Identification of a Leadership Competency Model for use in the Development, Recruitment & Retention of Intermodal Transportation Workers

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Development and Initial Validation of the Leadership Success Factors Inventory: Transportation Version (TLCI: TV)

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ABSTRACT

Transportation, like most industries, faces critical leadership challenges. Attracting, retaining, and training high potential candidates are essential to safe and productive organizational performance. Indeed, as the reliance on efficient public and private transportation services continues to grow with the population boom and mounting interest in shrinking the world's carbon footprint, leadership plays a more critical role then ever. Precise assessment of leadership competence is an important first step in identifying the core leadership competencies needed to be a highly effective leader in transportation. The purpose of this study was to begin to develop and validate the Leadership Success Factors Inventory: Transportation Version (LSFI: TV) by administering the instrument to a sample of 154 managers from a state Department of Transportation (DOT). The differentiating factors of highly effective versus typical leadership performance in transportation were explored along with the psychometric properties of the LSFI: TV by holding two cognitive interviews with veteran human resource executives in transportation, conducting three focus groups each composed of five mid-to-upper level managers at a state DOT, and then administering the survey to a self-assessment sample of 154 DOT managers. Factor analytic results demonstrated an 8-factor leadership competency model. The rotated solution yielded eight interpretable factors; the emotional competence factor, manages a culture of safety factor, motivation factor, innovative factor, communication factor, credibility and integrity factor, decision-making factor, and conflict resolution factor. Moderate to strong correlations were also found between a performance measure and the subscales, indicating initial validity for the measure.

Development and Initial Validation of the Leadership Success Factors Inventory: Transportation Version (TLCI: TV)

As the demand for transportation continues to increase dramatically amidst the current population boom and reliance on transportation services grows, an estimated 40 to 50 percent of the existing local, state, and federal transportation workforce near retirement (*1*). These baby boomers lead at all levels of the transportation industry and concerns are growing as to whether enough workforce development planning has been done to prepare for the future shortage of competent leadership (*2*). Sen. George Voinovich, R-Ohio recently estimated that by 2010 approximately 600, 000 employees will retire (U.S. Dept. of Transportation). Further, the Federal Highway Administration (FHWA) reported that 45 percent of its workforce will be eligible to retire by 2010 (*1*). Despite workforce development challenges amidst increasing demand for services, the transportation industry remains without a tailored leadership competency assessment tool and accompanying leadership competency model. In order to meet the demands of the future shortages of competent leaders at the executive level, the transportation industry must adapt their training, recruiting, and managing practices by use of psychometrically sound behavioral competency instruments which can be implemented to develop organization specific leadership competency models. Establishment of a competency assessment tool for transportation executives would greatly increase the likelihood of a smooth transition from the current aging management body by validly identifying the core competencies responsible for successful leadership in transportation. Thus, the purpose of this study was to develop a transportation leadership competency assessment tool that can be used to effectively recruit, select, train and reward transportation leaders.

Leadership matters to organizational outcomes (*3;4*). Indeed, there are several societal and economic reasons to focus on leadership performance (*4*). One does not have to look too far to see how costly poor selection and training procedures can be to organizations. The press is quick to announce executive scams and safety mishaps, which have been regularly seen in recent years. The recent oil spill in the gulf magnified leadership practices in high risk industries as the nation watched emergency response efforts. In the transportation industry, the cost of safety incidents has led to the downfall of transportation agencies, entire modes of transportation, the trust of the public and substantial loss in revenue. Take the recent rail accidents in California and Washington D.C. Many immediately questioned selection and training procedures and if the rail industry is selecting the best people to do the job. The final verdict is that leadership is one of the key ingredients in providing ethical, safe, and efficient services to consumers.

The global economic meltdown has also left companies starving for a competitive advantage to stay alive. As both public and private agencies look to stay afloat during these difficult economic times, establishment of a reliable, valid and psychometrically sound assessment tool that can be used to recruit, train, and promote highly effective leaders is essential (*6*). Thus, the primary justification for this project stems from the critical role that ethical and efficient leadership plays in organizational outcomes, and the well documented research indicating that competency assessment tools is one of the best starting places to achieve this mission.

