Research Report

Science and Technology Stakeholders' Ranking of Graduate Competencies Part 2: Students Perspective[†]

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Students from the University of Waikato's cooperative education program completed a questionnaire (n=71) in which they rated the relative importance of a list of 24 workplace competencies (using a 7-point Likert scale) for graduates entering the workforce now, and those who will do so in 10 years time. The top five ranked competencies in order were; *ability and willingness to learn*, *initiative*, *achievement orientation*, *personal planning and organizational skills*, and *analytical thinking*. Comparison with business sector students showed some differences in what students thought were the most important competencies, with business students ranking *computer literacy*, *teamwork and cooperation* and *self-confidence* more highly than their science and technology counterparts. The science and technology students saw *computer literacy* as the competency most likely to increase in importance in the future. The results of the present work show that science and technology students believed all competencies were important and that both 'hard' skills and 'soft' skills are important, suggesting that they perceive a need to be multi-skilled before entering the workforce. However, comparison of these data with that of science and technology employers, suggests that the employers see hard skills as well as *teamwork and cooperation* as more important (ranked second most important). (*Asia-Pacific Journal of Cooperative Education, 2002, 3(2), 35-44*).

This paper reports on research into science and technology students' perceptions of specific workplace competencies. The basis to this study is, that in the view of the authors, cooperative education programs worldwide seek to prepare students for the workplace by developing generic and specific competencies that they believe will be useful to employers. This raises the question as to what tertiary institutions perceive to be their educational function; to produce graduates solely with technical competence germane to their discipline, or other skills like the so-called soft skills? It is, however, unlikely that tertiary institutions will be able to instill particular competencies into students, if the students fail to see the importance of, for example, communication skills. Research in education and science education has shown that teaching students is greatly influenced by students' prior conceptions (see, e.g., Guba & Lincoln, 1989, 1994; Pfundt & Duit, 1997). Hence, here we sought to investigate students' perceptions of workplace competencies; these competencies were issues found to be of particular importance to employers across a number of different sectors (see, e.g., Coll, Zegwaard, & Hodges, 2002a,b; Burchell, Hodges, & Rainsbury, 2002).

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Competency and Capability

It appears that there is some interchange and contrasting views of terms such as competency and capability in the literature. Here we describe literature meanings of these two terms and seek to develop an understanding of the term competency since this concept underpins the research reported in this study.

Competency may be defined as the underlying personal characteristics of an individual that facilitate superior performance in a given situation (Boyatzis, 1982; Spencer & Spencer, 1993). Competency may be viewed in terms of inputs and outputs: an input measure being any aspect of the inner person, normally displayed as behaviors, which allows them to perform competently, resulting in an output or outcome measure (Boam & Sparrow, 1992). Competency also is related to the manner in which individual attributes – such as knowledge, skills and attitudes, are drawn on in performing tasks in specific work contexts and which results in overall job performance. However, according to Birkett (1993, p. 4), "neither contextual task performance or individual attributes constitute competence; it is the relation between the two that does."

Confusion amongst terminology is evident by looking at examples of definitions in the literature. For example, Stephenson (1997) sees capability as the integration of knowledge, skills, personal qualities and the ability to learn, to deal effectively with unfamiliar and familiar situations or tasks. This view of capability is very similar to what Birkett (1993) terms competency. Stephenson states (pp. 9-10): "Competence delivers the present based on the past, while capability imagines the future and helps to bring it about...competence is about dealing with familiar problems in familiar situations." Rudman (199), in contrast, views capability as a precursor to competency, where an individual has the capability to perform a specific task because they have the necessary knowledge and skills, but they do not become fully competent in the task until they have had some experience. However, capability is generally seen as a more a holistic concept than competency; the former being an integration of knowledge, skills and personal qualities used effectively and appropriately in unfamiliar as well as familiar situations (Birkett, 1993).

