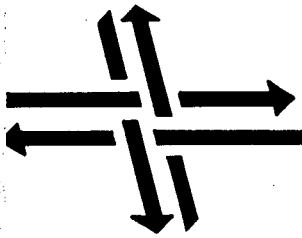
Reinventing PennDOT Training Report of Step II: Twenty-First Century Management Profile



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PROJECT TASK 37: REINVENTING PENNDOT TRAINING

Reinventing PennDOT Training Report of Step II: Twenty-First Century Management Profile

Prepared for

Commonwealth of Pennsylvania
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by

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13. ABSTRACT *(Maximum 200 words)*

MAUTC researchers have begun working with PennDOT to provide a conceptual framework to reinvent the Pennsylvania Department of Transportation (PennDOT) training function designed to systematically assist in positioning PennDOT for the 21st century. The framework design will address training functions with respect to distance education as a means of training within PennDOT and the upward mobility of managers in response to anticipated PennDOT needs associated with strategic objectives. The project is grouped into Step I: Distance Education; and Step II: PennDOT Manager Certificate Program.

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1. INTRODUCTION

The 21st century is approaching quickly. It is essential for organizations of the future to adhere to the consistently changing human and technological environment. In order to succeed, agencies must quickly learn to become agile competitors. Agile competitors "precipitate change, create new markets and new customers out of their understanding of the directions in which market and customer requirements evolve" (Goldman et al., 1995, p. 43). Adapting and cohering to customer's perceived needs and wants will aid an organization in reaching its goal of agility. In addition, organizations must be "knowledgeable, skilled, informed about the company, and flexible in adapting to ... changes and new performance expectations demanded by changing customer opportunities" (Goldman et al., 1995, p. 119).

PROJECT OBJECTIVES

This project identifies managerial competencies necessary for the Pennsylvania Department of Transportation to address 21st-century demands consistent with the PennDOT/MAUTC Partnership. The primary objective of this project is to develop a framework for managerial training based on managerial functions, roles, and competencies. Each competency, in the end, provides an association of a role with a specific knowledge module.

REPORT STRUCTURE

Change Agents

This report identifies current transportation change agents as well as those for the 21st century. The change agents listed are from the NCHRP Report 371: *State Departments of Transportation: Strategies for Change*. The study interviews State Department of Transportation (DOT) employees, American Association of State Highway and Transportation Officials (AASHTO) officials, and stakeholders to determine the current and future change agents for transportation agencies throughout the United States.

Managerial Functions/Roles

Managerial functions are derived from the issues forming change in transportation agencies. Each managerial function applies to a specific issue driving change. Distinct managerial functions apply to each function. Many of the functions overlap to form managerial roles. For example, characteristics, such as computer usage, envisioning, and partnering, are associated with each of the four key change agents. Consequently, they form the managerial roles of computer user, forecaster, and partner.

Managerial Competencies/Knowledge Bases

Managerial competencies are based on managerial roles. The competencies reveal the knowledge that managers need to perform requisite duties. Many of the competencies overlap to form specific knowledge bases. These bases are the foundation for specified knowledge modules.

Knowledge Module

A knowledge module, for our purposes, is defined as a combination of managerial "topics, assumed level of detail, and area of emphasis separating each knowledge module into its own area of training" (Project Task 19, pp. 12-14). Each is broken down into one of three different managerial levels (first-level supervisor, first-level manager, middle- to executive-level manager) to target specific needs. The purpose of the knowledge modules are to determine which employees have "knowledge of the essential elements" (Task 19, p. 14) and which need training in the functional areas, such as finances, legislation, environment, and technology. Additionally, managers in charge of knowledge modules may recognize the employees who need to begin at "the entry level to gain fundamental knowledge before proceeding to advanced levels of that knowledge module" (Task 19, p. 14). For those who are experienced, it is perceived that advanced training will need to take place.

2. CHANGE AGENTS

The NCHRP Report 371: *State Departments of Transportation: Strategies for Change* (Transportation Research Board, National Research Council, 1993) identifies fourteen priority issues that transportation managers face today and will continue to face in the future. These include lack of finances, the Intermodal Surface Transportation Efficiency Act (ISTEA), environmental protection issues, technology, governmental processes, economics, demographics, internal DOT organizations, land use, congestion, public concerns, infrastructure, Americans with Disabilities Act, and travel behavior. In this NCHRP report, State DOT employees, AASHTO officials, and stakeholders identified four key factors of change agents driving change in the future. These were finances, ISTEA-2, environment, and technology.