Competency-based scales for managers lend themselves nicely to leadership development and performance improvement programs because by definition competencies are considered to

be the "right" behaviors (*5*). The "right behaviors," or competencies, allow organizations to reach their desired outcomes by developing the factors that differentiate outstanding from typical leaders (*5*). Thus, competencies are at their core considered to be specific behavioral characteristics applied to successfully complete a task directly linked to a desired outcome (*5*; *7*). Identification of core competencies for specific industries allows organizations to better understand the cultural and environmental conditions needed to support emission of the "right" behaviors.

Several other industries are ahead of transportation in development of a valid industry-wide leadership competency assessment tool (*8*). In fact, consumer product companies, financial service corporations, higher education institutions, and health care have led the way in the development of industry-specific competency-based assessment tools. In a recent study by Calhoun (*8)*, the rationale behind behavioral competency-based assessment was clarified. The study set out to develop a method of measuring the skills necessary for effective performance in all types and levels of management in health care. The goal of the study was to develop an assessment tool that could be used across various levels of management in healthcare in a variety of settings, and that would provide a common language for all managers in the healthcare industry. The study's findings allowed the health care industry to improve business management and graduate training curriculum via their new model and accompanying scale. The current study set out to echo this movement by establishing a leadership competency scale for managers in transportation.

LITERATURE REVIEW

State of Transportation Leadership

Several glaring concerns and current factors in the transportation industry make this an ideal and possibly critical time to develop a valid and psychometrically sound instrument to assess leadership competency in the transportation industry. Transportation agencies in the public and private sector move people and products. Thus, safety and efficiency is key to success. Several studies in various industries have documented the relation between leadership competency assessment systems and individual and organizational performance outcomes. It is alarming that transportation operates at the responsibility level it does without such competency systems in place to ensure quality leadership that can guide various transportation agencies to safe and efficient practices. The transportation workforce is facing a potential crisis if more planning and attention is not garnered.

A 2007 article in the Minnesota Local Technical Assistance Program (LTAP) newsletter provided one of the best summaries of the causes of the workforce development crisis in transportation. They reported that the mix of baby boomers nearing retirement at alarming rates, whom lead at all levels of various private and public transportation sectors, coupled with increasing demands for transportation amidst world-wide efforts for environmentally friendly modes of moving people and products, have left the transportation workforce with the ingredients for the perfect storm. Further, the workforce is changing rapidly in socio-economic status, age, and values, and leaders are needed that can motivate diverse employees to safely compete in a global market.

A separate report by the Wisconsin Department of Transportation (*2*) reported workforce development issues a top priority. The report, prepared by CTC & Associates, LLC for the

WisDot Research Administrator, suggested that transportation agencies will be asked to do more with less in the 21st century. The report also noted that the pool of qualified applicants has shrunk due to public image issues. Further, the report acknowledged the expected complexities of leading in transportation in the years to come by highlighting the strong possibility that transportation agencies will face downsizing, outsourcing, and greater public interaction, all of which require keen leadership and effective, flexible manager training programs. The need for a reliable and valid instrument for transportation to compete is clear.

In 2001 the Federal Transit Administration (FTA) sponsored the American Public Transportation Association's (APTA) Workforce Development Initiative. With the Transit Cooperative Research Board (TCRP), the study identified the most important challenges that the transit industry currently faces in workforce development. Brian Vogel, principal investigator of the study, reported that it was universally agreed upon that workforce issues are critical to the success of the industry. Vogel suggested that the industry faces severe recruitment and retention of quality worker issues in the face of increasing demand for services. Further, Vogel specified the need for industry-developed models that could be used to measure the return on training or other human resources development. Additional issues identified included an aging workforce, problems with succession planning, recruitment difficulty, training issues, and planning issues. Nearly every issue identified was also related to leadership and managerial concerns.

Leadership Competencies

What is a competency?

Since psychologist David McClelland (*9*) first proposed competencies as potential differentiating factors of performance beyond intelligence nearly forty years ago, a considerable amount of research on the topic and strong efforts to define what is meant by the term competency have been documented. Like most psychological constructs, early agreement on the definition of competency was lacking (*10*). Researchers more recently have come to agree that competencies are behavioral and observable abilities that distinguish great leaders from the norm (*11*). They are thought of as behavioral and technical success factors. Calhoun et al., for example, defined competency as, "Those behavioral and technical characteristics (competencies) that discriminate outstanding leadership performance from typical performance" (p.377). Emphasis is placed here on the ability of competencies to differentiate highly effective from typical workers, which is part of what makes them so valuable to organizational outcomes. More simply, most seem to agree that a competency refers to a skill or personal ability that is necessary to achieving targeted outcomes (*12*).