Skill Development

A competent individual is one who has skills and attributes relevant to tasks undertaken, or more generic in nature. Individual attributes which are drawn on to perform tasks competently, consist of cognitive skills and behavioral skills. Cognitive skills are skills such as technical knowledge, skills and abilities, which are a function of the job requirements, whereas behavioral skills, are built up from personal characteristics such as principles, attitudes, values and motives, which are a function of an individual's personality (Birkett, 1993). Birkett developed a taxonomy of cognitive skills and behavioral skills in which he considered cognitive skills to comprise technical skills, analytical skills and appreciative skills. Technical skills represent the ability to apply technical knowledge with some expertise. Analytical and constructive skills are concerned with problem identification and the development of solutions. Appreciative skills refer to the ability to evaluate complicated situations and make creative and complex judgments. Similarly, behavioral skills comprise personal skills – how one responds and handles various situations; interpersonal skills – securing outcomes through interpersonal relationships; and organizational skills – securing outcomes through organizational networks. For both cognitive and behavioral skills, the skills may be ordered according to increasing complexity, and considered to be cumulative in that the skills build upon each other. For example, if an individual applies technical skills well, the next level would be to develop analytical and problem-solving skills. The development of skills typically occurs over a period of time, with appreciative and organizational skills required at the advanced stage of a professional career. Any successful performance, while dependent on a number of skills, will likely require both cognitive and behavioral skills (Birkett, 1993).

Hard and Soft Skills

Skills such as those described above are also referred to as 'soft' and 'hard' skills. There is evidence in literature to suggest that soft skills as well as hard skills are critical for successful performance (Ashton, 1994; Caudron, 1999; Georges, 1996; Strebler, 1997). The literature also suggests that there is a lack of emphasis placed on the development of soft skills in many educational organizations. Hard skills (i.e., cognitive skills to use Birkett's 1993 terminology) are those associated with technical aspects of performing a job and usually include the acquisition of knowledge (Page, Wilson & Kolb, 1993) and according to some authors are influenced by the individual's *Intelligence Quotient* (IQ). Spencer and Spencer (1993) describe technical skills and knowledge as containing a threshold in that they represent a minimum level necessary to be able to perform a job with basic competence. Soft skills (i.e., behavioral skills according to Birkett's terminology) also referred to as interpersonal, human, and people skills; place emphasis on personal behavior and managing relationships between people. They are primarily affective or behavioral in nature and have recently been associated with the *Emotional Quotient* (EQ) popularized by Daniel Goleman (see, Caudron, 1999; McMurchie, 1998). EQ is regarded to comprise a blend of innate characteristics and human, personal and interpersonal skills (Kemper, 1999).

Many authors see hard and soft skills as complementary with successful individual performance requiring both types of skills and superior performers having high EQ ratings (e.g., Kemper, 1999; McMurchie, 1998). Research by Spencer and Spencer (1993) suggests that superior performers are not distinguished solely on the basis of technical skills, but also by the demonstration of certain motives, values, traits and attitudes.

Development of Hard and Soft Skills

Some authors believe that employers neglect the development of soft skills because of the difficulty in their measurement, or difficulty in demonstrating a link between them and desired work outcomes (Arnold & Davey, 1994; Georges, 1996). Furthermore, soft skills are seen by some to be more difficult to develop than hard or technical skills (Caudron, 1999). Bandura (1986) believes that career development "requires more than the specialized knowledge and the technical skills of one's trade" (p. 433). According to Bandura, success in the workplace depends on the self-efficacy (i.e., an individuals' perception of their ability to achieve a specific task or tasks) of the individual in dealing with the social realities of work situations. In other words, how well an individual is able to complete a task in the workplace is dependent on their actual ability (i.e., their competence) and their perceived ability (i.e, their self-efficacy) towards competing that task. Fletcher (1990, 1991) claims this could occur via a process of enactive mastery in which the student's increase in confidence as they gain practical competence, and Coll, Lay and Zegwaard (in press) have shown that cooperative education can serve to enhance students' self-efficacy towards practical science skills. Hackett, Betz & Doty (1985) identified a number of skills that subserve the broader function of soft skills. These include the ability to communicate well, to relate effectively to others, to plan and manage the demands of one's job, to exercise leadership, and to cope with stress effectively.

