

## Employer Assessment of Work-Related Competencies and Workplace Adaptation

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*This exploratory study identified 17 work-related competencies that might relate to superior job performance and examined their relationship to the successful workplace adaptation of recent co-op engineering graduates. Traditional mail and web-based surveys were employed. The research questions were examined through correlations, t tests, ANOVAs, and multiple regressions. Work-related competency scores were similar among the graduates who co-oped and those who did not. The results suggested a relationship between the competencies tested and workplace adaptation.*

**Keywords:** Workplace Competencies, Workplace Adaptation, Cooperative Education

Workplace changes have increased the need for an effective and integrated education whereby students develop the requisite skills and attitude for work, an appreciation of the holistic environment of the practice of engineering, and an understanding of the need for continuous learning (Spitzer, 2002). Business leaders and educational accrediting agencies, particularly those in engineering, are now calling for the incorporation of experiential learning opportunities in the curriculum. As a result, there is a need for researchers to investigate different experiential learning models as to their effectiveness in producing graduates with the right competencies and organizational socialization skills to adapt quickly.

Cooperative education, one of America's oldest experiential learning pedagogies, is a partnership between students, educational institutions and employers. Cooperative education began in engineering as a way to better prepare engineering graduates for the world of work and will celebrate its 100<sup>th</sup> year in operation in 2006. Cooperative education, or co-op as it is commonly called, is "an academic program integrating classroom learning and productive work experiences in a field related to a student's academic and career goals. Co-op provides students with progressive learning experiences integrating theory and practice" (National Commission for Cooperative Education, 2003, p. 7). Today, co-op programs have been established in almost every state of the union and in many other countries (Sovilla, 1998) such as Canada, Australia, and England. The co-op model provides students with the opportunity to gain relevant experience working in an area related to their field of study alternating with periods (semesters or quarters) of academic coursework. Because cooperative education is an integrated program of theory and practice, it can potentially provide students with the requisite competencies and workplace adaptation skills needed in the workplace. Competencies are underlying characteristics of traits, attributes, skills and knowledge necessary for proficient or superior job performance. "Competency-based selection predicts superior job performance and retention--both with significant economic value to organizations---without race, age, gender, or demographic bias" (Spencer & Spencer, 1993, p. 8).

Organizational socialization or workplace adaptation is an important part of the assimilation process for newcomers. It is the process by which a person learns the values, norms, and required behaviors. As a result, they are more likely to adapt and function better in their environment (Morton, 1993; Walberg, 1976). Gardner and Kozlowski (1993) defined organizational socialization as understanding what is expected in terms of job assignments (e.g. learning the ropes) and finding one's role within the organization (e.g. fitting in). Therefore, adaptation skills of "learning the ropes" and "fitting in" is important to recent graduates because it influences how they feel about the job and the organization (Gardner & Kozlowski) and how they perform.

### Research Problem

The increased demand for employees to embrace change and the changing nature of work has created an interest in and need for empirical research in understanding the competencies that employees in the future will need to help organizations be competitive in the marketplace. Recruiting and selection researchers (Barber, 1998) and popular business and management authors and researchers (Bennis, 2001; Boyett &

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Conn, 1991) continually emphasize the need for organizations to hire, select and retain knowledge workers. Knowledge work or intellectual capital is the “possession of the knowledge, applied experience, organizational technology, customer relationships and professional skills that provide a competitive edge in the market” (Edvinsson & Malone, 1997, p. 44).

Cooperative education is assumed to have inherent benefits to both students and employers. Yet, most of the studies that document cooperative education benefits have focused on topics related to students or the educational institutions and not on topics of interest to employers (Braunstein, 1999; Hurd & Hendy, 1997). Little research has focused on competencies and workplace characteristics that relate to successful workplace adaptation in the 21<sup>st</sup> Century. At the same time, there is a groundswell of demand from business, industry and government to prepare graduates for the new workplace that consistently requires a diversity of ideas and people (Spitzer, 2002). As a result, the Accreditation Board for Engineering and Technology (ABET), the accrediting agency for engineering programs in the United States, is emphasizing the need for workplace competency development as part of the engineering curriculum and student educational experience (American Society for Engineering Education, 1994).