The researchers in this study were interested in developing a transportation leadership competency measure. Based on the definition of competencies provided above, transportation leadership competence, which is the variable intended to be measured by the Leadership Success Factors Inventory: Transportation Version (LSFI: TV), was defined as the distinct set of behavioral and technical characteristics and skills that are causally related to superior transportation leadership performance. We viewed competencies as a behavioral approach to emotional, social, and cognitive intelligence (*11)*, and think of leadership competencies as those distinguishing learned behaviors that divide typical and superior performers on a specific job task.

Use of Competency-Based Assessments

The use of managerial competency systems has become the gold standard design to improve leadership performance (*13*). Most organizations rely on competency-based assessment tools to select, train, promote, and reward managers (*11*). Prior to the work of psychologist David McClelland, who first proposed competencies as critical differentiating factors of leadership performance, most looked to traditional human resource factors such as education and experience to select, promote and train leaders (*4*). Since competencies were first proposed as key differentiating leadership performance determinants during the height of the behavioral movement, there has been an outpouring of leadership competency research in business (*8*; *11*; *14*; *15*). Today both practitioners and scholars seem to agree that effective organizations have behavioral-competency systems in place (*8*). Managerial competencies have been empirically linked to performance and organizational success (*16*). Despite widespread use of various forms of competency-based performance scales (e.g., 360s) to improve HR processes, as well as mounting empirical evidence to support such scales, it is still difficult to locate psychometrically sound managerial competency scales in the empirical literature for certain key industries. Transportation is one such industry. As a result, the methodology, psychometrics, and science supporting the practice have lagged behind (*11*). This deficit exists amidst recent findings demonstrating that the specific core competencies essential for successful performance is partially influenced by industry context (*12*). Such findings follow years of leadership and management research that has failed to agree upon one essential set of core competencies that ensure success across industry lines.

Reigning Models of Leadership Competency

Both general managerial and industry-specific competency models have surfaced over the past twenty-five years. For the purposes of this study, the competency models presented in the empirical literature and from the dominant consultancy groups in business psychology are presented as they provide the foundation for development of the transportation leadership competency scale. Seven competency models or frameworks are presented here. These seven were chosen based on there scientific rigor in development, because they are heavily cited in organizational behavior, psychological, and business literature, and because they were generated by the leading scholars in the field of managerial behavior. Table 1 provides a summary of some of the reigning managerial and leadership competency models.

Table 1

Prominent Leadership and General Managerial Competency Models

Source(s)	Sample/population	Methodology	Structure	Competency Clusters
Healthcare Leadership Alliance (HLA; 2005a,b)	General health administration at all levels.	Collaboration of six major health administration professional associations.	300 competencies in 5 clusters	Business knowledge and skills, communication and relationship management, knowledge of healthcare

				environment, professionalism, and leadership.
Healthcare Leadership Competency Model (HLCM; 2008)	84 randomly selected managers from across the field. Also, 75 mid- and late-career leaders deemed outstanding were interviewed.	Initial development included behavioral event interviewing, psychometric analysis, and cross-industry sector benchmarking.	3 overarching domains subsuming 26 behavioral and technical competencies.	3 Domains that include; Transformation, Execution, and People
Hay Group (McClelland/ McBer, 1973 and updated) Manager Competency Model	General managerial competency model	Observing and interviewing outstanding performers in various industries and then grounded in solid empirical research.	11 competencies organized in 4 clusters	Managing yourself, managing your team, managing your work, and managing collaboratively
Competencies for Leadership (Weiss, 2003)	General leadership and managerial competency model	Reviewed relevant models and synthesized via empirical techniques	4 "SEEDS" or foundational requirements and 4 general clusters	4 SEEDS; Sense of purpose, Energy and optimism, Engaging, Decision-Making. 4 Clusters; Personal effectiveness, Communication, Managing others, Thinking
Levenson, Van der Stede, & Cohen (2006) General Managerial Competency Model	Fortune 500 consumer products company with 52 geographic units dispersed across the US (N = 699)	Web-based survey of individual-level and unit-level competency level and performance ratings	3 levels; beginning, intermediate and advance. 3 categories of competency, multiple dimensions within each category	3 categories of competencies include; (a) technical/functional skills, (b) basic management skills, and (c) leadership skills (e.g., mentoring, networking, etc.)

