Self-Responsibility in Employability Competencies Development: Perceptions from Australian Engineering Student and Alumni

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Abstract

As the competencies demanded by the labour market has changed, engineering graduates have to proactively be self-responsible by participating in competency-enhancing activities to possess competencies needed by the labour market. Without any learners' sense of self-responsibility (SR), competency development only creates low quality engineering graduates. Therefore, this study examines the perceptions of 1056 students and alumni of Australian engineering schools regarding SR in their employability competencies development process. Findings show that the engagements of both participants were extrinsically motivated. However, the alumni participants had internalised their extrinsic motivations into positive behaviours, including self-initiation, persistence, motivation and independency. As a consequence, the alumni participants felt a greater sense that SR is an integral part of themselves, expressed through their capability to be self-initiated, highly persistent, motivated and independent in navigating their competency development without relying on their friends, families or instructors. In relation to the external circumstances affecting the perceptions of SR, the participants did not associate their perspective of SR with their prior development experience in high schools but rather they associated it with their recent experiences within the engineering school environments. This finding has implications for how SR could help learners at university level to internalise their external motivations.

Keywords – Self-Responsibility, employability, competencies development, engineering graduates, Australian engineering students

1. Introduction

When we talk about *Self-Responsibility*, several similar terms have been used within the educational context explaining the idea the personal responsibility of an individual to his/her actions. Allan (2006), for instance, conducted a quantitative study with a sample of 286 Australian students to measure their understanding about personal responsibility for learning. He found that responsibility is related with a capability of an individual to be autonomous and to self-control the learning process. In this regard, Mergler (2007) developed a construct which help adolescents and teachers comprehend the concept of personal responsibility. She argued that personal responsibility is related to one's awareness and control over four components, namely: 1. Thoughts and feelings, 2. The choices, 3. The outcomes and 4. The impacts. Comprehensively, personal responsibility has been defined as "[the] readiness to account for oneself and one's interiorized social judgment, not only for one's own actions, but also and above all for what one is, and so for one's personal qualities and dispositions. It is expressed in a constant readiness of the person to bear the social consequences of their actions" (Ciechanowska, 2014, p. 4). Through her definition, Ciechanowska linked student's personal responsibility with his/her readiness for deeply integrating new construed information with the existing concepts.

Despite of these studies, less attention is given by experts and scholars in the field of employability in to the research on SR. "Supporting students in their development seems to be marginalized in recent years … [because most people see] universities as a place to build economic capital … [where it] has become important only in the perspective of its usefulness and measurable financial and economic accountability (Ciechanowska, 2014, p. 2). This argumentation

supports Walther and Radcliffe (2007) who critique the competency development process within engineering institutions which, at last five decades, has only equipped graduates with a formal certificate or qualification with a little support to better equip and develop their employability competencies. These critiques were based on the existed competency gap issue where employability competencies developed by our graduates in development institutions have not match with what are expected by industries. For example, Australian engineering graduates were identified with 11 areas competency deficiencies: including, communication, working in team, professionalism, self-management, ingenuity, management and leadership, engineering business, entrepreneurship, practical engineering, professional responsibilities and applying technical theory (Male, Bush, & Chapman, 2010).

Our study found that the mismatch issue was related to the disputes between university and industry regarding what kind of competencies need to be developed by learners. University tends to equips learners with a broad range of academic competencies where industry expects learners to possess a set of specific employability competencies (Walther & Radcliffe, 2007). It has created two conflict of interests. Correspondingly, we conduct a descriptive study to examine the responses of students of a state educational institution in Indonesia on these two conflicting interests. We found that learners without a reconstructing capacity who passively relied on the development support from their educational institutions may have difficulties to develop appropriate competencies compare to those who are able to use their reconstructing capacity in finding alternatives when they are confronted by perceived barriers (Lazarus & Ferris, 2014). Therefore, we argue that SR in competency development could expand the limitations of the conventional development process by providing freedom for learners to initiate plans, manage activities and evaluate the outcomes (Lazarus & Ferris, 2016). Unlike conventional teaching methods that heavily rely on roles of both instructor as the one-way knowledge transmitter and learners as the passive receivers without any capability to provide evaluation to the process, SR in the competency development process encourages the learners to decide what kind of suitable activities needed to overcome the perceived barriers. This freedom allows them to recognise their full function and, thus, develop their own approaches to improve their competency deficiencies. For instance, Allan (2006) shows that the capability of students to gain a real freedom and control over the learning process has a positive correlation with their learning behaviours. Therefore, learners have to proactively be self-responsible by developing their own approach to possess linear competencies with the requirements of the labour market.