There has been limited research in documenting the success of cooperative education to provide the prerequisite competencies needed of practicing engineers today and few studies that provide evidence of cooperative education’s ability to assist in the socialization of graduates. This study will examine the ability of cooperative education to provide the workplace adaptation skills preferred by today’s employers.

### **Purpose and Research Questions**

The primary objective of this study is to examine current work-related competencies that employers expect of recent engineering graduates and how they relate to workplace adaptation. This study also looks at the ability of cooperative education to provide engineering students with the crucial competencies required of effective job performance. Specifically this study addresses the following research questions:

1. What are the similarities between the work-related competencies of recent engineering graduates who participated in cooperative education and those who did not?
2. What are the differences between the work-related competencies of recent engineering graduates who participated in cooperative education and those who did not?
3. How are these work-related competencies related to workplace adaptation of recent engineering graduates who did and did not participate in cooperative education?

### **Method**

#### *Participants*

The sample for this study was 203 employers who hire engineers and engineering co-ops. They included for-profit organizations and governmental agencies. There were 21 employers in the sample who responded but were not eligible because they had not hired recent engineering graduates during the last two years. The final sample (*N*) used in calculating the response rate was 182 employers. Of this number, 83 employers completed the survey for a response rate of 45.6 percent. Participants who filled out the survey and thus evaluated an employee were organizational representatives that include engineering managers, supervisors and human resource professionals who have access to the performance information of engineering graduates at the employee’s workplace.

#### *Research Measures*

The Work-Related Competency Index (WCI) was chosen to test the independent variable of work-related competencies. The WCI is comprehensive and demonstrates sound psychometric properties. Her instrument consisted of 15 competencies (questions) developed from the literature. Two additional items, innovativeness (Question 8) and openness to change (Question 15) were added to this instrument from the literature for a total of 17 items. The Cronbach’s alpha for this scale was .93.

The Workplace Adaptation Questionnaire (WAQ), developed by Morton (1993) and modified by Reio (1997), was chosen as the adaptation measure to test the dependent adaptation variables (job knowledge, acculturation and establishing relationships) for this study. The three subscales of the instrument are Job Knowledge (JK), Acculturation to the Organization (AC) and Establishing Relationships (ER). JK consists of eight questions (e.g. “Knows how to prioritize assignments.”), and refers to the extent the respondent

reports mastering the tasks of his or her job. AC contains five questions (e.g. “Knows the informal rules, policies, and procedures of the organization.”) that measure the degree to which employees learn the norms, values and culture of the organization. ER is a six-item subscale (e.g. “Knows which co-workers are likely to be able to answer their questions correctly.”) that assesses the employee’s capability to identify co-workers who could provide relevant information and who know how to get things done in an organization (Reio & Wiswell, 2000). The subscale, Establishing Relationships, was modified based on the literature to add one additional item (“Knows which co-workers are interested in mentoring them.”). A 5-point Likert Scale of 1 = strongly agree, 2 = agree, 3 = neither agree nor disagree, 4 = disagree, and 5 = strongly disagree was used to measure the responses. The Cronbach’s alpha for each subscale was .94, .88, and .91, respectively, and .96 for the entire instrument. There was also a seven question demographic survey.

### *Procedure*

Both a mailed and web survey were used to collect data. Dillman’s (2000) modified Tailored Design Method (TDM) survey methodology was used for this study because it has been shown to increase both the response rate while minimizing sampling error (inclusive representation of the population), coverage error (access to the survey by all elements of a population), measurement error (questionnaire wording and construction), and nonresponse error (number and characteristics of respondents completing the questionnaire).