Methodology

Theoretical Background

We decided to focus on competency rather than capability in this study as we believe that the concept of competency is consistent with the aims of our cooperative education programs. In our view cooperative education seeks to develop individuals with specific competencies and skills as detailed above. According to Spencer and Spencer (1993) a number of generic competency categories account for 80% to 95% of the distinguishing features of superior performers in technical and managerial positions (Appendix A). These are the competencies investigated here and they were classified into hard and soft skills utilizing Birkett's (1993) taxonomy with cognitive skills being equated to hard skills, and behavioral skills to soft skills.

Research Objectives

The aim for this study was to identify science and technology co-op students' views of the importance of various graduate competencies. We chose co-op students who had completed one three-month industry placement (see below) to see if these work placements had exerted any influence on their views. In addition we wished to compare these students' views with employers (see, Coll et al., 2002a,b) and those of studies of business students, graduates and employers (Burchell et al., 1999; Rainsbury, Hodges, Burchell, & Lay, 2002). Likewise, we sought to ascertain the students' views of any changes they saw for

the importance of these competencies for new graduates in the future – in case the participants felt some competencies might assume greater importance due to, for example, advances in information and communication technologies.

The students were asked to rate the importance of 24 competencies in Appendix A, namely those identified by Spencer and Spencer (1993) and four additional competencies that the authors deemed to be significant. The four additions were; *ability and willingness to learn*; *written communication*; *personal planning and organizational skills*; and *computer literacy* (Meade & Andrews, 1994; Sweeney & Twomey, 1997). These competencies formed the basis of a survey instrument that has been used in a similar study for business students, graduates and employers (Rainsbury et al., 2002). The competencies were listed in random order on the instrument and the students were asked to rate the importance of each competency for new graduates, now and for new graduates entering the workforce in 10 years time. The ratings were based on responses to a seven-point Likert scale, where 1 indicated the competency was not important, and 7 indicated the competency was important. Participants were able to provide comments on the survey form, and to add other competencies they deemed important. The survey form contained definitions for each of the 24 competencies listed. The full instrument used in the study is provided in Appendix B.

It is worthwhile to note that oral communication was omitted from the instrument. Oral communication was not included as a separate competency because the authors regarded it as a key component within a number of other competencies, for example, teamwork and cooperation, relationship building, customer service orientation, interpersonal understanding, and developing others. The authors felt that this competency should not be isolated from the context in which it would be used. Rainsbury et al. (2002) likewise omitted oral communication from their instrument and as we wished to compare our findings directly with their study, we chose to omit this item also.

Context

The context for this study is a group of cooperative education programs offered through the School of Science and Technology at the University of Waikato in Hamilton, New Zealand. At Waikato we offer cooperative education in the form of the BSc(Technology), BTech and BE degrees, three of four undergraduate programs offered by the School of Science & Technology. The BSc(Technology) degree consists of a full BSc degree, with two additional management papers and a total of 12-months relevant work experience (Chapman & Kirk, 1992). The work experience is normally carried out as two placements, one of three-months duration at the end of the second year, and a second of nine-months duration at the end of the third year. The BTech and BE degrees are four-year engineering-oriented degrees that have a requirement of two three-month placements completed in the vacation between the second and third year and at the end of the third year. For all three degrees student selection and admission to the program is

carried out on a case-by-case basis, with individual students screened on the basis of academic record and personal interviews with placement coordinators. The BSc(Technology) program has been offered for over 20 years and has experienced a steady increase in enrolments – leveling out since the mid-1990s (Coll, 1996), whereas the BTech and BE represent a more recent development, although they too are showing growth. Currently more than half the students in the School are enrolled in a cooperative education program. The *Cooperative Education Unit* (CEU), a team of academic staff who hold joint appointments between the subject discipline and the Unit, facilitates student placements (Coll & Eames, 2001).