Tett, Guterman, Bleier, & Murphy (2000) Hyperdimensional Taxonomy of Managerial Competence	110 randomly selected Academy of Management members (75 men and 35 women)	Binomial test analyses following survey mailout procedure	53 competencies making up 9 clusters	9 clusters include; traditional functions, task orientation, person orientation, dependability, open mindedness, emotional control, communication, developing self and others, and occupational acumen and concerns
Personnel Decisions International (PDI) PROFILOR (*16*)	Hundreds of job analysis questionnaires from a variety of PDI clients on an international level	Based on major literature review and data from hundreds of job analysis questionnaires	24 competency areas and 130 leadership behaviors	Example of competency areas include; Drive for Results, Act with Integrity, Use Sound Judgment, Manage Execution, amongst others

Another recent landmark paper that must be mentioned in the discussion of empirically grounded models of competencies comes from the work of Tett et al. (*7*). In this eloquent study, the authors explored 12 of the most heavily cited taxonomies of managerial competence in the academic literature and then reported findings from three studies on the development and content validation of a "Hyperdimensional" Taxonomy of Managerial Competence. The term hyperdimensional is reportedly used to emphasize the quest for dimensions more specific than what models have previously proposed. As presented in Table 1 above, the Tett et al. Hyperdimensional Taxonomy of General Managerial Competence, is a comprehensive model including 53 competencies that comprise 9 cluster or domain areas. The researchers linked each of the 53 competencies to competencies established and presented in the 12 taxonomies they reviewed. They produced this model by conducting three content validation studies. In these studies, the authors mailed materials to the management participants and asked them to match 141 behavioral elements to various competency labels. The primary research question they asked in improving specificity of their model was the degree to which behavioral element could be uniquely classified into targeted competencies. They employed the binomial test to compare observed frequencies with those expected due to chance. Thus, they were able to detect the number of people correctly classifying the element to the competency to reach statistical significance according to the binomial test. This methodology was employed to simply improve the specificity of managerial competency models. No doubt, the Tett et al. model is one of the most elaborate and methodologically sound taxonomies reviewed for this study, and was used and referenced in great detail as a comprehensive sounding board for critical competencies to include in the development of a transportation managerial competency scale.

Do Leadership Competencies Really Matter?

Though the concept of management competency has become omnipresent within the field of performance assessment and organizational development (*17*), and billions have been spent on leadership competency system development, the academic and applied research literature is only in its infancy (*11*). Steady research on the topic has come from consulting firms and American corporation's human resource departments, yet little has been published in the academic literature until the past decade (*11*). The initial findings are quite promising.

Much of the outcome research on the efficacy of using competency systems focuses on performance. At there core, competencies are "an employee's ability to perform the skills required for a specific job" (*4*, p.361). For the past fifty years organizations have placed major stock on the notion that assessments of employee's competencies can yield an effective means of predicting job performance (*9*; 18). Though competency systems are heavily used today across various industries to select, reward, and promote managers, limited empirical evidence exists for the effectiveness of managerial competency systems (*10*). More specifically, little data exists that shows that managerial competency systems increase managerial effectiveness. Despite large gaps, competency assessments have been shown to predict individual managerial success as measured by 360-degree ratings (*19*) and other promising findings have emerged relating competency measurement to performance outcomes. Levenson et al. (*4*), for example, found that higher level competency managers had higher individual performance ratings. They also found a positive relationship between mentoring based on a competency system and individual performance, suggesting that competencies can be used for training and development as well. Similarly, Dreyfus (*20*) investigated the competencies that predict highly effective performance in science and engineering managers. It was concluded that the highly effective managers demonstrated more interpersonal competency than their average peers, therefore demonstrating that interpersonal skills make a difference. Further, Dreyfus demonstrated the importance of including social and emotional intelligence competencies in management competency models, as these were found to be discriminating competency areas between superior and typical performers.

In a recent Guest Editorial by Boyatzis (*11*) in the *Journal of Management Development*, the legendary competency scholar expanded on the notion of emotional, social, and cognitive intelligence competencies while providing an update on competencies in the 21st century. This manuscript ties in nicely with the discussion on what we know about competencies that relate strongly to performance and discriminate typical from superior performers. Boyatzis reported that "An integrated concept of emotional, social, and cognitive intelligence competencies offers more than a convenient framework for describing human dispositions. It offers a theoretical structure for the organization of personality and linking it to a theory of action and job performance" (p.21). He then defined emotional intelligence competency as an ability to recognize and use emotional information about oneself that leads to or causes effective or superior performance (*11*). Boyatzis made the point that emotional intelligence competencies very much relate to performance and cited numerous studies to empirically support this point. Thus, in the current study, incorporation of emotional competencies will most likely be critical to the development of a general managerial competency scale for managers in transportation.