FINANCES

Financial restraints limit the ability of an agency to invest and function properly. With the increasing cost of business in the future, the manager needs to know how to gain more money and manage the limited currency efficiently. Financial pressures require managers to make wise decisions about what projects or activities will be funded and maintained. This type of rationale is termed "'supply side' concern" (Transportation Research Board, National Research Council, 1993, p. 13). This means that "more funding will be required to support the maintenance and investment in transportation" (Transportation Research Board, National Research Council, 1993, p. 13). Managers need to market and communicate the importance of their activities in order to gain financial support.

ISTEA/ISTEA-2

ISTEA is a change agent. This legislation is tied to the federal government by way of funding. Thus, it has been proven to be forceful due to federal oversight and enforcement (Transportation Research Board, National Research Council, 1993, p. 14). ISTEA is responsible for changing the way State Departments of Transportation do business. In addition to its

contribution to highways and byways, it is critical to the education and training of tomorrow (*Leading Transportation Education in the 21st Century*). ISTEA allows new money for research, communication, and technology. Furthermore, the legislation permits flexibility in funding, planning requirements, program enhancements and a connection between the intermodal realm and government. Because of the increased number of alternatives DOTs are pursuing, the number of stakeholders involved in transportation are expanding.

While ISTEA is a current force for change in transportation agencies, ISTEA-2 (referred to as NEXTEA) is the reauthorization that is forcing transportation change into the future. NEXTEA stands for the National Economic Crossroads Transportation Efficiency Act. It "calls for preserving the infrastructure development, environment, and safety programs of ISTEA" (www.apta.com/press/310sb2.htm). This new act could result in "an 11 percent increase in funding over the old program [ISTEA]" (www.dot.gov/affairs/30197s.htm). NEXTEA "is an initiative to rebuild America, to assure that in the 21st century [sic], we have the best national system in the world" (www.dot.gov/affairs/30197s.htm).

ENVIRONMENT

Working hand-in-hand with NEXTEA are environmental factors. The control that the State DOT has over environmental law is quite limited. "Most of the administrative standards for implementing the laws are developed and administered outside DOTs, in environmental agencies at the federal and state level" (Transportation Research Board, National Research Council, 1993, p. 15). Due to increasing environmental awareness within society, State DOTs should incorporate environmental practices into "transportation policies and decisions ... early on to avoid adversarial hearings and/or lawsuits after plans are developed" (Transportation Research Board, National Research Council, 1993, p. 14).

TECHNOLOGY

The fourth key change factor is technology. The uses of technology have previously been underestimated in State DOTs. From a basic understanding of computers to cruising the information highway, transportation agencies need to understand technology throughout.

Technology allows for accelerated communication, planning, and decision making. Given the increased benefits of technology, along with an enhanced awareness, a greater emphasis is placed on technological training, funding, and research.

3. MANAGERIAL FUNCTIONS

As we have seen, there are four key issues that currently affect, and will affect, change in the 21st century. Along with these alterations, there are certain roles that a leader must play in order to effectively manage such change. A leader is a manager that leads his or her organization into the 21st century. Once again, the four change agents will be examined, and the functions that a manager or leader must adhere to within each environment will be identified.

The first change agent is financial constraint. This is characterized as "a difficult constraint on the ability to make investment and improvements in transportation" (Stull, 1995, p. 1). In his report, the survey on transportation training requirements, Stull (1995) numerically breaks down the characteristics that are important for a manager to practice. As a leader in the 21st century, the main functions a person must perform are the following:

1. Strategic Planner,
2. Financial Planner,
3. Partner,
4. Entrepreneur,
5. Liaison to State and Local Government,
6. Visionary,
7. Marketer, and
8. Communicator – with both media and community.

The second change agent, ISTEA/NEXTEA, refers to the six-year legislation passed to allow for "flexibility of funding, planning requirements, transportation enhancements" (Stull, 1995, p. 1), technology, communication, and education. The training survey report again puts the characteristics critical to managers in numerical order. Taking the top essential characteristics, a manager acting under this legislation may be required to function as:

1. Liaison to state and local government,
2. Safety Manager,

3. Geographical Information Systems (GIS) user,
4. Communicator -- with both media and community,
5. Strategic Planner, and
6. Partner.

The third change agent is the environment, which encompasses environmental impacts as well as current and future environmental legislation. People who are involved with this task take on preservation of the environment as well as appeasing active/persuasive environmental groups. Stull's (1995) survey on transportation training requirements identifies six characteristics needed to perform the job of managing the environment. The functions of the manager in this group include:

1. Waste/Hazardous Materials Manager,
2. Partner,
3. Environmental/Natural Resources Manager,
4. Liaison to State and Local Government,
5. Engineer, and
6. Geographical Information Systems (GIS) User.