Administration of the Instrument

The participants that completed the survey instrument comprised 71 students enrolled in either majors in the earth sciences, chemistry and the biological sciences (or related specified programs, see Coll 1996) for the BSc(Tech) and BTech degrees from a total population of 80 students (i.e., a response rate of 89%) enrolled in these programs. Students were approached during routine meetings or in laboratory classes and took about 15-20 minutes to complete the questionnaire.

Data Analysis

Estimated mean values were calculated for all of the competencies, and in addition competencies were categorized into hard and soft skills (according to Birketts' 1993 taxonomy). The mean importance for the latter two categories was determined by summing the mean importance of each competency within that category, and dividing by the number of competencies for each category. The difference in the means were tested for statistical significant difference via one-tailed t-tests using conventional statistical methods (Statistical Package for the Social Sciences [SPSS], 2001).

Research Findings

Ranking of Competencies

The estimated means for the students' perceptions of the importance for each competency, both now and in 10 years time are shown in Table 1 and illustrated graphically in Figure 1. As these data are ordinal level,[1] only estimated means can be computed, and the results can be used to only show order of ranking of competencies. It can be seen that for the science and technology students, the mean of the competencies ranged between 5.03 and 6.66 for the present, and between 5.49 and 6.59 for 10 years in the future. Rainsbury et al. (2002) took a mean of less than 4 to mean that respondents interpreted such competencies as being unimportant. On this basis, in the case of the present work, overall the respondents felt the competencies were all important. This observation is supported by written

comments, for example "all of the listed competencies are very important, none can be rated unimportant."

The top five ranked competencies in order were; *ability and willingness to learn*, *initiative*, *achievement orientation*, *personal planning and organizational skills*, and *analytical thinking*. This result is different to that of business students' views who ranked the top five competencies as; *computer literacy*, *customer service orientation*, *teamwork and cooperation*, *self-confidence*, and *willingness to learn* (Rainsbury et al., 2002). The science and technology students' ranking of the least important competencies were; *directiveness*, *organizational awareness*, *impact and influence on others*, *developing others* and *organizational commitment*. Remarkably, this is almost identical to the rankings provided by business students namely; *impact and influence on others*, *directiveness*, *organizational awareness*, and *developing others*.

Comparison of Hard Skills and Soft Skills

A comparison of the students' rating of the overall importance of hard skills (overall mean = 5.89) against soft skills (overall mean= 5.71), found there was little or no difference in the rating of importance between the two categories (not statistically significant at p<.05). Therefore, it seems that the science and technology students, like their business student counterparts, perceive soft skills to be equally important as hard skills (Rainsbury et al., 2002).

Students' Views of Changes to the Importance of Competencies

It is interesting to note that the students in this study ranked the importance of the competencies in 10 years time very similar to the present, and only one – *ability and willingness to learn* deemed likely to be less important (and then only by a difference of -0.17). The largest change was for *computer literacy* (difference in estimated mean +0.91). This also was seen in written comments with several students stating that computer literacy will become more important in the future. Some comments were:

> Anything to do with computers will become even more important to know and understand in the future than it is today.

> I think computers will play an even larger role in all workplaces in 10 years time. Due to this, some aspects of jobs such as conceptual thinking, that is, recognizing patterns etc, may be done more by computers leaving it less up to the employees.

> In the future I think employers will look for a higher understanding in computer programs than today

Interestingly the students considered that computers would also affect interpersonal communication and mentioned in their written responses what potential impact that they thought this may have on written communication

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[1] Ordinal level data is data that is not continuous (as is, e.g., age)

competency as can be seen in the following written quotations.