In Australia, the correlation between students' sense of responsibility and the process of developing generic skills firstly examined by Callan (2004). He argues that learners' commitment to their own competency development process is important for creating graduates with quality as required by government or expected by the employer. To him, the effectiveness of competencies development and the quality of its graduates is not solely depending on how good an educational institution to prepare their learner to enter the labour market, but also determined by learners' understanding about their responsibility to manage the development process. His argument supports the earlier work of Forrier and Sels (2003) who believe that the main preparation for entering the labour market is mainly determined by student's characteristic in accepting responsibility to develop a set of competencies that could increase his/her employment opportunities. Indeed, it is the learner who become the centre of his/her own development process, not others.

Collectively, the term of SR in the competency development process was defined as *a self-determined process to a certain degree that a learner, as the centre of the development process, accepts personal responsibility, along with its consequences, to identify, plan and address any development limitations which he/she may have by developing a series of competencies needed to manage well in his/her real life or future career*. This definition is more complex than the definition of personal responsibility. Because by revealing that SR is a self-determined process, the definition of SR addresses learners' different levels of interest in accepting SR. Accordingly, these levels of interest are detailly explained in the following section.

2. Self-Responsibility in Competency Development

The current employability competencies development has heavily focused on the effective methods for equipping learners with appropriate competencies that may be matched with the requirements of the labour market. However, the global graduate unemployment issues indicate that this focus has not hundred percent produced graduates with the quality as expected by governments, professional bodies or employers. Correspondingly, Callan (2004) argues that without any commitment from the learners, the competency development process only creates low quality engineering graduates. Indeed, commitment is self-determined process where the learners have the freedom to or not to develop a series of competencies for their own future.

This sense of freedom is essential for learners, particularly in the interaction among the role of self-concept, cognitive self-development and career-choice. Accordingly, the sense of freedom plays a vital role in activating learners' willingness to accept the role of self-concept into a certain level of where they would like to exercise SR for developing appropriate competencies correlated with their career choice. This self-concept is connected to pro-action, initiative, assertiveness or persistence for securing future career and solving career problems (Chen, 2006). Therefore, if learners want to secure their future career, they should accept SR in their personal competencies development process. This perspective is in line with the protean career concept where "an individual manages his or her career in a proactive, self-directed way driven by personal value and evaluating career success based on subjective success criteria" (Vos & Soens, 2008, p. 449). When we mix the concept of SR with this protean concept, we could understand that SR in employability competency development is expressed through the capability of learners to self-manage the development process for securing their future career.

In this regard, King (2004) argues that this capability is stimulated by intrinsic or extrinsic motivations. Individuals with a strong sense of responsibility are more likely to use their own values to guide their career (Briscoe, Hall, & DeMuth, 2006) and independently develop their own approaches for managing their career development (Vos & Soens, 2008). In contrast, individuals with traditional career perspectives passively manage their career development by heavily leaning on external directions and assistance from others (Briscoe et al., 2006; Vos & Soens, 2008).

To address such sense of responsibility, a study by Lazarus and Ferris (2016) has indicated that learners who intrinsically or extrinsically motivated may different understanding to the concept of SR in developing a set of competencies that are important for their future careers. Both intrinsically and extrinsically motivated learners may have effectively identified their competency strengths and weaknesses, although, we argue that learners with a higher level of understanding to SR may gain a greater degree of autonomy to develop their own approaches for improving the identified weaknesses, conducting appropriate actions and evaluating the outcomes. Correspondingly, the purpose of this paper is to examine the perceptions of engineering student and alumni in Australia regarding the importance of SR in their competency development process. In conjunction with this purpose, this paper may help learners to increase their willingness to accept SR for their own development process.