The fourth theme is technology. It includes "the computerization of industry operations, telecommunication, and new vehicle technology" (Stull, 1995, p. 1). The survey, numerically arranged the characteristics needed by managers in his transportation training for the future report. The report indicates that the functions a leader must perform in this area include:

1. Skilled Computer User,
2. Entrepreneur,
3. Teacher,
4. Partner,
5. Visionary, and
6. Resource Manager.

Pulling from the four key themes, there are like characteristics on which a manager must focus in the future. Clustered together, they form the key managerial roles of the 21st century. The key managerial roles are a combination of the characteristics previously listed and the characteristics listed by Farren and Kaye (1996), who write for the non-profit Druker Foundation.

In their book, *The Leader of the Future*, Farren and Kaye list five roles a manager needs to be proficient as a leader. These roles are:

1. Facilitator,
2. Appraiser,
3. Forecaster,
4. Adviser, and
5. Enabler.

In combination with the characteristics from the four key change agents (as expressed in the Goldman et al. [1995] *Agile Competitor and Virtual Organizations: Strategies for Enriching the Customer*) as well as Farren and Kaye (1996), to successfully lead the agile organization of the future a manager must posses these key roles:

1. Partner,
2. Facilitator,
3. Enabler,
4. Forecaster,
5. Computer User,
6. Resource Manager,
7. Strategic Planner,
8. Financial Planner,
9. Teacher, and
10. Marketer.

The purpose of table 1 in the following is to show how the managerial roles were derived. As the reader will see, the Y axis lists the key managerial roles while the X axis lists the four key change agents and others. The managerial functions, which overlap, combine to form the key managerial roles.

"The 21st century organization is characterized by responsibility, autonomy, risk and uncertainty" (Hammer, 1996, p. 31). The goal of the organization is to become agile. This means that the agency is capable of operating most efficiently and effectively in a competitive environment of continually, and unpredictably, changing customer opportunities (Goldman et al., 1995, p. 3). If an organization plans on being able to cope with consistent change, it must train its leaders to be adept in these roles.

Table 1: Identification of key managerial roles and the characteristics that correspond with them.

Key Roles	**Financial Constraint**	**ISTEA / NEXTEA**	**Environment**	**Technology**	**Managerial Leadership and Agility**
Partner	X	X	X	X	X
Facilitator	X	X	X	X	X
Enabler	X	X		X	X
Forecaster	X		X	X	X
Computer User		X	X	X	
Resource Manager	X	X	X	X	X
Strategic Planner	X	X		X	X
Financial Planner	X	X			X
Teacher	X			X	X
Marketer	X	X	X	X	X

4. MANAGERIAL CHARACTERISTICS AND COMPETENCIES

While understanding the futuristic roles, a manager must also comprehend the competencies that correspond with them. In this section, the ten managerial roles and the characteristics that best coincide with them will be identified. The characteristics that coincide may be similar or different within each category. Once identified, the similar characteristics will be clustered to form the managerial competencies.

MANAGERIAL CHARACTERISTICS

Partner

As a leader, there are ten roles that must be learned and understood in order to succeed in an ever-changing world. As a partner, a leader or manager must learn to be a part of all aspects in transportation. In other words, the leader learns to contract out the necessities needed for the agency. Instead of contracting with a company that offers single-minded products and services, the leader contracts with the organization that offers a multitude of unique products and services made for specific needs or opportunities (Understanding Agility).

Facilitator

It is important for a leader to understand facilitation. The focus of leadership should not be on directing and instructing, rather it should be on facilitating. As a facilitator, a leader "helps people understand and articulate what they want from their career" (Farren and Kaye, 1996, p. 179). This type of structure will "create an open and accepting climate" (p. 179), which in turn will help leaders and the organizations they manage become more agile (Goldman et al., 1995).

Enabler

The third role is that of an enabler. As a leader, it is important to understand employees' needs and desires. The enabler "help[s] individuals develop detailed action plans for achieving career goals" (Farren and Kaye, 1996, p. 180). In addition to aiding career planning, the manager will also "connect people with the resources they need to implement the career plans" (Farren

and Kaye, 1996, p. 180). Enabling the employees to further their goals will help broaden the global connections of the organization as well as increase the potential to develop customer-enriching products and services (Goldman et al., 1995).

Forecaster

Fourth is the role of forecaster. A forecaster "points out emerging trends and new developments" (Farren and Kaye, 1996, p. 179) for the organization. The forecaster practices a key role, trend watching. Trend watching "is a way of thinking about how the future is shaping itself and what that will mean for the organization and members of the work team" (Farren and Kaye, 1996, p. 181). As a leader, one must be a "perpetual learner, studying newspaper reports and industry or professional journals, and scanning the culture and the people around you for signs of the new and previously unrecognized" (Farren and Kaye, 1996, p. 181). Additionally, the forecaster subsumes two important roles; entrepreneur and visionary.