Table 1
Science and technology students ranking of workplace competencies; estimated means (n=71) based on a 7-point Likert scale where 1 = unimportant and 7 = important

	Today			Ten Year's Time		
Soft Skills	Mean	Std. Deviation	Std. Error Mean	Mean	Std. Deviation	Std. Error Mean
Team Work and Co-operation	6.07	0.85	0.10	6.17	0.88	0.10
Flexibility	5.69	1.07	0.13	5.99	0.97	0.12
Relationship Building	5.66	1.07	0.13	5.86	1.05	0.12
Concern for order, quality and accuracy	5.86	0.96	0.11	6.15	0.87	0.10
Impact and influence on others	5.10	1.08	0.13	5.49	1.23	0.15
Initiative	6.33	0.72	0.09	6.29	0.90	0.11
Customer service orientation	5.44	1.40	0.17	5.93	1.21	0.14
Developing others	5.31	1.21	0.14	5.73	1.08	0.13
Directiveness	5.03	1.02	0.12	5.59	1.14	0.14
Team Leadership	5.49	0.98	0.12	5.87	1.11	0.13
Self control	5.94	1.11	0.13	6.18	0.93	0.11
Organizational commitment	5.42	1.05	0.12	5.69	1.09	0.13
Ability and willingness to learn	6.66	0.58	0.07	6.49	0.74	0.09
Interpersonal understanding	5.55	1.08	0.13	5.81	1.00	0.12
Self confidence	5.97	0.96	0.11	6.11	0.93	0.11
Information seeking	5.90	0.93	0.11	6.12	0.92	0.11
Achievement orientation	6.31	0.80	0.10	6.44	0.77	0.09
Organizational awareness	5.03	1.25	0.15	5.52	1.07	0.13
Hard Skills						
Computer Literacy	5.68	1.05	0.12	6.59	0.77	0.09
Conceptual Thinking	5.70	1.07	0.13	6.01	0.96	0.11
Technical expertise	5.70	1.14	0.14	6.14	0.98	0.12
Analytical thinking	6.15	0.89	0.11	6.37	0.80	0.10
Personal planning and organizational skills	6.21	0.83	0.10	6.37	0.83	0.10
Written communication	5.92	1.07	0.13	5.93	1.29	0.15

I think technological advances in areas such as computers will reduce the need for human interaction and written communication.

I believe that written communication will deteriorate in the future because of the rising communication technology like mobile phones and emails.

Written communication will become even less important with the greater use of email and other programs.

These science students also ranked *developing others* as not as important for today compared to the other competencies. However, they stated that they see *developing others* as a competency likely to be more important for new graduates entering the workforce in the future (increase 0.42) as can be seen the following written responses provided by two students:

Developing others will become more important because you will have to teach 'new recruits' what is going on and how to do things as processes become more technical.

It is very difficult for a student to train the others when he/she is not very experienced in his/her job.

These comments and another comment made by a student suggests such data need to be treated with some caution:

"After 10 years some experience should have been gained therefore competency in these areas would be more important." This comment may mean that this participant has misinterpreted the question – in other words, it seems that he/she thinks the task was to say how a new graduate would 'have gained' more experience 10 years after entering the workforce. If this is the case, then it is possible that some other participants also were confused about the task, which would undoubtedly affect the reliability of these findings. Such a situation likely holds for the other studies for employers and business sector counterparts. The fact that similar overall trends were seen in other studies suggests that it is reasonable to conclude that the bulk of the student participants here have interpreted the task correctly.

Discussion

The results show that Waikato University's science and technology students perceive *ability and willingness to learn* to be the most important competency in the workplace. It is interesting that this is the same as for the business students (Rainsbury et al., 2002) and also found in a recent study of New Zealand graduate employers (Burchell et al., 1999). The findings in these studies, and the present work, seem to provide support for Stephenson's (1997) assertion that one must be willing to learn new skills to keep pace with what is now seen as a rapidly changing workplace.

