	5,130	50	48	57	47	9
2	Humboldt	Humboldt	2	3	4,470	49	49	62	42	8

TABLE 2 (*continued on next page*)

TABLE 2 (*continued*)

DOT DISTRICT	COUNTY NAME	CITY NAME	POP GROWTH LEVEL	SERVICE LEVEL (1-6)	1986 POP	CITY RANK: W/ CHANGE	CITY RANK: W/Q CHANGE	COUNTY SIZE RANK	COUNTY CHANGE RANK	COUNTY LEVEL
PRIORITY 5B: Connect smaller and mid-sized communities (5,000 to 20,000 population) without city or county growth to nearby metro area or Interstate										
5	Lee	Keokuk	4	2	13,010	229	20	15	78	5A
5	Mahaska	Oskaloosa	4	1	10,800	209	21	30	50	5B
5	Lee	Fort Madison	4	2	12,360	228	21	15	78	5A
4	Union	Creston	3	1	7,800	246	32	58	66	9
4	Montgomery	Red Oak	3	2	6,250	238	37	55	61	9
2	Fayette	Oelwein	4	2	6,840	262	38	25	86	5B
2	Kossuth	Algona	2	2	5,920	60	39	34	91	5B
5	Appanoose	Centerville	4	2	5,920	276	42	59	53	10
4	Page	Shenandoah	4	2	5,720	271	42	40	88	5B
2	Emmet	Estherville	3	1	6,420	251	43	67	85	10
3	Cherokee	Cherokee	4	2	6,280	276	44	52	64	7

NOTE: All connections not previously assigned were assigned priority based on current traffic levels:
*West of Decorah (IA 150 and US 18): red, level 5
*Burlington to Keokuk (US 61): green, level 3

1. POPULATION GROWTH LEVEL:
   1 and 2: Shows population growth during 1950-1986
   (1 shows growth during both 1950-1980 and 1980-1986; 2 shows overall growth but decrease in one of the periods)
   3 and 4: Shows population decrease during 1950-1986
   (3 shows overall decrease but decrease in only one of the periods; 4 shows decrease during both 1950-1980 and 1980-1986)

2. City growth was based on being ranked in the top 50 in city change.
   County growth was based on being included in county levels 1, 2 or 3.

Some improvements will be made to lower priority corridors early in the program. However, these will be limited to localized safety improvements and surface preservation projects.

The type of improvement planned for a corridor will depend on the corridor priority level, design guidelines established for the CIN, projected traffic and percentage of trucks, public input, and sufficiency ratings. Departing from the traditional approach of programming improvements in small segments, improvements on the CIN will be undertaken on a corridor-wide basis. This change reflects the realization that the benefits of improvements will not occur until major links in the system are completed. Also, the rapid improvement of major portions of the network will enhance Iowa's image as a state dedicated to supporting economic growth and diversification.

Decreasing travel time and travel costs will be main objectives in planning improvements in the CIN. The design guidelines established for the CIN system generally exceed traditional engineering standards. For instance, Priority 1 corridors may be considered for four-laning even if traffic levels do not currently warrant a four-lane improvement. Also, climbing and passing lanes will be more liberally used than on other two-lane primaries.

Following is an explanation of the five major CIN corridor improvement priority levels.

CIN Priority 1 Corridors

Beginning with the highest-priority corridors, Figure 4 shows routes that connect metropolitan areas in Iowa with major midwestern business centers in surrounding states (Chicago, Minneapolis-St. Paul, Omaha, Kansas City, and St. Louis). Many of these Priority 1 corridors would provide connections of near-Interstate quality between Iowa metropolitan areas and major markets in surrounding states. For programming purposes, improvement of these routes would receive top priority because they would yield the greatest economic payoff for the state.