An entrepreneur is able to argue his or her need before officials to obtain results for the community. "Leaders must become cosmopolitans who have the vision, skills, and resources to form networks that extend beyond their home base and bring benefits to their own group by partnering with others" (Kanter, 1996, p. 91). A visionary looks into the future to see what may benefit the organization, customer, and environment and is consequently better able to live up to the standards of agility; enriching the customer; cooperating to enhance competition; organizing to master change and uncertainty; and leveraging the impact of people and change (Goldman et al., 1995). "True leaders for the future will have vision for the workplace; broadening of corporate culture and workplace environment" (Work, 1996, p. 78). Both the entrepreneur and visionary look beyond what is happening now and grasp onto what consumers need for the future. An example of this is the need for increased technological education and training.

Computer User

The next role is that of a computer user. It is difficult for a manager to be an expert in this ever expanding role, but he or she should be knowledgeable in the general usage and capabilities of computers. Some skills a manager should obtain are geographical information systems (GIS)

planning, database applications, spreadsheets, word processing, presentation applications, and basic aspects of connectivity.

Resource Manager

The role of resource manager requires that a person be knowledgeable in the different resources that surround him or her (for example, environmental/natural resources, financial resources, and/or human resources). "The organization constantly needs to know the details of the deployment of its resources, whether they are computers, machines or people" (Goldman et al., 1995, p. 345). Furthermore, as a director of resources, the person needs to have personal effectiveness skills "to achieve excellence, balance, and ongoing renewal" (Bolt, 1996, p. 167) of assets within the organization.

Strategic Planner

Strategic Planners also subsume the futuristic role of visionary based on past experiences and organizational goals. "A strategy must anticipate, create, and guide change and create commitment among the organization's members" (Bardwick, 1996, p. 136). It is the manager's job to relay the vision as achievable and worth doing in order to obtain a competitive advantage over competitors (p. 136). Not creating a strategic plan "almost guarantees only tactile benefits from agility and only incremental improvements over current practices and performances" (Goldman et al., 1995, p. 73). Strategic planners act as facilitators between the internal and external customers. They communicate with the stakeholder to further grasp perceived needs and wants; thus linking stakeholder goals with strategic initiatives (Goldman et al., 1995, p. 73).

Financial Planner

The second type of planner is the financial planner. The financial planner has the responsibility of making wise investments in transportation. Finances are often barriers to agility. Internal barriers, such as how employees are measured and rewarded (Goldman et al., 1995), are easy to remedy with good leadership and management. It is the external barriers that are difficult to remedy "due to government regulation or societal attitudes" (Goldman et al.,

1995, p. 289). The knowledge and skills a manager may need in this position are budgeting, cost accounting, and investing.

Teacher

The role of the teacher may be viewed in two ways, an educator or a mentor. As an educator, the leader is able to teach employees about technological advances, team work, marketing, communication, and other skills that may help the employee become an entrepreneur within the organization. As a mentor, the leader instructs the employees by way of empowering. Just as a maestro empowers his or her orchestra by way of guiding arm movements, the mentor empowers his or her employees by way of guiding statements and tasks.

There are two types of behaviors which managers as teachers partake, task behaviors and relationship behaviors. Task behaviors are "defined as the extent to which the leader engages in spelling out the duties and responsibilities of an individual or group" (Hersey and Johnson, 1996, p. 267). The relationship behavior is "defined as the extent to which the leader engages in two-way or multi-way communication — listening, facilitating, and supporting" (Hersey and Johnson, 1996, p. 267).

Marketer

The final role of marketer is essential to the organization of the 21st century. "Marketing (as opposed to financial and generic management) skills are increasingly being recognized as crucial even to high-tech product success" (Goldman et al., 1995, p. 158). Since transportation agencies are moving toward a customer-enriching view, managers within these agencies need to understand how to effectively market to the customer to leverage impacts of people on transportation. It is the responsibility of "the leader to indirectly motivate and inspire followers to find the most efficient and effective ways to serve the larger community or group" (Goldman et al., 1995, p. 30).

MANAGERIAL COMPETENCIES

Competencies "are general areas of proficiency" (Farren and Kaye, 1996, p. 186). In other words, competencies are the areas of expertise in which the manager should be qualified. The characteristics identified in correspondence with the managerial roles "are specific actions or activities that support the overall competency" (Goldman et al., 1995, p. 186). In addition to being adept in transportation related fields, the overlap of specific characteristics prove to be important competencies a manager should follow. Highlighted above are the ten key managerial roles. Listed in appendix A are the competencies which relate to each of these roles.

6. KNOWLEDGE MODULES

As previously stated, knowledge modules are a combination of managerial "topics, level of detail and area of emphasis which separate into specific areas of training" (Mason et.al., 1994, p. 14). Based on the managerial competencies classified from managerial roles, knowledge bases are formed. Each knowledge base describes the knowledge modules that apply to one of the three levels of management: (1) first-level supervisors, (2) first-level managers, and (3) middle- to executive-level managers (see table 2).