Business students ranked *customer service orientation* highly, and both business students and science and

Other competencies ranked higher by Waikato science and technology students than business students included
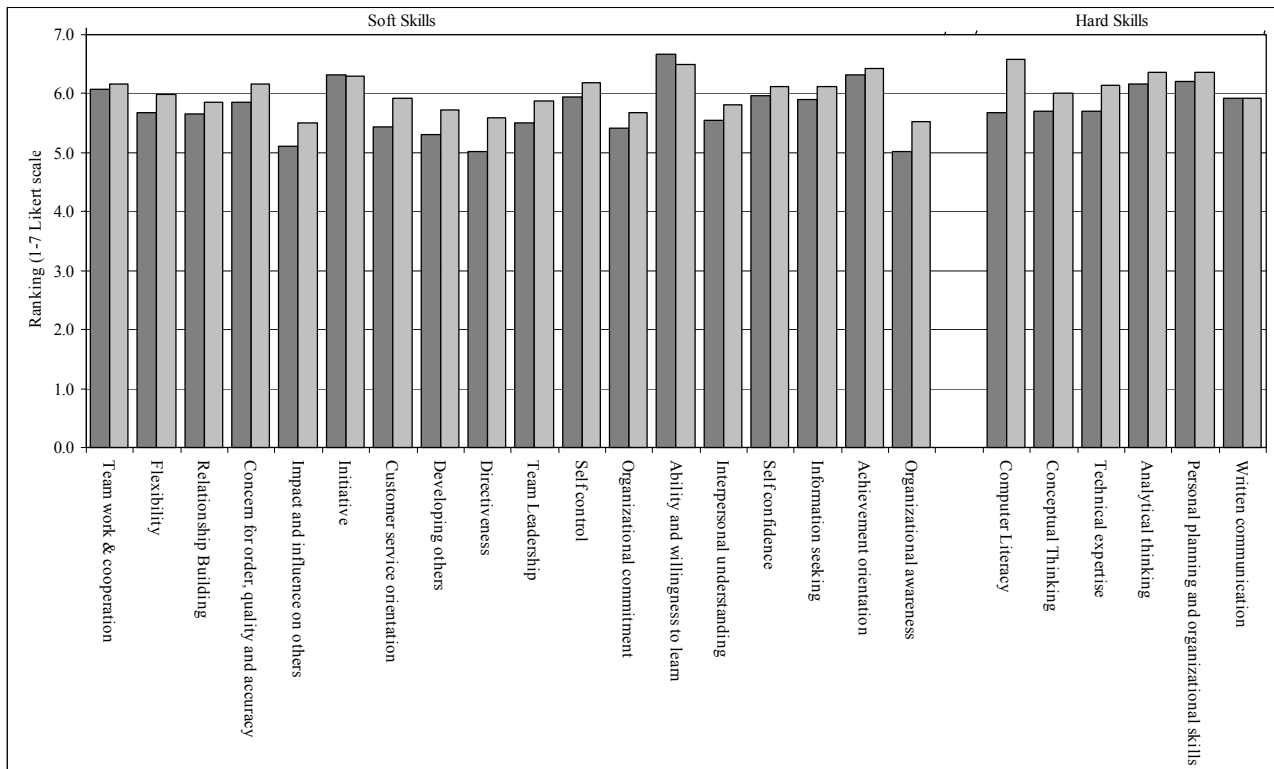
Figure 1
Histogram showing science and technology students ranking of workplace competencies now (dark gray) and in 10 year's time (light gray); estimated means (n=71), based on a 7-point Likert scale where 1 = unimportant and 7 = important

technology students see this increasing in importance in the future, as commented by a science and technology student in the present work: "Customer service – the needs of the customer dictating the quality of the products will be quite important in the future." These findings suggest that both cohorts of students from different sectors have a well-developed sense of the importance of service for customers in a modern commercial context. What is interesting about this result is that at least some of the science and technology students had been placed in government research institutes (where customer interaction and/or service is not traditionally been seen as important) and it seems that science and technology students see customer-focused ethos becoming more important in such organizations in the future.