The web-based survey was hosted on a secure university server, and in addition, a userid and password was developed to further ensure that only the respondents chosen for this study would have access to the survey. Employers were provided this information in the cover letter and via e-mail. The mailed surveys were coded to assure confidentiality and to provide a tracking system that would assist in the efforts to increase the number of respondents. Before the first mailing, many of the respondents were alerted that they were being invited to participate in this research through e-mail, phone, and personal contact. In addition, a TDM constructed personalized cover letter providing information and instructions on returning the survey was included with the mailed survey along with an enclosed self-addressed return envelope. The cover letter highlighted the availability of completing the survey via the web. Follow-up procedures included three mailed, e-mail, face-to-face, and telephone reminders two to three weeks after each deadline.

The first mailing resulted in 48.2 percent ( $n = 40$ ) of the returns. The second initiative resulted in 32.5 percent ( $n = 27$ ) of the returns, and the third initiative resulted in 19.3 percent ( $n = 16$ ) of the returns. The mailed return proportion of responses was 39.8 percent ( $n = 33$ ), and the proportion of web responses was 60.2 percent ( $n = 50$ ).

## **Results**

### *Demographics*

The demographic survey contained seven questions that focused on the different demographics of employers and recent engineering graduates that were being evaluated. Question one asked for the employer product classification from a modified 12-item Standard Industrial Classification ranking. There were no responses for classification one (agriculture), two (mining) or eight (trade). Classification twelve (other) allowed respondents to list their product classification if one of those listed did not fit. See Tables 2 and 3 for a breakout of the classification category responses and a descriptive list of category twelve, respectively.

Demographic question two described the size of the organization’s total workforce at the respondent’s specific work site. A total of 25.3 percent ( $n = 21$ ) of the participants stated that they were small size employers whose workforce was 50 or fewer employees, while 36.1 percent ( $n = 30$ ) indicated that they were medium size employers with a workforce between 51-499 employees. The remaining 38.6 percent ( $n = 32$ ) replied that they were large organizations with more than 500 employees. Thus, there was representation from each respective size category.

Questions three through five related to gender, ethnic background, and cooperative education experience, respectively. The results showed that 65.1 percent ( $n = 54$ ) of the graduates being evaluated were male and 28 percent ( $n = 23$ ) were female. The percentage of females reported in the study is similar to the 20.9 per cent of Bachelor of Engineering degrees awarded to women in 2001-2002 in the United States (Gibbons, 2003). There were 6 missing values (7.2 percent).

For question four, 12.1 percent ( $n = 10$ ) of the employees evaluated were minority, and 79.5 percent ( $n = 66$ ) were non-minority. There were 7 missing values (8.4 percent). The percentage of minorities in the

study was below the 32 percent minority students earning engineering degrees in 2001-2002 (Gibbons, 2003). Table 4 lists the number of males and females in each ethnic classification.

For question five, 74.7 percent ( $n = 62$ ) of the recent engineering graduates had co-oped and 25.3 percent ( $n = 21$ ) had not participated in a cooperative education program before graduation. Question six pertained to the amount of time the graduate had worked since graduation. Twenty-eight percent ( $n = 23$ ) had less than three months work experience, 36.1 percent ( $n = 30$ ) had four to six months experience, 7.2 percent ( $n = 6$ ) had 7 months to one year experience, and 28.9 percent ( $n = 24$ ) had between one to two years work experience since graduation.

The final demographic question asked for the respondent's job title. The survey was sent to both engineering managers and human resources personnel with a request to forward the survey to the person who had access to performance data of their recent engineering hires. A majority, 65.1 percent ( $n = 54$ ), indicated they were an employee's engineering manager or supervisor, 21.7 percent ( $n = 18$ ) were human resources personnel, and 13.3 percent ( $n = 11$ ) specified category three, "other." These category three respondents were asked to classify their title.

Demographic variables were compared between participants who took the survey by web versus those who took the survey by paper. There were no statistically significant differences on the research variables ( $t$  tests). Further analyses were performed to determine whether there were systematic differences between the number of mailings and the demographic variables. None of the analysis of variance analyses revealed a statistically significant difference between the respective demographic variables by mailing ( $F_s < 1.8$ ,  $df = 2$ ,  $ps > .05$ ).