Table 2: Knowledge Modules as they relate to specific levels of management.

Knowledge Modules	**Functional Areas**		
	First-level Supervisors	*First-level Managers*	*Executive-level Mangers*
Communication	X	X	X
Team Building	X	X	X
Agility	X	X	X
Financial management		X	X
Evaluation	X	X	X
Inter-governmental Relations		X	X
Computer Education and Training	X	X	X
Environmental Awareness	X	X	X
Facilitation	X	X	X
Leadership	X	X	X
Presentation		X	X

Once the knowledge modules are paired up with the appropriate managerial level, specific media are applied to that knowledge module. Once the module has corresponding media, it becomes a tool for training. As stated in the *Project Task 19: Traffic Engineering Education Plan*, the most suitable forms of media in a training program are:

Information packets: Printed material giving a brief discussion of the important topics, references on where to search for information and information on other sources of information, such as informational videos.

Research circulars: Detailed research reports on specific areas of knowledge.

Study course: A self-paced course consisting of a test or evaluation method when the material is completed.

Manual: A comprehensive compilation of statewide practices and guidelines.

Newsletter: A quarterly publication, internal to PennDOT, on up-to-date technical information within transportation education.

Short course: Two- to-four day training classes with an instructor to allow for interaction. These could be existing courses owned by PennDOT, new courses to be developed, or already developed courses offered by an outside source. These would also be appropriate for dissemination by the distance learning education media.

Distance Learning Education: A mechanism for teaching other media across great distances. The three primary modes are direct cable line, compressed video technology, and satellite technology. The direct cable and compressed video technology are effective for point-to-point communication and may be used for point-to-multi point communication. The satellite communication is primarily effective for point-to-multi point communication (Mason et al., 1994, p. 19).

For each knowledge module, a specific method of training is placed. PennDOT currently offers many courses that touch on many of the modules mentioned. Yet, there are some additions needed to further enhance transportation education in the 21st century (see appendix B).

The following three tables (tables 3, 4, and 5) represent examples that can be used for training development. Corresponding to each managerial level is the appropriate knowledge module and the type of media available. The Transportation University College of Executive Services may use these matrices as a guide to develop specific training for managers.

Table 3: First-level supervisor.

Knowledge Modules	Training Media								
	Information Packets	Research Circulars	Study Courses	Manual	News-letter	Short Courses	Video	Computer Programs	Distance Learning Education
Communication									
Team Building									
Agility									
Evaluation									
Computer Education and Training									
Environmental Awareness									
Facilitation									
Leadership									

Table 4: First-level manager.

Knowledge Modules	Training Media								
	Information Packets	Research Circulars	Study Courses	Manual	Newsletter	Short Courses	Video	Computer Programs	Distance Learning Education
Communication									
Team Building									
Agility									
Financial Management									
Evaluation									
Intergovernmental Relations									
Computer Education and Training									
Environmental Awareness									
Facilitation									
Leadership									
Presentation									

Table 5: Middle- to executive-level manager.

Knowledge Modules	Training Media								
	Information Packets	Research Circulars	Study Courses	Manual	Newsletter	Short Courses	Video	Computer Programs	Distance Learning Education
Communication									
Team Building									
Agility									
Financial Management									
Evaluation									
Intergovernmental Relations									
Computer Education and Training									
Environmental Awareness									
Facilitation									
Leadership									
Presentation									