It is also interesting that the science and technology students see *initiative* as more important than the business students. It appears that these near-graduates in science, who have had some work experience as part of their co-op degree, regard initiative as highly as business graduates and employers rather than business students (Burchell et al., 1999). The contrast in views between the science and technology students' and business students at a similar stage of their degree program may be because the business students had minimal or no work experience at the time of surveying.

achievement orientation and *analytical thinking*. These different perceptions may be due to the nature of science tasks required in the workplace. Scientists place great importance on problem-solving skills, which perhaps explains the higher ranking of *analytical thinking* ranking by Waikato students (see, Coll et al., 2002). It is, however, not obvious why Waikato students would rank *achievement orientation* so highly. The high-ranking business student's attribute to *computer literacy* is consistent across business graduates (Rainsbury et al., 2002) and employers (Burchell et al., 1999) and may be a feature of the importance of information and communication technologies (ICT) in this sector.

Conclusions

The results of the present work show that the science and technology students involved in the study rated all competencies higher in importance than did the business students reported by Rainsbury et al. (2002). The science and technology students placed more emphasis on some science related skills, but also ranked a number of soft skills highly. There was little difference in their perceptions of the importance of such competencies in the future – with the exception of computer literacy. The two groups of students order of ranking of least important skills were almost

identical. Both cohorts see the importance of both soft and hard skills in the workplace, and the findings of this work suggest that these students perceive a need to be multi-skilled as they seek to enter the workplace as new graduates. Placement coordinators are, however, recommended to emphasise the use of co-op placement experiences to highlight importance of interpersonal skills, which the students rated lower than their employers.

Acknowledgements

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Appendix A

Generic competencies that account for 80-95% of the distinguishing features of superior performers (Spencer & Spencer, 1993)

Competency	Description	
Achievement and action		
Achievement orientation	Task accomplishment, seeks results, innovation, competitiveness, impact, standards, efficiency	Soft
Concern for order, quality and accuracy	Monitoring, concern for clarity, reduce uncertainty, keeping track	Soft
Initiative	Bias for action, decisiveness, strategic orientation, proactive, seizes opportunities, self motivation, persistence	Soft
Information seeking	Problem definition, diagnostic focus, looking deeper, contextual sensitivity	Soft
Interpersonal understanding	Empathy, listening, sensitivity to others, diagnostic understanding, awareness of others feelings	Soft
Customer service orientation	Helping and service orientation, focus on client needs, actively solves client problems	Soft
Impact and influence		
Impact and influence on others	Strategic influence, impression management, showmanship, persuasion, collaborative influence	Soft
Organisational awareness	Understands organisation, knows constraints, power and political astuteness, cultural knowledge	Soft
Relationship building	Networking, establish rapport, concern for stakeholders e.g. clients, use of resources, contacts use	Soft
Managerial		
Developing others	Training, developing others, coaching, mentoring, providing support, positive regard	Soft
Directiveness	Assertiveness, decisiveness, use of power, taking charge, firmness of standards, group control and discipline	Soft
Teamwork and co-operation	Fosters group facilitation and management, conflict resolution, motivating others, good climate	Soft
Team leadership	Being in charge, vision, concern for subordinates, build sense of group purpose, group motivation	Soft
Cognitive		
Analytical thinking	Thinking for yourself, reasoning, practical intelligence, planning skills, problem analysing, systematic	Hard
Conceptual thinking	Pattern recognition, insight, critical thinking, problem definition, can generate hypotheses, linking	Hard
Technical expertise	Job related technical knowledge and skills, depth and breadth, acquires expertise, donates expertise	Hard
Personal effectiveness		
Self control	Stamina, resistance to stress, staying calm, high EQ, resists temptation, not impulsive, can calm others	Soft
Self confidence	Strong self concept, internal locus of control, independence, ego strength, decisive, accepts responsibility	Soft
Flexibility	Adaptability, ability to change, perceptual objectivity, staying objective, resilience, behavior is contingent	Soft
Organizational commitment	Align self and others to organizational needs, business-mindedness, self sacrifice	Soft