#### *Analysis of Similarities between Work-Related Competencies*

Research question one asked: What are the similarities between the work-related competencies of recent engineering graduates who participated in cooperative education and those who did not? The analysis consisted of two steps. First, correlations were calculated to determine the strength, direction, and patterns of relationships between co-ops and non co-ops on the research variables, and the relationships were similar. For example, although not identical, the relationships between the Job Knowledge, Acculturation, and Establishing Relationships variables and each of the 17 competencies were strong, positive and statistically significant ( $ps < .05$ ) for both co-ops and non co-ops, respectively. Only critical thinking and resource utilization did not reach statistical significance with the non co-ops ( $ps = .051$  and  $.058$ , respectively).

Second, an Independent Samples  $t$  test was utilized to test the significance of the difference between the two groups (see Table 1). When conducting the  $t$  tests, the 17 competency scores derived from the WCI were similar except for two competencies, i.e., communication and resource utilization, among co-ops and non co-ops. There was not a statistically significant difference between co-ops and non co-ops on 15 of the 17 WCI variables ( $ts < 1.55$ ,  $df = 81$ ,  $ps > .05$ ). As for the 11 ABET competencies, which are included in the 17 WCI competencies, there were no statistically significant differences between co-ops and non co-ops, except for the communication variable. Overall, co-ops and non co-ops were similar on 15 of the 17 competencies measured in this study.

#### *Analysis of Differences between Work-Related Competencies*

An Independent Samples  $t$  test was used to determine if there were group mean differences for the purpose of answering research question two: What are the differences between the work-related competencies of recent engineering graduates who participated in cooperative education and those who did not? Two competencies were statistically different. Graduates who had cooperative education experience were perceived to be more proficient in communication ( $t = 2.42$ ,  $df = 81$ ,  $p < .02$ ) and resource utilization ( $t = 2.08$ ,  $df = 81$ ,  $p < .05$ ). Overall, the results suggest that there is a perceived difference in the communication and resource utilization competencies between co-ops and non co-ops, i.e., co-ops are perceived to have higher competencies in these two important areas.

Finally, ANOVA analyses indicated that there were no statistically significant gender or ethnic differences (or for their interactions) in the 17 work-related competencies measured in this research study.

#### *The Relationship between Work-Related Competencies and Workplace Adaptation*

Research question three states: How are these work-related competencies related to workplace adaptation of engineering graduates who did and did not participate in cooperative education? In other words, do the competencies that were identified as important from the research literature in hiring high performance employees predict workplace adaptation?

This exploratory study examined the relationship of work-related competencies and workplace adaptation. First, a Principal Component analysis was used in an attempt to classify the WCI competencies

into meaningful categories and reveal the possible underlying pattern that influenced respondent perceptions (Tabachnick & Fidell, 2001). The 17 competencies were subjected to a principal components analysis. The results indicated that there was but one component. Hence, with the evidence that there were no underlying patterns to the WCI, the entire 17-item WCI was used to predict the dependent variable.

Regression analyses were conducted then to test the extent of the relationship between the independent variable of work-related competency and the dependent variable of workplace adaptation. First, the overall model was examined. This model explained 80.0 percent of the variance (Adjusted  $r^2$ ) in workplace adaptation. Thus, the evidence suggests that there is a robust relationship between the stated 17 competencies and workplace adaptation as measured by the WAQ.

Second, the overall model was examined with the 11 ABET competencies. The ABET model explained 78.7 percent of the variance (Adjusted  $r^2$ ) in workplace adaptation. As expected, the results indicate that the ABET competencies are roughly equivalent to the enhanced WCI competency model. Based on the strength and direction of the correlations between the six additional competencies identified in the study and the regression analysis, the data firmly supports the inclusion of the additional competencies into engineering curricula (see Appendix O; Multiple R =.91).

The next step in the regression analyses investigated the model by the co-op and non co-op variables. For the non co-op model, the seventeen-item Work-Related Competency Index (WCI) explained 77.2 percent of the variance in the dependent variable, workplace adaptation. Similarly, in the co-op model, the WCI explained 80.4 percent of the variance.