Finally, Hopkins and Bilimoria (*21*) added to the literature on the relation of competencies to performance when they analyzed data from a sample composed of 130 upper-level executives (90 males and 40 females). In this recent examination, the authors looked at the gender differences in the demonstration and predictability of emotional and social competencies

to performance. The authors reported no significant differences between male and female leaders in emotional and social competencies. However, they concluded that there were significant differences found between the most successful male and female leaders. Hopkins and Bilimoria (*21*) reported that gender does moderate the relation between emotional and social competence and success. Further, only male leaders were more successful when they demonstrated higher competencies (*21*). The findings from this study suggest that gender is an important factor when identifying the core competencies that distinguish superior from typical leaders.

As one can see from the studies presented above, there is mounting evidence that suggests that competencies can and do predict performance. So yes, it seems safe to at least initially accept the notion that competency-based assessment instruments can make a difference in performance at the leadership level. Further, the current literature provides sufficient guidance on the key competencies to include in the development of a transportation managerial competency scale. Several aspects of the current state of transportation warrant additional research toward managerial performance improvement.

Research Hypotheses

Hypothesis 1: The scale will be unidimensional.
Hypothesis 2: The scale and subscales will demonstrate acceptable internal consistency, measured by Coefficient Alpha.
Hypothesis 3: Convergent validity will be shown by demonstrating strong correlations to scores on a measure of performance.

METHODOLOGY

Sample

There were two separate samples obtained in this study: one sample of managers who participated in one of three focus groups held prior to data collection at the DOT and one sample composed of managers who assessed their own leadership competencies. Fifteen managers at a state Department of Transportation located in the Western half of the United States participated in one of three focus groups. Each focus group was composed of five participants who had been identified by a senior human resources manager at the DOT as outstanding in their position. These fifteen managers were diverse in ethnicity, age, gender, rank, years with the DOT, and position or job title. The self-assessment sample who completed the leadership measure consisted of 154 managers (121 males and 33 females) at a state Department of Transportation located in the Western half of the United States. The ethnic breakdown of the self-assessment sample was: 120 Caucasians (78%), 18 Hispanics, Latino/as (11.7%), 2 African-Americans (1.3%), 1 Asian or Pacific Islanders (.6%), 4 Bi-racials (2.6%), 4 Multiracials (2.6%), 2 American Indian or Native Alaskan (1.3%), and 3 who indicated Other (1.9%). The average age of the self-assessment sample was 49 years old and the annual salary was $58, 206.07. On average, self-assessment participants supervised 22 people at the time of data collection. 153 of the self-assessment managers indicated that they were full-time while only 1 manager indicated that they were part-time employees. There was variance in job classification or title as well: 7 Entry-level manager (i.e., Team Leaders) (4.5%), 92 Supervisors (59.7%), 43 Managers (27.9%), 5 Directors (3.2%), 2 Executives (1.3%), and 5 indicated Other (3.2%). The average length of

time in this position for this sample was 5.82 years, while the average length of time in the field for this sample was 20.42 years.

Measures

Leadership Success Factors Inventory: Transportation Version (LSFI:TV)

The Leadership Success Factor Inventory: Transportation Version (LSFI: TV) is a web-based or paper-and-pencil questionnaire that was constructed by the researcher team in this study to measure transportation leadership competence. The LSFI: TV consists of behavioral and technical leadership characteristics to which an individual responds to each characteristic with respect to how much they agree with each statement based on how they feel they can perform that characteristic of leadership (e.g., accurately identifies his or her own strengths and weaknesses, responds well to criticism). The questionnaire assesses both performance and importance of various leadership competencies in transportation. It can be used as a 360 degree assessment tool and it contains two versions composed of the same items: one version for managers to rate their own performance on a six-point Likert-type rating scale (1=Very Strongly Disagree to 6=Very Strongly Agree), and a second part composed of the same items that is designed for peers, supervisors, and colleagues associated with the manager to rate that individual on the same items once for performance and a second time for importance for success in the position (1=Very Important, 2=Important, 3=Not Important).

