

STUDENT AND MANAGER PERSPECTIVES ON THE GRADUATE ATTRIBUTES OF INFORMATION TECHNOLOGY (IT) STUDENTS AFTER WORK-INTEGRATED LEARNING (WIL)

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ABSTRACT – Graduate attributes of IT students during a WIL activity in Systems Analysis and Design and Business Management modules were investigated. The graduate attributes considered in the study were communication, teamwork, analysing and investigating, initiative or self-motivation, planning and organising, time management, conflict resolution, self-awareness (e.g. reflective thinking, self-discipline, flexibility, dedication), integrity and stress tolerance. The purpose of an overarching project that started in 2010 at North-West University (NWU) was to enhance the work-readiness and soft skills of IT students by doing practical work in industry. The purpose of the paper is to compare the perspectives on the graduate attributes of students. Both the perspectives of students and managers or employers of companies where students worked during the WIL activity, were investigated. In addition, the paper presents the relationship between students' perspectives regarding graduate attributes and module marks. Specific experiences of students including skills learnt and personal aspects that need change are presented in the paper. Electronic questionnaires were used to gather data from managers and students after the WIL activities. Results during 2017 and 2018 revealed that the perspectives of managers regarding the graduate attributes communication, initiative or self-motivation, planning and organising, time management and integrity were more positive than the perspectives of students.

Keywords: Graduate attributes, Work-integrated learning (WIL), IT students

INTRODUCTION

The paper focuses on a section of a bigger research project conducted at NWU to investigate the work-readiness and soft skills of second-year IT students during WIL activities. There is a need to align academic content and industry experiences as part of IT education. Since 2010 NWU students in the Systems Analysis and Design and Business Management modules have been doing practical work for between one and three weeks in corporate environments during the winter holidays. Data to determine the experience of IT students during and after the WIL activities has been collected from 2015 to 2018, including students' level of competency, work-readiness and soft skills. Since 2017 data to determine the experience of managers or employers regarding graduate attributes of students involved in the activity, was also collected. In the paper graduate attributes of IT students participating in a WIL activity were considered. The perspectives of both students and managers of companies where students worked, were investigated.

The following research questions were stated: How do management's perspectives on the graduate attributes of students differ from students' own perspectives during WIL? Is there a relationship between students' perspectives on their own graduate attributes after WIL and module marks for the Systems Analysis and Design or Business Management modules? What are the most important skills learned by students during WIL? What personal aspects that need change did students identify during WIL? The paper is structured as follows: in the following section, a theoretical background of graduate attributes and employability skills is presented, after which the methodology is discussed. Results and the discussion thereof follow in the next section and in the last section, the paper is concluded.

THEORETICAL BACKGROUND

Graduates today need to have expert workplace skills in order to meet the challenges of the current era (Musa, Mufti, Latiff, & Amin, 2012). According to Osmani et al. (2016), technical skills alone are insufficient for IT professionals to be successful. IT professionals need soft interpersonal skills to be able to meet the challenges in the dynamic and complex IT industry (Osmani et al., 2016). The Australian Technology Network (Bowden, Hart, King, Trigwell & Watts, 2000) defined graduate attributes as: *“the qualities, skills and understandings a university community agrees its students would desirably develop during their time at the institution and consequently shape the contribution*

they are able to make to their profession and as a citizen". In the NWU strategy document (2016) graduate attributes are described as "*personal qualities, and academic, professional and practical knowledge and skills*". A recent publication by Oliver and de St Jorre (2018) focusing on Australian higher education and graduate attributes beyond the year 2020, recommends graduate attributes needed in future to include communication, critical thinking, ethical engagement with communities, teamwork, learning and working independently, problem-solving and information literacy. According to Oliver and de St Jorre (2018) terms to describe graduate attributes are used interchangeably and boundaries between the terms became 'blurred' over the past twenty years. In the paper the terms skills, competencies, qualities and abilities refer to graduate attributes. The attributes covered in the questionnaires used for managers and students during the study, closely correspond to the attributes found in recent literature.

To justify the attributes self-awareness and integrity used in the questionnaires of the study, Scoufis (2000) identifies sensitivity to multicultural issues, awareness of ethical issues and civic responsibility to be important qualities that graduates should have. In support of the attributes identified by Scoufis (2000), Nagarajan and Edwards (2014) included attributes such as the ability to work with people from different spheres, (e.g. business, IT, international and interstate sites), communication with people from different cultures and work ethic as being important.