Subsequent analyses for the ABET model indicated similar relationships between the independent and dependent variables. The ABET competencies explained 80.3 percent of the variance in workplace adaptation for the non co-ops and 77.2 percent for co-ops, respectively.

These results provide evidence that the WCI and the ABET models are strong predictors of workplace adaptation. These findings support development of relevant work-related competencies to improve the likelihood of successful workplace adaptation of future engineering graduates.

## Discussion

This research adds to the body of knowledge and theories of organizational socialization, cooperative education and competency research in several ways. Both competency and adaptation research are growing appreciably, yet no studies were found that linked the two to test whether work-related competencies are predictive of workplace adaptation. This study identified the work-related competencies that the literature affirmed to be predictive of higher performance employees and developed a survey test battery to test whether these competencies were predictive of workplace adaptation among recent engineering graduates who had up to two years experience. The findings provide preliminary evidence that competencies are strong predictors of workplace adaptation, and the Work-Related Competency Index (WCI) and Workplace Adaptation Questionnaire (WAQ) used in this study are reliable instruments that can be used for future adaptation research.

The seventeen-item WCI also included the 11 Accreditation Board for Engineering and Technology (ABET) competencies. The reliability of the WCI and the ABET competencies were similar which is an indication that both the WCI and ABET competency models are reliable instruments for measuring competencies of engineering graduates. Regression analysis explained 80 percent of the variance (Adjusted  $r^2$ ) in the overall WAQ (workplace adaptation measure), which indicates that there is a strong relationship between work-related competencies and workplace adaptation.

The study also included engineering graduates who had participated in cooperative education, as well as those graduates who had not participated in cooperative education to determine if employers perceived co-ops to be superior to non co-ops on any of the 17 work-related competencies identified in the literature. While the results were not statistically significant, the mean scores on 15 of the 17 competencies were lower for co-ops than non co-ops, tentatively suggesting that graduates who have cooperative education experience might have a higher level of perceived competency by their employers.

One of the major contributions of this study is that it is one of the few employer-based studies utilizing surveys or questionnaire measures that were completed by the employee's supervisors, engineering managers or HR managers (i.e., those who could objectively evaluate employee performance), and not simply an employee self-report.

The solid response rate (45.6 per cent) of this study suggests that competency and adaptation research is relevant and of interest to employers today (Dillman, 2000). The findings indicate that with careful

adherence to appropriate survey methodology and researcher persistence, more employers may take the time to participate in research that is applicable to understanding how they can improve the recruiting, selection and retention of employees.

There were several interesting demographic findings. There was no gender or ethnic differences found between co-ops and non co-ops. The 13.2 percent of minorities reported in the study was below the 32 percent minority students earning bachelor of engineering degrees in 2001-2002 (Gibbons, 2003). It should be noted that the bachelor's degree figure includes foreign national students who may not typically be in the full-time American workforce, nor does it account for the increasing number of students who go on to graduate school because of the competitive job market and other reasons (Gibbons).

Of the recent engineering graduates evaluated, 74.7 percent had cooperative education experience and 25.3 percent had none. In the last few years, more and more companies are limiting or eliminating their college recruiting programs (National Association of Colleges and Employers, 2001), and many employers are currently hiring only from their co-op ranks. This study supports that assessment.

The National Association of Colleges and Employers (NACE) 2004 Experiential Education Survey reported that 89 percent of the employers participating in the survey ( $N = 212$ ) had internship and co-op programs in place. Sixty percent of the co-ops received offers for full-time employment and 82 percent accepted those offers (National Association of Colleges and Employers, 2004). These figures suggest that experiential work experience might add to the employability of graduates. The NACE research also reported a higher retention rate among students who have work experience compared to their peers without such experience. Investigating how and why cooperative education might increase adaptation and thereby increase retention would be a logical next step in cooperative educational research.