Item and Scale Development. An initial item pool of 33 items were generated in previous research as a part of a grant from the National Center for Intermodal Transportation (NCIT) to identify essential managerial competencies relating to outstanding transportation leadership. The initial 33 items were developed from two sources of information; 1) qualititative data gathered from focus groups comprised of human resource managers in various transportation agencies, and 2) a thorough literature review in business management and psychology academic databases. This initial item pool formed the basis of the LSFI: TV. These original items were pilot tested on a sample of 62 managers in transportation. The researchers found strong reliability for the scale with a Cronbach's Alpha of .98. However, factor analytic techniques revealed overlap and redundancy, as well as gaps in the instrument. The initial findings were presented at the American Psychological Association's national convention in 2009.

As a part of the current investigation, the researchers revisited the literature and previous findings to expand the item pool to 90 items. The LSFI:TV was developed rationally to represent the leadership competencies found to underlie the structure of the reigning general leadership competency models. The researchers then administered the 90 items plus a short performance measure to the focus group participants at the DOT in the current study. This pilot sample was composed of 15 transportation managers, each of whom had been identified by a human resource manager within the organization as a star or peak performer. An exploratory factor analysis of the pilot demonstrated overlap between items and lack of coverage of key leadership competencies. The focus group's qualitative data was also content analyzed and 18 managerial competencies were identified. The group provided feedback about specific items and assisted the researchers in tailoring the items to transportation. The researchers then wrote new items to cover the missing competencies, changed the language of several items to reflect transportation specific terms, and removed both redundant and irrelevant items. In addition, two cognitive

interviews were conducted to assess the 90 items. One participant was an Industrial-Organizational Psychologist at the DOT and the second was a high ranking human resource manager at the DOT. Both individuals were asked about leadership/managerial competencies essential to successful performance as a transportation manager. Both individuals indicated a great need for a competency cluster or area relating to managing safety practices. Thus, the researchers wrote 7 items relating to Managing a Safety Culture and included them with the previous 90 items. Following the focus groups and the pilot sample data analysis, the researchers arrived at the version of the LSFI: TV administered in this study, which consisted of 102 items.

Demographic and Performance Ratings

A short demographic questionnaire was included in the LSFI:TV. The demographic section assessed each participant's age, ethnicity, gender, length of time in the field, length of time in the current position, marital status and salary. A short five item performance questionnaire was also included in the survey. The performance items assessed the participant's beliefs about their performance over the past year. Participant's were asked to respond to each question based on how much they agree with the 5 statements (Strongly Disagree = 1, Strongly Agree = 7). Two internal consistency estimates of reliability were computed for the Performance scale: a split-half coefficient expressed as a Spearman-Brown corrected correlation and coefficient alpha. For the split-half coefficient, the scale was split into two halves such that the two halves would be equivalent as possible. In splitting the items, we took into account the sequencing of the items as well as whether items assessed the same aspect of performance. The first half included items 1, 3, and 5 from the performance scale, while the second half included items 2 and 4. The Spearman-Brown coefficient for unequal length was .95. A coefficient alpha was also computed to assess the reliability of the performance scale. For the coefficient alpha, the greater the consistency in responses among items, the higher the coefficient alpha will be. The coefficient alpha was found to be .93, which suggests that the scale scores are reasonably reliable for respondents like those in the study.

Procedures

Prior to data collection, approval for this project was granted by the Institutional Review Board (IRB) at the University of Denver. The focus group participants were identified and asked to participate in one of three scheduled focus groups by a high ranking human resource manager within the DOT. The participants were notified that the DOT was conducting a research study to identify a leadership competency model and accompanying leadership survey which could be used for future leadership development initiatives. Three focus groups were then held on site in a DOT meeting room. Each focus group participant was asked at the beginning of the group to complete the LSFI: TV on one of the laptops set-up in the meeting room. Upon completion of the survey, the researchers facilitated a discussion about essential characteristics and qualities of leadership within transportation. The focus group participants were asked to tell personal accounts of successful leadership experiences at the DOT. Participants were also asked to comment on the survey they had recently completed and to provide feedback on specific concerning items or areas they did not think were well covered.

The self-assessment sample (n = 154) was obtained by a series of email solicitations that were sent out via the DOT's employee email list from a senior human resource manager. Only

managers who were at the very least Team Leaders received the email. An initial email was sent out from the Executive Director introducing the study and providing a rationale for the data collection, as well as explicitly indicating voluntary participation. The second email contained the informed consent form and a link to the on-line version of the LSFI: TV. Participants who were interested in participating in the study completed the survey on-line. Approximately 225 managers were invited to participate. Of those 225, 154 completed the on-line assessment. These 154 managers served as the sample in this study.