Problem-solving, critical analysis and creative thinking abilities were considered to be important attributes graduates should have (Moalosi, Oladiran, & Uziak, 2012; Scoufis, 2000; Nagarajan & Edwards, 2014; Musa et al., 2012; Saad & Majid, 2014). In the questionnaires the attribute "analysing and investigating" were used.

In support of the attributes initiative or self-motivation, planning and organising, time management and stress tolerance used in the questionnaires, Scoufis (2000) highlights independent initiative while Musa et al. (2012) regard self-motivation and self-management desirable attributes graduates should have. Nagarajan and Edwards (2014) confirm the abilities to develop new skills, adapt to dynamic work requirements and to use technology to manage time, to be important. Saad and Majid (2014) endorse the importance of lifelong learning skills while Moalosi et al. (2012) affirm the ability to plan, organise and prioritise work as being important.

Scoufis (2000), Moalosi et al. (2012), Nagarajan and Edwards (2014), Musa et al. (2012) and Saad and Majid (2014) confirm that the attribute communication used in the questionnaires, is a necessary ability for graduates to have. According to Moalosi et al. (2012) communication includes the abilities to communicate verbally with persons inside and outside the organisation, sell or influence others and create and/or edit a written report. Nagarajan and Edwards (2014) regard formal and informal communication with senior colleagues and people from different cultures part of communication abilities needed in the challenging work environment.

The attributes teamwork and conflict resolution used in the questionnaires are confirmed to be important by Scoufis (2000), Moalosi et al. (2012), Nagarajan and Edwards (2014), Musa et al. (2012) and Saad and Majid (2014). Nagarajan and Edwards (2014) regard using technology, tools and techniques for team interaction, as skills needed by graduates.

The questionnaire used for the study had questions covering the above discussed graduate attributes self-awareness, integrity, analysing and investigating, initiative or self-motivation, planning and organising, time management, stress tolerance, communication, teamwork and conflict resolution.

METHODOLOGY OR METHOD

Students were given specific instructions and outcomes to reach during the WIL activity:

Instructions

Students were guided to use own personal networks (family, friends and acquaintances) to identify and approach possible companies. Students were given an assignment in advance to be completed during the WIL. The assignment required the students to report on the business in general, as well as on specific IT-related topics, including software development methodologies, hardware and software used, security aspects and project management approaches used.

Students received a letter from the university addressing the manager(s) of the company involved in the WIL. The letter communicated the aim of the WIL, the framework of the assignment and possibilities for the practical time. Appreciation was also expressed to the companies for the value exchange. The two defined questionnaires were developed in Google Forms and the links communicated to managers and students involved. After the completion of the WIL activity, all managers were requested to complete the online questionnaire for managers. After the holidays, students had to submit their assignments. The marks of the assignments counted towards the final participation marks for the Systems Analysis and Design II and Business Management modules. Thereafter, all involved students were asked to complete the online questionnaire for students.

Research instruments

The students' questionnaire comprised four sections. Section 1 contained demographic information: type of industry, previous work experience, age and gender. Section 2 contained information regarding work experience during the WIL: main activities, how challenging the work was, how likely the students would be to work for the company involved, the most satisfying aspects of practical work and the least satisfying aspects of practical work. Section 3 contained information regarding personal development and skills competencies (graduate attributes) assessed according to a 4-point Likert-type scale with response categories being poor, fair, good and very good. The following graduate attributes were included: communication, teamwork, commercial awareness, analysing and investigating, initiative or self-motivation, planning and organising, time management, conflict resolution, self-awareness, integrity and stress tolerance. Section 4 contained two qualitative questions on the most important skill learnt and an important personal aspect needing change to promote success in careers.

The managers' questionnaire comprised three sections. Section 1 contained demographic information: type of industry and size of company. Section 2 contained information regarding the students' work experience: how challenging it was, would the student's abilities and skills add value to the company, did the WIL experience improve the student's employability, will the WIL experience lead to the possibility of full-time job offers from the company. Section 3 contained information regarding the skills and competencies (graduate attributes) of students assessed according to a 4-point Likert-type scale with response categories being poor, fair, good and very good. The same graduate attributes of the students' questionnaire were included: communication, teamwork, commercial awareness, analysing and investigating, initiative or self-motivation, planning and organising, time management, conflict resolution, self-awareness, integrity and stress tolerance.