Although the results of this study did not find a statistically significant difference in the competency totals overall between co-ops and non-cops, the trend in the data (see Table 6 in Chapter 4) supports the notion that employers believe co-ops to be superior to non co-ops on a majority of competencies (Braunstein, 2001). This study also supports Gardner and Kozlowski's (1993) research that co-ops appear to practice different and more efficient learning strategies during their early socialization. There were statistically significant differences between co-ops and non co-ops on the WCI in communication ( $t = 2.42$ ,  $df = 81$ ,  $p < .02$ ) and resource utilization ( $t = 2.08$   $df = 81$ ,  $p < .04$ ). The resource utilization competency includes understanding the fundamentals of business applications, and project management as well as how to identify, organize, plan and locate resources. The overall competency totals also suggest that engineering programs are graduating entry-level engineers, both co-ops and non co-ops, with the competencies perceived to be needed of high performance employees.

Current organizational socialization research indicates that newcomers who are able to adapt, learn the ropes, fit in, and understand what is expected of them early on view the organization more positively and functions more effectively in the workplace (Gardner & Kozlowski, 1993; Lee, 1994; Morton, 1993; Reio & Wiswell, 2000). Organizational socialization assists new employees in successful workplace adaptation by becoming proficient in the performance of job tasks, developing good interpersonal relationships and skills, and acquiring an understanding of the culture and norms of an organization (Reio & Wiswell). Research also indicates that failure to adapt leads to greater turnover, which is expensive for organizations (Morton). Fogarty (2000) asserts that a purpose of socialization is to produce role specific competence. Yet, a review of the literature did not find a research instrument that measured whether work-related competencies predict workplace adaptation. Question three of this study explored how the independent variable of work-related competencies related to the dependent variable of workplace adaptation. The question was intended to establish whether the competencies identified as projecting high performance predicted workplace adaptation of recent engineering graduates.

Regression analysis was conducted to test the extent of the relationship between the variables. The overall model (WCI) was examined, and the model explained 80 percent of the variance (Adjusted  $r^2$ ) in workplace adaptation, suggesting that there is a robust relationship between the competencies and adaptation. Regression analyses were conducted for both the co-op and non co-op variables, and similar results were reported. The percent of variance in adaptation explained by the WCI was 80.4 percent and 77.2 percent for the co-op and non co-op groups, respectively. In addition, analyses were performed for the ABET competencies, and the percent of explained variance in co-op workplace adaptation was 77.2, and for non co-ops 80.3. Again, similar results were achieved. The results provide evidence that both the WCI and ABET competencies were strong predictors of workplace adaptation.

In 1993, Gardner and Kozlowski examined organizational socialization and assimilation of recent engineering and business co-op and non co-op graduates upon entry and then at six months. The results

showed that co-ops adapted more effectively than non co-ops. The current study did not test whether co-ops adapt faster and more effectively; however, the results suggest that organizations hire graduates, both co-ops and non co-ops, with the requisite competencies to allow them to adapt quickly and effectively.

The Gardner and Kozlowski (1993) and the Ashforth and Saks (1996) studies also found evidence that organizational socialization and adaptation diminish over time. Incorporating a time variable in future cooperative education, competency, and adaptation research would be a useful extension of the current research. This new information might assist organizations in developing orientation and training programs that achieve maximum results.

#### *Recommendations for Future Research*

The findings of this study support the relevance of work-related competencies in predicting workplace adaptation and provide an agenda for further research using a wider range of cooperative education students and employing new measures of workplace outcomes.

There is a lack of a clear and consistent conceptualization of cooperative education and a shortage of theory-building research that proposes constructive operational models and frameworks (Ricks, Cutt, Branton, Loken, & Van Gyn, 1993). Expanded research that demonstrates the ability of cooperative education to provide students with the competencies required of high performance knowledge workers might assist researchers in developing and testing new theories. Such a research focus may also help practitioners in marketing co-ops to prospective employers, provide employers with greater confidence in utilizing cooperative education programs as a recruiting tool for graduate recruitment, and add to the research on the benefits of cooperative education.

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