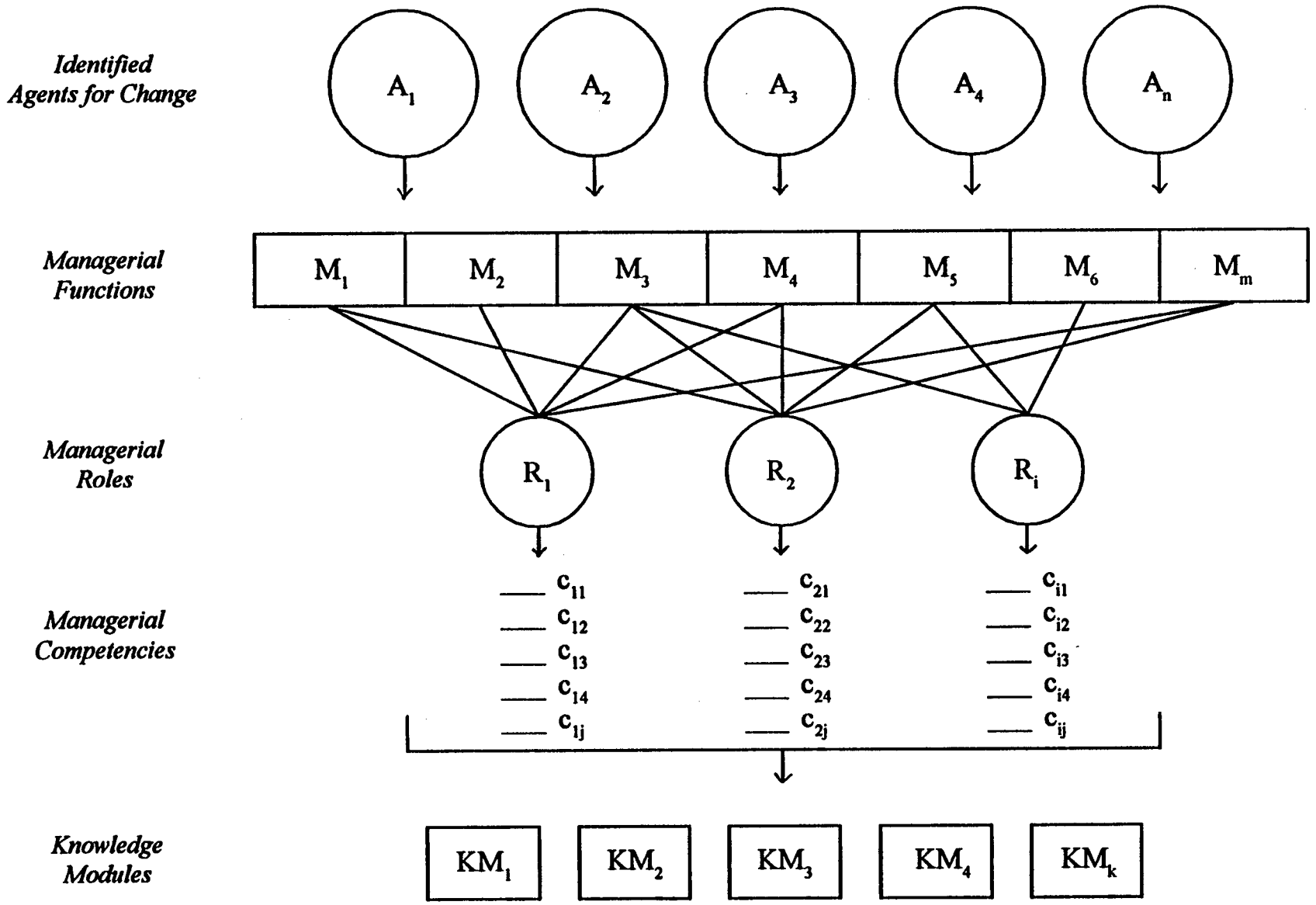
7. CONCLUSION

As organizations speed into the next millennium, they must be ready for the continuing and unexpected changes which face them. Organizations must learn to deal with issues such as decreased finances, changing legislation (e.g., NEXTEA), environmental concerns, and polymorphous technology. Although managers do face these issues today, the intensity will grow to enormous levels. Mangers must be trained in specific areas of need in order to meet customer and stakeholder market demands.

Figure 1 shown in the following represents a conceptual framework designed to help guide and develop the executive services aspect of the PennDOT Transportation University. This framework provides a systematic mechanism to address managerial training by identifying managerial functions, roles, and competencies in relation to key factors driving change in the field of transportation. Within this figure, A_i represents identified change agents in transportation. Transportation management must function appropriately in response to issues linked with these agents. M_i represent the many managerial functions associated with these change agents. These functions are then grouped into managerial roles, R_i, where a single M_i may function in more than one role. Next, managerial competencies, c_{ij}, are derived from the designated roles. These competencies represent knowledge required by managers to perform effectively amidst changing technologies and environments. These c_{ij} are then grouped into knowledge modules, KM_i, where each KM_i defines a specified boundary that encompasses a designated area for training. Following the process outlined within this framework will provide a conceptual map for targeting management training activities associated with key transportation change agents significantly impinging upon an organization's future.

In this paper, we addressed five different change agents for the 21st century: (1) financial constraint, (2) legislation, (3) the environment, (4) technology, and (5) managerial leadership with agility. Authorities in and out of transportation agree that these are the five main issues driving change into the future. Starting with these agents, we developed the conceptual framework discussed previously for guiding educational and training activities for transportation managers.

Figure 1: Conceptual Framework to Guide Transportation Management Training and Education Activities



After the change agents were addressed, managerial functions were developed based on current and future change agents. It was decided that there were certain functions a manager needed to perform to work with such change agents. After the functions were listed, they were grouped by similar characteristics to form the key managerial roles. These roles include:

1. Partner,
2. Facilitator,
3. Enabler,
4. Forecaster,
5. Computer User,
6. Resource Manager,
7. Strategic Planner,
8. Financial Planner,
9. Teacher,
10. Marketer.