Analysis

The dimensionality of the 102 items from the LSFI: TV was analyzed using the maximum likelihood factor analysis. A principle factoring method with varimax rotation was employed to examine the factor structure. The study also involved an initial validation procedure in which the manager subscale scores on the LSFI: TV were correlated with the performance measure. Composite scores were generated for each subscale and then correlated to the five item performance measure. Coefficient Alpha and Split-Half Coefficient estimates were obtained to assess the reliability of the scale and subscales of the LSFI: TV.

RESULTS

Exploratory Factor Analysis

The dimensionality of the 102 items from the LSFI: TV was analyzed using maximum likelihood factor analysis. Three criteria were used to determine the number of factors to rotate: the a priori hypothesis that the measure was unidimensional, the scree test, and the interpretability of the factor solution. The Eigenvalues and scree plot for the first sample indicated that our initial hypothesis of unidimensionality was incorrect. Based on the plot, the Eigenvalues, and the interpretability of the factor solutions, eight factors were rotated using the Varimax rotation procedure. Surprisingly, the five factor model that was hypothesized was not interpretable. Though the initial analysis revealed 15 factors based on Eigenvalues over 1.0, the researchers only extracted eight factors as this was the most interpretable solution. The rotated solution yielded eight interpretable factors; the emotional competence factor, manages a culture of safety factor, motivation factor, innovative factor, communication factor, credibility and integrity factor, decision-making factor, and conflict resolution factor. The emotional competence factor accounted for 11.47% of the item variance, the manages a culture of safety factor accounted for 10.19% of the item variance, the motivation factor accounted for 9.25% of the item variance, the innovative factor accounted for 9.17% of the item variance, the communication factor accounted for 8.73% of the item variance, the credibility and integrity factor accounted for 7.67% of the item variance, the decision-making factor accounted for 7.21% of the item variance, and the conflict resolution factor accounted for 5.4% of the item variance.

Items were selected for the measure based on the factor pattern matrix using the following criteria: (1) a factor loading above .45 on the factor, (2) cross-loadings on other factors of less than .40, and (3) no more than five items representing each of the eight factors. Based on these criteria, 40 items out of the original 102 were retained.

Factor 1 was labeled the emotional competence factor and was composed of five factors. These items reflected the ability to recognize and manage one's own and other's emotional

reactions. The highest loading items were "Responds well to emotions of others" and "Able to recognize his/her own emotional reaction to people, events, and situations."

Factor 2 was termed Manages a Culture of Safety and it also was composed of five items relating to one's ability to create a culture of safety. This factor reflected the leader's ability to promote and establish a value of safety first. The highest loading items were "Provides necessary training or tools to safely perform the job" and "Is a model for the use of safe work practices."

Factor 3 was labeled Motivation. These items reflected initiative, drive, and hunger on the job. Further, these items reflected a sense of knowing what the customer wants and staying motivated to fulfill those needs. The highest loading items were "Anticipates what needs to be done and does it" and "Always keeps the customer in mind."

Factor 4 was labeled Innovative leadership. This measure reflects the ability of the leader to develop and implement long-range strategic plans. The highest loading items were "Comes up with new ideas and solutions to recurring problems" and "Encourages innovation and risk taking."

Factor 5 was labeled the Communication factor. Similar to all of the other factors, it is made up of five items. These items tended to reflect the ability to relay a message in a concise and clear manner. The highest loading items were "Is clear when delegating responsibilities" and "Is able to communicate a clear vision for the team."

Factor 6 was termed Credibility and Integrity. These items reflected two aspects of successful leadership in transportation; being seen as credible in that one knows technical skills and information and two, they demonstrate high ethnical and moral standards in the face of conflict. The highest loading items in this measure were "Is able to use softward and other technologies effectively" and "Demonstrates high personal standards."

Factor 7 was labeled the Decision-making factor. As the title indicates, this factor related to the decision-making process, especially the ability to manage multiple points of view and information from multiple sources to arrive at a sound decision. The highest loading items were "Demonstrates an ability to manage multiple systems to achieve a coordinated result" and "Acts as a catalyst to a committee's decision-making process."