Research population

The research population for the students' questionnaire comprised second-year students in IT, BCom, Entrepreneurship and Business Management. The questionnaire was completed by 154 students of which 90 were IT students. The research population for the managers' questionnaire comprised managers of companies where students worked during WIL. The questionnaire was completed by 183 managers of which 99 were from the IT industry. Participation was voluntary, informed consent was given and ethical clearance was obtained from NWU. Both students' and managers' responses are reflected upon in the paper.

Statistical analysis

Content analysis was performed on the qualitative data from section 4 of the students' questionnaire. Descriptive and the following inferential statistics were performed: T-tests, Spearman's correlation and regression analysis. To provide the level of significance at which the null hypothesis would be rejected, p-values were calculated. According to Ellis and Steyn (2003) practical significance is measured by effect size which is independent of the size of the sample. A large enough effect size indicates a large enough effect to be important in practice. Effect sizes were calculated to give an indication of the practically significant differences between the student and manager groups.

A literature review was conducted to map graduate attributes of questions in questionnaires to graduate attributes in literature (see Theoretical background above). A pilot study for completing questionnaires was done to ensure the face validity of questionnaires. An exploratory factor

analysis was performed to ensure construct validity. Due to all attributes loading to one factor and the Cronbach alpha coefficient (0.84) indicating high internal consistency, the decision to consider all graduate attributes separately and not as one factor score, was made in order to allow more information to be retained.

The software SPSS version 25 was used for analysing data and Statistical Consultation Services of NWU provided assistance.

RESULTS AND DISCUSSION

Table 1 presents the manager participants' demographic and company characteristics. Of the companies where students worked, 43.2% were small (fewer than 51 employees) with 54.1% being in the IT industry. There were companies where more than one student worked during the same time period.

Table 1: Demographic and company characteristics of managerial participants

Factor	Subgroup	Respondents	
		n	%
Type of industry	Industrial (e.g. manufacturing; agriculture; forestry and fishing)	84	45.9
	Information Technology	99	54.1
Size of company	Small (1-50 employees)	79	43.2
	Medium (51-200 employees)	44	24.0
	Large (201-10 000 employees)	46	25.1
	Very large (10 000+ employees)	14	7.7

Table 2 shows the student participants' demographic and work placement characteristics. Of the students, 58.4% worked in the IT industry and 39.6% had previous work experience of more than two weeks. Students were mostly male (79.2%), 20 years old (55.2%) and Afrikaans-speaking (89%). Of the students, 70.1% studied IT.

Table 2: Demographic and work placement characteristics of student participants

Factor	Subgroup	Respondents	
		n	%
Type of industry	Industrial (e.g. manufacturing; agriculture)	64	41.5
	Information Technology	90	58.4
Previous work experience	None	41	26.6
	Up to 1 week	35	22.7
	Up to 2 weeks	17	11.0
	More than 2 weeks	61	39.6
Age group	19 or younger	14	9.1
	20	85	55.2
	21	28	18.2
	21+	27	17.5
Gender	Female	32	20.8
	Male	122	79.2
Home language	English	8	5.2
	Afrikaans	137	89.0
	Other	9	5.8
Study field	BCom / Entrepreneurship and Business Management	40	26.0
	Information Technology	108	70.1
	Other	6	3.9

Figure 1 indicates the statistical significant ($p < 0.01$) results of the independent T-test which revealed medium to high effect sizes that varied between 0.48 and 0.68 for managers and students regarding the graduate attributes communication, "initiative or self-motivation", "planning and organising", integrity and time management. In practice this indicates that managers assessed these graduate attributes of students better than students themselves.