It is important to note that in order for mangers to be successful in the 21st century, they must be proficient in all roles, not just a few.

The next step was to assign competencies to the ten key managerial roles. The competencies are the proficient characteristics a manager possesses to perform such roles. There are many competencies that pertain to the roles. Once listed, the competencies were aggregated conceptually to form knowledge modules.

The knowledge modules are education and training tools. They provide information to educate managers in specific areas that will help them become agile managers of the 21st century. After a manager becomes educated and trained within a knowledge module framework, he or she will be better equipped to take on the key managerial roles listed earlier. Educating transportation managers about the important roles will help them to tackle the future change agents that are quickly coming upon transportation agencies.

8. REFERENCES

A Virtual Company. PennDOT handout on a Virtual Company.

An Agility Overview. PennDOT handout on Agility.

Bardwick, J. 1996. "Peacetime Management and Wartime Leadership." *The Leader of the Future*. Jossey-Bass Publishers, San Francisco: pp. 131-139.

Bolt, J. 1996. "Developing Three-dimensional Leaders." *The Leader of the Future*. Jossey-Bass Publishers, San Francisco: pp. 161-173.

Elements of Administration's ISTEA Plan Taking Shape. www.apta.com/press/310sb2.htm.

Farren, C. and B. Kaye. 1996. "New Skills for New Leadership Roles." *The Leader of the Future*. Jossey-Bass Publishers, San Francisco: pp. 175-187.

Goldman, S., R. Nagel, and Preiss. 1995. *Agile Competitors and Virtual Organizations: Strategies for Enriching the Customer*. Van Nostrand Reinhold, New York.

Heresy, P. and D. Johnson. 1996. "Situational Leadership in the Multicultural Organziation." *The Organization of the Future*. Jossy-Bass, San Francisco: pp. 165-273.

Hesselbein, F, M. Goldsmith, and Beckhard. 1996. *The Leader of the Future: New Visions, Strategies, and Practices for the Next Era*. Jossey-Bass Publishers, San Francisco.

Hesselbein, F, M. Goldsmith, and Beckhard. 1996. *The Organization of the Future*. Jossey-Bass, San Francisco.

Mason, J., C. Poe, and M. Pietrucha. 1994. *Project Task 19: Traffic Engineering Education Plan*. The Pennsylvania Transportation Institute, University Park, PA.

Pennsylvania Department of Transportation. 1996. *Moving PennDOT Forward*. Course Catalog. College of Administrative Sciences, College of Technology, and College of Executive Services.

"PennDOT: Joint Maintenance Program Going Well." *The Derrick*. Friday, October 11, 1996: p. 2.

PennDOT/MAUTC Partnership Scope of Work. *Project Task 37: Reinventing PennDOT Training*: 1-4.

Stull, R. 1995. *Educational Training Initiatives Survey*.

Stull, R. 1995. *Transportation Training Requirements for the 21st Century.* Saratoga Springs, New York.

The Teaching Web: A Guide to the World Wide Web for all Teachers. Http://www.edu.yorku.ca/~`rowston/chapter.html.

Transportation Trends. www.dot.gov/affairs/31097s.htm.

Transportation Research Board, National Research Council. 1993. *NCHRP Report 371.* Washington, DC.

Understanding Agility. Pennsylvania Department of Transportation Information Sheet.

Video: *Leading Transportation Education into the 21st Century.*

9. BIBLIOGRAPHIC MATERIAL

A Virtual Corporation. Http://www.rtcent.com/RTC_def.html.

Agility Update. 1996. Operations Review Group. 1(4).

Chisholm, R. 1996. *On the meaning of networks*. Groups & Organization Management. 21(2): 216-235.

Employee Training and Development Core Training Programs: Continuous Quality Improvement. 1996. Pennsylvania Department of Transportation Training Manual.

Employee Training and Development Core Training Requirements/Developmental Activities: First-Line Supervisors, First-Line Mangers, Middle, Senior, and Executive-Level Mangers. 1997. Pennsylvania Department of Transportation, Transportation University Manual. Section: (6) © (e) (g).

Hammer, M. 1996. *The soul of the new organization*. Government Executive. 28(9):2-6.

Inventing the Organizations of the 21st Century. Http://www-sloan.mit.edu/ccs/21c/mgmt.html.

Knowledge Module 1: Transportation Engineering Draft Annotated Outline. 1996. 1-34.

McCarty, F. 1996. *Learning faster and better*. Manufacturing Engineering. 117(1): 232.

Ohio Department of Transportation, Office of Training. *ODOT Leadership Academy: Recognizing Professional Management in a Quality Environment*.

PennDOT Certified Manger Program handout.