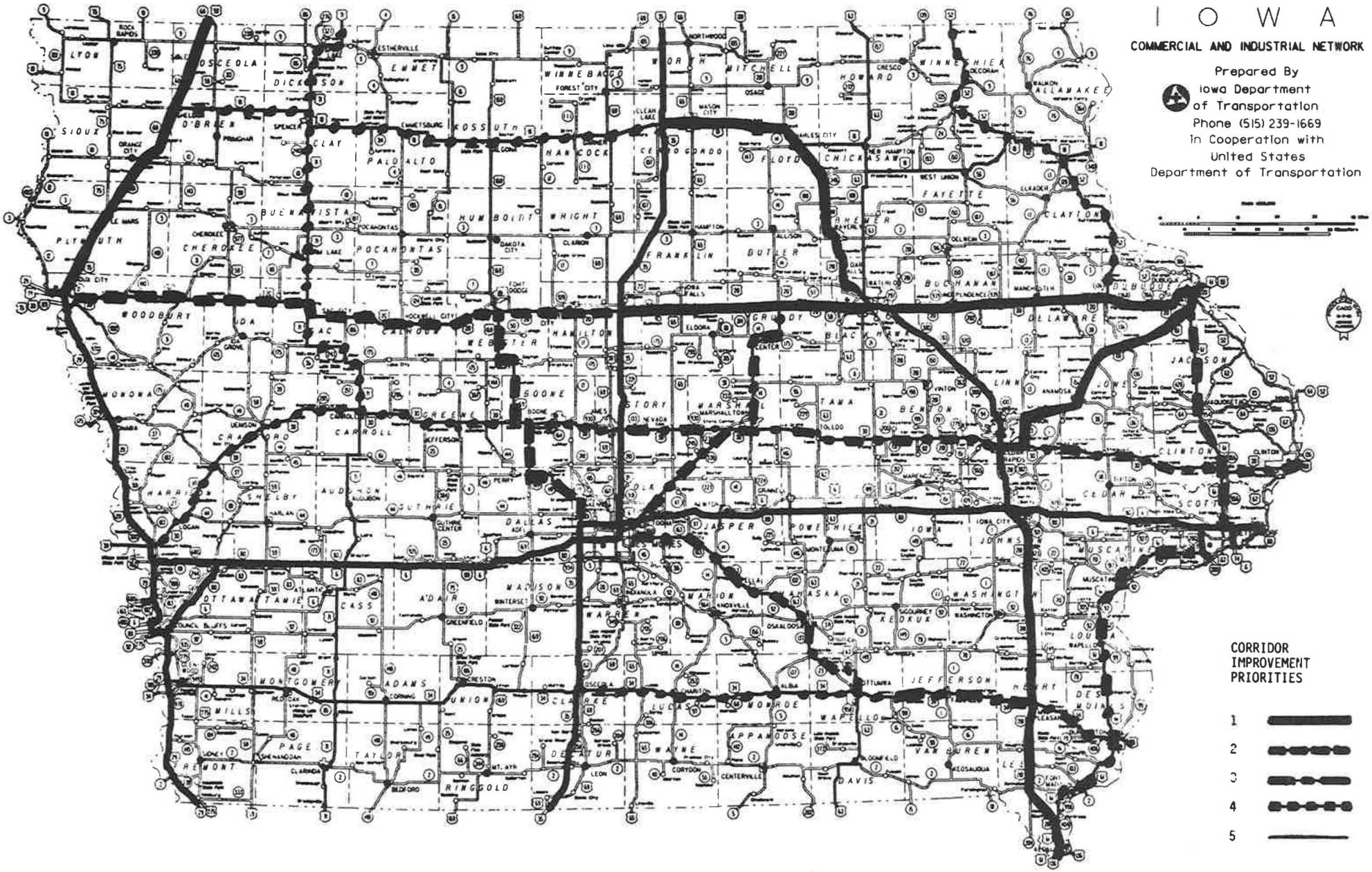

FIGURE 4 Iowa CIN corridor improvement priorities.

CIN Priority 2 Corridors

The second priority for improvement would include corridors connecting Iowa metropolitan areas. The two routes at this priority level, on the basis of current conditions, link Dubuque to Davenport and Sioux City to Waterloo. All other intrastate metropolitan area connections are already satisfied by the Interstate system or would be satisfied by the CIN Priority 1 corridors. Priority 2 corridors provide opportunity for Iowa-based industry to develop branch facilities as well as an efficient network of local suppliers. For these reasons, the level of improvement made on Priority 2 corridors would be either to expressway or high-quality, two-lane standards. However, because major investment on these corridors would not be made until Priority 1 improvements were completed, their level of improvement would not be determined until later.

This same programming philosophy applies to all lower priority levels because early improvements to the network may induce changes in traffic that would alter system needs. Also, because the improvement of Priority 2 corridors would not begin for a number of years, prudence dictates delaying the specification of design standards for these corridors.