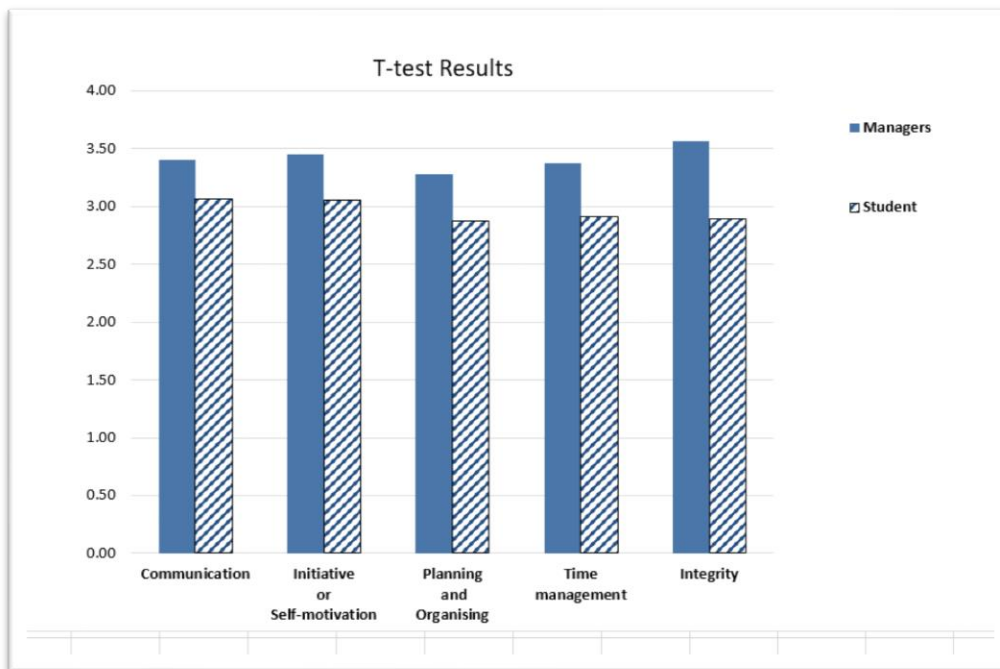


Figure 1: Results of independent T-test

Table 3: Results of Spearman's correlation

	4. Indicate your age	10. How challenging would you rate your work experience gained during the time in practice?	11. In your opinion, does the time period of experience in practice improve your employability?	16. In your opinion, does the time period of experience in practice lead to the possibility of full-time job offers for you?
Teamwork		.160*		
Analysing and Investigating				.192*
Initiative or Self-motivation			.181*	.184*
Self-awareness			.177*	
Integrity	.184*			.186*
Stress tolerance		-.257**		

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Results of the Spearman's correlation between students' opinions regarding graduate attributes, work experience and age are given in Table 3. The degree to which the work was challenging, improvement in employability and the possibility of full-time job offers were indicated according to 4-point Likert-type scales. The question regarding age had response categories 19 or younger, 20, 21 and 21+. The question regarding the degree to which the work was challenging had response categories not at all challenging, slightly challenging, moderate challenging and very challenging. Response categories for the questions regarding improvement in employability and the possibility of full-time job offers ranged from strongly disagree (1) to strongly agree (4).

Stress tolerance and challenging work experience, had a medium negative correlation (-0.257), that was statistically significant. Therefore, students with poorer stress tolerance, experienced the WIL work to be the more challenging.

The graduate attribute "analysing and investigating" and the possibility of full-time job offers had a medium, positive correlation (0.192), which was statistically significant. The better students rated

their analysing and investigating skills, the more they agreed that full-time job offers were possible. A medium, positive correlation (0.184), which was statistically significant existed between the graduate attribute “initiative or self-motivation” and the possibility of full-time job offers. The better students rated their own “initiative or self-motivation”, the more they agreed that the possibility of full-time job offers existed. Integrity and the possibility of full-time job offers had a medium, positive correlation (0.186) which was statistically significant. The better students rated their own integrity, the more they agreed that full-time job offers were possible.

A medium, positive correlation (0.181), which was statistically significant existed between the graduate attribute “initiative or self-motivation” and the improvement in employability. The better students rated their own “initiative or self-motivation”, the more they agreed that the WIL activity improved their employability. Self-awareness and the improvement in employability had a medium, positive correlation (0.177), which was statistically significant. The better students rated their own self-awareness, the more they agreed that the WIL activity improved their employability.

A medium, positive correlation (0.160), which was statistically significant existed between teamwork and the degree to which the work experience was challenging. The more challenging the work during WIL was considered, the better students rated their ability to work in a team.

Age and integrity had a medium, positive correlation (0.184), which was statistically significant. The older the students, the better they considered their level of integrity.

Regression analysis revealed time management had a positive, statistically significant contribution to module marks ($p=0.001$), i.e. the better time management skills were rated, the higher the module marks. The R-square was 0.091, indicating that the regression explained 9.1% of the variance in module marks.

Qualitative results revealed that the most important skills students learned during WIL (Figure 2) were communication, practical skills and teamwork. The most important personal aspects that students needed to improve to promote success in careers (Figure 3) are self-awareness (16%), self-confidence (16%) and patience (11%).