APPENDIX A: Managerial Competencies

The following provides a listing of managerial competencies.

Managerial Competencies based on Managerial Roles

Partner
Contract award and execution process
Labor relations
Negotiator
Project management
Intergovernmental relations
Public relations
Communication

Facilitator
Effective communication to groups
Team building skills
Leadership skills
Supervisory skills
Understanding the changing role of the manger
Role playing
Active listening skills
Communication

Enabler
Liaison between individuals, project and the strategic objective
Employee development skills
Customer service skills
Cultural diversity skills
Personnel management skills
Customer enrichment skills
Participative exercises skills
Product and service performance skills
Problem solving skills
Team building skills
Conflict resolution skills
Labor relations
Active listening skills
Communication

Forecaster
Finance skills
Trend assessment
Visionary skills
Entrepreneurial attitude
Economic skills
Communication

Computer User
Basic geographical information systems skills
Spread sheets
Database application design
Connectivity
Computers as an information resource
Word processing applications
Computer presentation

Resource Manager
Budgeting
Accounting
Natural resource management
Energy conservation
Team building
Harassment
Hearing conservation
Intergovernmental cooperation
Resource leveraging and agility concepts
Economics
Project management
Integrity
Communication
Environmental awareness
Assessment of wetlands
Keeping PA beautiful

Strategic Planner
Design concepts
Graphics and printing
Achieving quality and business objectives
Strategic planning principles
Evaluation
Stakeholder identification
Facilitation/moderator
Active listening
Communication

Financial Planner
Budgeting
Accounting
General math
Planning
Cost benefit analysis

Educator
Safety in the workplace
Customer service in the workplace
Communication in the workplace
Teamwork
New employee orientation
Conflict management in the workplace
Distance education technology in the workplace
Evaluation in the workplace
Limitations and advantages of training and education in the workplace
Employee development in the workplace

Marketer
Media communication skills
Powerful presentation skills
Graphics and printing skills
Marketing planner
Program implementation
Program development
Program evaluation
Needs assessment skills
Market communication skills
Marketing researcher
Customer enrichment
Customer satisfaction
Economics
Market behavior

APPENDIX B: Knowledge Modules and Corresponding Courses

The following provides a listing of the knowledge modules and corresponding courses.

Knowledge Module 1: Communication

*Group communication
*Individual communication
*Introduction to conflict resolution
Media training
*Liaison between individual, project and strategic objective

**** Denotes courses not yet offered by PennDOT.***

Knowledge Module 2: Team Building

*Problem solving process
Effective team building
*Introduction to active listening
*Conflict resolution for team development

**** Denotes courses not yet offered by PennDOT.***

Knowledge Module 3: Agility

Customer service
Introduction to cultural diversity
*Coaching technology to enhance employee performance
*Customer enrichment
Personnel management
*Creative problem solving
*Measuring performance on products and services
Overcoming resistance to change

**** Denotes courses not yet offered by PennDOT.***

Knowledge Module 4: <u>Financial Management</u>

*Budgeting
*Accounting
*Financing
Cost benefit analysis

**** Denotes courses not yet offered by PennDOT.***

Knowledge Module 5: Evaluation

*Financial evaluation
*Program evaluation
*Evaluation fundamentals
*New products/technology evaluation

**** Denotes courses not yet offered by PennDOT.***

Knowledge Module 6: <u>Intergovernmental Relations</u>

Effective writing
*Listening to governmental/customer needs and wants
*Liaison between different governmental organizations
*Decision-making processes

**** Denotes courses not yet offered by PennDOT.***

Knowledge Module 7: Computer Education and Training

*Database applications
Introduction to GIS
Word processing
*Computers as information resources
*Computer presentations

**** Denotes courses not yet offered by PennDOT.***

Knowledge Module 8: <u>Environmental Awareness</u>

*Natural resource management
Keeping PA beautiful
Environmental assessment training
Wetlands management
Earthwork construction parts 1-3
*Resource conservation
*Transportation systems management

**** Denotes courses not yet offered by PennDOT.***

Knowledge Module 9: Presentation

*Computer presentations
Design concepts
Graphics and printing
*Presentation planning

**** Denotes courses not yet offered by PennDOT.***

Knowledge Module 10: Facilitation

*Introduction to team building effectiveness
Facilitation for managers
Super facilitator
*Supervisor skills
*Effective group listening
*Project management

**** Denotes courses not yet offered by PennDOT.***

Knowledge Module 11: Leadership

Concepts of management
*Organizational behavior
*Understanding and managing a culturally diverse work force
Facilitation for leaders
Time management
*Advanced team building
Transportation management
Strategic quality planning
*Inter and intra organizational conflict resolution
Integrity

**** Denotes courses not yet offered by PennDOT.***