Finally, Factor 8 was labeled the Conflict Resolution factor. This measure seemed to tap into the ability to come up with and implement effective problem-solving strategies. For instance, the highest loading items were "Listens to peers and subordinates ideas in order to improve overall processes" and "Knows when to become involved in a conflict and when not to."

Reliability and Correlations among the Subscales

The results indicated adequate levels of reliability for all eight subscales: Emotional Competence had a coefficient alpha of .86, Manages a Culture of Safety had a coefficient alpha of .91, the Motivation factor had a coefficient alpha of .88, the Innovative subscale had a coefficient alpha of .89, the Communication factor had a coefficient alpha of .91, the Credibility and Integrity subscale coefficient alpha was .90, the Decision-Making subscale produced a coefficient alpha of .88, and the Conflict Resolution subscale produced a coefficient alpha of .91. The correlations among the subscales were relatively high, as demonstrated in Table 2. Correlations of this magnitude give concern for the independence of each factor. This was assessed again in the second phase of the study. The correlations between the performance measure and the subscale were also strong, indicating concurrent validity.

Table 2
Correlations Among the Leadership Subscales and Performance

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Variable	1	2	3	4	5	6	7	8	9
1. Emotional Competence	1.00								
2. Safety Culture	.63*	1.00							
3. Motivation	.70*	.72*	1.00						
4. Innovation	.64*	.66*	.75*	1.00					
5. Communication	.73*	.74*	.76*.	.78*	1.00				
6. Crebidility/Integrity	.68*	.70*	.79*	.76*	.73*	1.00			
7. Conflict Resolution	.72*	.70*	.73*	.79*	.78*	.73*	1.00		
8. Decision-Making	.65*	.74*	.71*	.80*	.76*	.71*	.74*	1.00	
9. Performance	.65*	.71*	.73*	.80*	.82*	.76*	.77*	.81*	1.00
Mean	21.51	22.62	23.88	22.38	22.14	24.24	22.72	22.58	23.14
Standard Deviation	3.5	3.84	3.70	3.91	3.72	3.87	3.97	3.64	4.20

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* $p < .05$

DISCUSSION

Leadership plays an integral role in organizational outcomes. Thus, the means by which we select, promote, and reward leaders is a critical aspect of achieving operational excellence. Leadership competency assessment tools and accompanying competency models have grown from a new concept to common practice over the last three decades (*11*). Since first introduced by David McClelland (*9*) as key differentiating factors of successful leadership, competencies have been established by several industries. Despite widespread practical growth and use among various industries, the academic literature has lagged behind. Further, certain key industries, such as transportation, remain without a tailored leadership competency instrument. The purpose of this project was to begin the development and initial validation of a leadership competency measure that could be used in the recruitment, retention, and rewarding practices of transportation agencies.

Structure of Leadership in Transportation

Extensive review of the reigning models of business management and leadership in various academic databases revealed several core competencies thought to cut across industry lines as key differentiating factors of peak performance. The most heavily cited and well established structures of leadership include various competencies organized in a myriad of ways. However, agreement amongst scholars on a single core group of competencies has been difficult to achieve for the over 100 years of research on the topic. Thus, recent research has suggested the need to explore industry-specific models of leadership. The current investigation was charged by this exact premise.

An eight factor model solution was found based on three criteria; the scree plot, intrepretibility of the solutions, and unidimensionality of the measure. The rotated solution yielded eight interpretable factors; the emotional competence factor, manages a culture of safety factor, motivation factor, innovative factor, communication factor, credibility and integrity factor, decision-making factor, and conflict resolution factor. After setting criteria to retain items, the original 102 items were cut back to a total of 40 items that are organized across eight unique competencies.

Based on an extensive literature review, cognitive interviews, and three focus groups held at a DOT focusing on the essential differentiating factors of successful transportation leadership, creating a culture of best safety practices and having emotional awareness were two frequently identified competency areas. Thus, the current version of the LSFI:TV focuses heavily on these two aspects of transportation leadership. These two areas or subscales were found to have the highest item loadings, and the items loaded less on other factors than other items did. Factor 1 was labeled the emotional competence factor and was made up of items such as, "Responds well to emotions of others" and "Able to recognize his/her own emotional reaction to people, events, and situations." The second factor, termed Manages a Culture of Safety, reflected the leader's ability to promote and establish a value of safety first. It is clear from this investigation that more work is needed on the study of the essential factors underlying competent leadership in transportation. The researchers hope to continue to validate this measure and assess the 8-factor solution in future research studies with transportation manager.

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