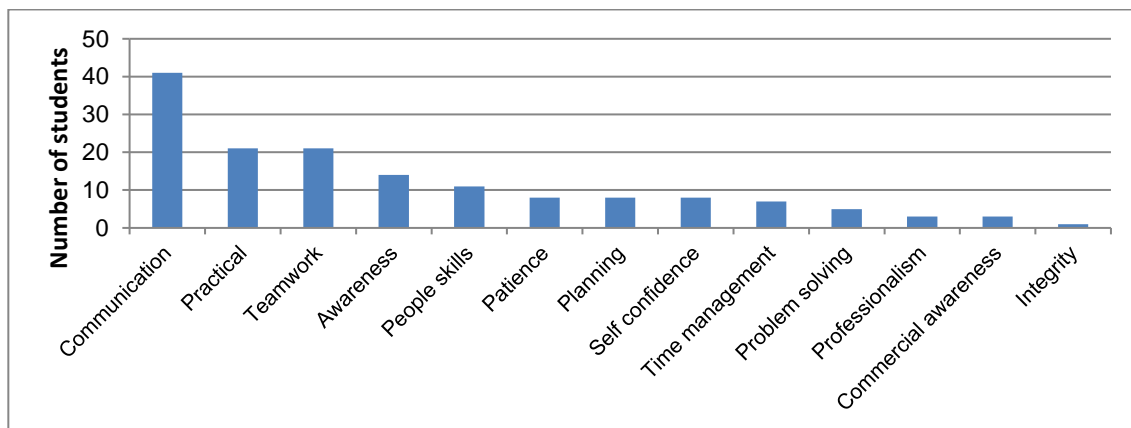


Figure 2: Skills learned during WIL

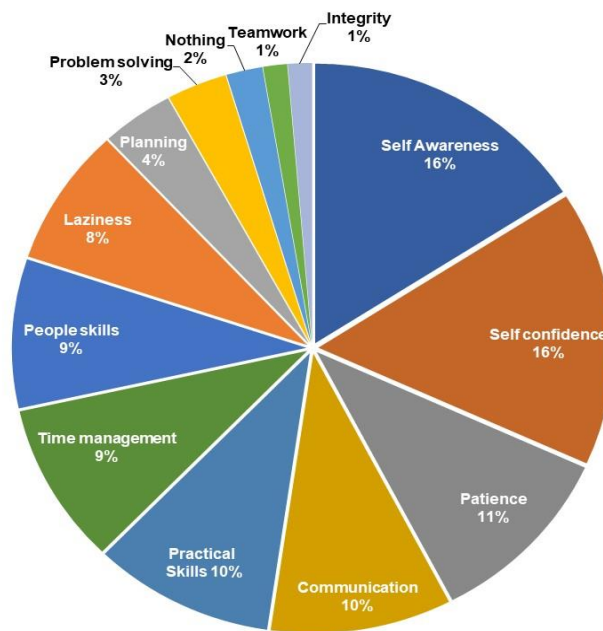


Figure 3: Personal aspects that need change to promote success in careers

CONCLUSION

In the study on which this paper is based, graduate attributes of IT students participating in a WIL activity were investigated where the perspectives of both students and managers of companies where students worked, were considered. The first research question regarding the difference between management's and students' perspectives on graduate attributes was answered. Managers regarded the graduate attributes integrity, communication, "initiative or self-motivation", "planning and organising" as well as time management of students to be better than what students considered their own attributes. Students and lecturers can therefore be positive that the above soft skills are already being developed whilst studying.

The second research question regarding the relationship between students' perspectives on graduate attributes and module marks for the Systems Analysis and Design or Business Management modules, revealed time management had a positive contribution towards students' module marks. The better the time management skills, the higher were the module marks. Lecturers can therefore further give guidance to the students on the topic of time management as it was seen that module marks and this skill had a positive relation.

In answer to the third research question regarding the most important skills learnt by students, communication, practical skills and teamwork were considered most important. The most important personal aspects that needed improvement to promote success in careers, were self-awareness, self-confidence and patience. This answered the fourth research question. The significance of the results is that these aspects can be focused upon in self-improvement endeavours when students know their own shortcomings.

Other specific aspects to address that came forth from the results were stress tolerance, teamwork capabilities and integrity. The experiences students had during WIL can be used by lecturers in IT courses to change course content, to improve planning for WIL sessions and to empower students to bridge gaps discovered during WIL activities. Results obtained during the study can be used to address shortcomings in graduate attributes during lectures. In order to improve module marks, time management skills need to be taught.

Future work to be done includes the extension of the study to determine tendencies on graduate attributes of students over time. A pre-test prior to WIL, followed by a post-test after WIL can be done to analyse the influence of a specific WIL activity on the graduate attributes of students. The questionnaire should be translated into Afrikaans, isiZulu, Sesotho and Setswana to be available in more students' home languages.

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