CIN Priority 3 Corridors (3A–3D)

The third priority for improving the CIN would involve upgrading connections between large nonmetropolitan communities and both Iowa and out-of-state metropolitan areas. This would be accomplished by linking such cities as Ames, Burlington, Clinton, Marshalltown, Muscatine, and Ottumwa to previously designated corridors and the Interstates. All of these communities are important nonmetropolitan commercial centers, but not all can be characterized as growth centers. Some, such as Burlington, Clinton, and Ottumwa, experienced a significant decline in economic activity during the 1980s. However, these communities remain dominant commercial centers within their areas of the state. Thus, CIN corridors serving these communities have been classified as Priority 3 corridors to provide a high level of highway service to communities most important to the state's rural economy and most likely to generate future growth in rural Iowa.

CIN Priority 4 Corridors (4A–4B)

The city and county analysis also shows relatively stable growth in portions of west central Iowa—the area bounded by I-29 on the west, I-35 on the east, I-80 on the south, and US-20 on the north. The level of development and industrial diversification in this area is not as great as in east central Iowa, but the communities and surrounding counties show potential for industrial growth. Therefore, the CIN corridors transversing this area have been classified as Priority 4. US-52 in northeast Iowa has also been assigned this priority.

CIN Priority 5 Corridors (5A–5B)

Priority 5 corridors serve communities that are smaller and have experienced more limited success in diversifying and expanding their industrial base. Although some of the communities experienced growth between 1950 and 1986, the counties are still predominantly agricultural and have experienced significant losses of population, particularly among the young adult age groups, which are necessary to attract new business. Therefore, portions of the CIN that traverse these areas would likely not be improved until the end of the planning period. Local efforts to develop the plans and resources needed to expand and strengthen the industrial economies of these communities could affect the priority placed on improving the CIN in these areas.

Figure 4 represents a statewide application of the methodology outlined in the previous section. This methodology is one of the approaches being explored for establishing improvement priorities on the CIN, and the example given in this section is based on current information. If the methodology is adopted, a design-year analysis will be undertaken that will then be used to modify the system plan for the CIN.

CONCLUSIONS

The methodology described and applied in previous sections represents the initial phase of development of a system plan for Iowa's CIN. Issues remaining to be addressed include the following:

- What types of highway transportation improvements do manufacturers, wholesalers, and distributors perceive as necessary to support their businesses?
- Where are the principal suppliers, customers, and branch facilities of area manufacturers, wholesalers, and distribution centers located?
- From how large an area do various Iowa businesses draw their work force?
- How are industrial centers and residential communities linked in Iowa?
- Where do area residents make different types of retail purchases?

The results of research in this area, such as surveys and interviews, would be useful for selecting the types of corridor improvements.

Several other areas may merit additional in-depth study. First, recent trends show that growth both in manufacturing and in wholesale employment is occurring in many of Iowa's poorest counties, on the basis of county economic size rankings. Even in some rich counties, employment growth is occurring outside the major center. Further research into the reasons for these trends, and whether or not area highway improvements are needed and cost-effective, is warranted.

Second, the quality of jobs and life is a high priority on Iowa's economic development agenda. Although it is intended that targeting resources at regional economic centers will help support this priority, the issue is not specifically addressed in the economic analysis. Further research into areas with high rankings in value added by manufacture, new capital expenditures, and educational attainment is merited, including examination of per capita and change rankings. Evaluating whether area highway improvements are needed to support growth in

"pockets of quality" would complement the corridor priority analysis.

Finally, the economic analysis of Iowa's communities and counties indicates that economic growth in the state has not been equitably distributed. Because population and economic activity are concentrated in the eastern half of the state, and because existing economic activity can be expected to strongly influence future development, any method of transportation investment that proposes to maximize the return on investment dollars will likely result in future investments being geographically concentrated.

Traditionally, Iowa highway programs have addressed the issue of equity by trying to equalize highway quality, as measured by annual sufficiency studies. IDOT is not required to follow this practice for the CIN. Nevertheless, to maintain broad-based support for this system, it will likely be necessary to ensure that benefits of the program are spread throughout the state.

The regional center analysis attempts to combine considerations of equity with the objective of maximizing benefits. This goal is accomplished by targeting highway improvements to the most important regional centers in more economically disadvantaged areas of the state, generally communities with lower service levels or in areas showing a lack of growth. However, major highway investments should not be made in areas that lack the necessary infrastructure, raw materials, strategic planning, or other resources required to support manufacturing, wholesaling, or distribution facilities.

Although the economic development benefits of highway improvements should be as broadly distributed as possible, such improvements cannot, by themselves, provide an economic lifeline for all of Iowa. Strategies aimed at supporting regional economic centers, encouraging cooperation between smaller communities, forming cluster communities to share complementary resources, and developing broader structures for educational and governmental support are necessary to spread economic benefits throughout the state.

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