Appendix B
The Survey Instrument Used in the Study

SECTION B
COMPETENCY DESCRIPTIONS

Please read the following descriptions of each competency before completing question B.1.

Teamwork & cooperation (fosters group facilitation and management, conflict resolution, motivation of others, creating a good workplace climate)
Flexibility (adaptability, perceptual objectivity, staying objective, resilience, behaviour is contingent on the situation)
Relationship building (networking, establish rapport, use of contacts, concern for stakeholders eg clients)
Computer literacy (able to operate a number of packages and has information management awareness)
Conceptual thinking (pattern recognition, insight, critical thinking, problem definition, can generate hypotheses, linking)
Technical expertise (job related technical knowledge and skills, depth and breadth, acquires expertise, donates expertise)
Organisational awareness (understands organisation, knows constraints, power and political astuteness, cultural knowledge)
Concern for order, quality & accuracy (monitoring, concern for clarity, reduces uncertainty, keeping track of events and issues)
Impact & influence on others (strategic influence, impression management, showmanship, persuasion, collaborative influence)
Initiative (bias for action, decisiveness, strategic orientation, proactive, seizes opportunities, self motivation, persistence)
Customer service orientation (helping and service orientation, focus on client needs, actively solves client problems)
Developing others (training, developing others, coaching, mentoring, providing support, positive regard)
Directiveness (assertiveness, decisiveness, use of power, taking charge, firmness of standards, group control and discipline)
Team leadership (being in charge, vision, concern for subordinates, builds a sense of group purpose)
Analytical thinking (thinking for self, reasoning, practical intelligence, planning skills, problem analysing, systematic)
Self control (stamina, resistance to stress, staying calm, high Emotional Quotient, resists temptation, not impulsive, can calm others)
Organisational commitment (align self and others to organisational needs, businessmindedness, self sacrifice)
Ability and willingness to learn (desire and aptitude for learning, learning as a basis for action)
Interpersonal understanding (empathy, listening, sensitivity to others, diagnostic understanding, awareness of others' feelings)
Self confidence (strong self concept, internal locus of control, independence, positive ego strength, decisive, accepts responsibility)
Personal planning and organisational skills
Written communication
Information seeking (problem definition, diagnostic focus, looking deeper, contextual sensitivity)
Achievement orientation (task accomplishment, seeks results, employs innovation, has competitiveness, seeks impact, aims for standards and efficiency)

Appendix B *Continued*

B.1   Please complete the table below, indicating from your perspective the *importance* for science and technology graduates entering the workforce, of each of the competencies listed. <u>Please circle the number of your choice</u>. (Refer attached description of each competency.)

COMPETENCY	IMPORTANCE TODAY							IMPORTANCE IN 10 YEARS TIME						
	Unimportant ⟶ Important							Unimportant ⟶ Important						
	1						**7**	**1**						**7**
Teamwork & cooperation	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Flexibility	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Relationship building	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Computer literacy	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Conceptual thinking	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Technical expertise	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Organisational awareness	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Concern for order, quality and accuracy	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Impact and influence on others	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Initiative	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Customer service orientation	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Developing others	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Directiveness	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Team leadership	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Analytical thinking	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Self control	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Organisational commitment	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Ability and willingness to learn	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Interpersonal understanding	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Self confidence	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Personal planning and organisational skills	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Written communication	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Information seeking	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Achievement orientation	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Please add others, if required:														
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
	1	2	3	4	5	6	7	1	2	3	4	5	6	7