3. Methods

To examine the participants' perceptions about SR within the context of employability competencies development, this paper employed a correlational quantitative method. Thus, the focus of this method is generating objective, rigorous and strong explanation about the importance of SR and the correlation with its factors. In conjunction with this focus, a new measurement scale, later referred as the *Self-Responsibility Scale* (SRS), was used as the instrument for the survey. The justification of using the SRS is the limitation of the available scales to measure the participants' understanding about SR. For example, the self-directed learning readiness scale (SDLRS) and the Oddi Continuing Learning Inventory (OCLI) were developed only to examine learners' attitudes and skills toward their readiness of a learner to study within a self-directed environment. Despite of the popularity of the SDLRS, both scales were not suitable for examining the various levels of perception of learners in accepting SR with respect to employability competencies development.

The SRS consists of 18 measurement items constructed from seven components of SR, namely: Awareness, Involvement, Own reflection, Independency, Initiative and creativity, Characteristics role and Managing resources. All these components were directly deducted from the factors that affect an individual's motivation and behaviour in practicing SR. The validation process further indicated the strong internal consistency of the SRS and classified the 18 measurement items within four underlying factors of SR: namely, 1. Autonomy and Self-Initiation (ASI), 2. Sense of Agency (SA), 3. Self-Awareness and Evaluation (SAE) and 4. Self-Management (SM). In addition to the 18 measurement items, the SRS also contains of several demographic items aimed to broaden the investigation on additional variables – including gender, age, level of education, current or previous experience of competency development and parents' educational background – that might have affected stakeholders' perceptions of SR.

After granted ethic approval from the Human Resource Ethics Committee of the University of South Australia (HREC UniSA) on 27 January 2016 with ref. number 0000035039 and the HREC of the University of Technology Sydney (UTS) with ref. number ETH16-0355 on 8 June 2016, the SRS was administered to targeted groups from seven participating engineering schools in Australia. The sample was selected using purposive and snowball sampling and divided into two groups, namely: (1) Student and (2) Alumni. To be eligible to participate in the student group, the potential candidates should be enrolled as part-time or full-time students from any engineering disciplines within the participating schools and have completed a minimum of one semester of any level of study. Meanwhile, any alumnus

from the participating schools with: (a) at least three months of working experience after graduating, (b) a minimum age of 20 and (c) a minimum qualification of a Bachelor degree in Engineering are qualified to participate in this study.

This study was conducted through a web survey and an introductory email, with a link to the web survey software service: *SurveyMonkey*, was sent to all eligible participants. The respondents were asked to provide short answers to the demographic items and provide their levels of agreement or disagreement to 18 items on the SRS through a 5-point Likert Scale ranging from 1 which indicates strong disagreement to 5 which indicates strong agreement. A total of 1064 responses (570 students and 494 alumni) were obtained; after data screening, eight responses (2 students and 6 alumni) had not provided a complete response. Thus, only 1056 responses could be used for further data analysis.

4. Findings and Discussions

4.1 The overall perceptions

To provide the descriptive analysis on the perceptions of the participants regarding the importance of SR in their competencies development experiences, the obtained responses to the 18 measurement items were analysed using its similarities. To present the findings in an easily-interpreted format, these responses were measured with frequency distributions, measures of central tendency (including the measurement of *mean, median* and *mode*) and analysis of variance or the Standard Deviation (SD). Accordingly, the average perception of SR was 3.87 on a 5-point Likert Scale, with the average SD of 1.03, indicates a high level of agreement from the participants with all 18 items on the SRS. In addition to this univariate information, we found that the obtained perceptions were negatively skewed, range from −0.18 to −2.18. It means that most participants showed their agreement (positive/high perceptions) and only few participants disagreed (low perceptions) to the 18 measurement items in the SRS. This assumption was supported by the fact that most of the respondents (almost 74%) agreed with all 18 items in the SRS and only 19% respondents showed their disagreement. In other words, the overall perceptions about SR in employability competency development were positive. Therefore, the response related differences are further discussed in the following section.

4.2 Response Related differences

For making a comparison about the perceptions of SR for two different groups of participants, we employed an independent sample t-test at $p < 0.05$. The findings reveal that the student participants (M = 72.97, SD = 10.13; t(1054) = 11.59, p = 0.001) has a moderate effect of the differences ($\eta 2 = 0.11$) with the alumni participants (M = 65.64, SD = 10.33). A follow-up descriptive analysis for all 18 items loaded into four underlying factors of SR was applied to further determine if the differences between students and alumni on these four factors were also significant (Table 1,2, 3 and 4, respectively).

Table 1 Descriptive statistic for five items loaded to the first-order construct ASI

	Item	Group	n	Mean	SD
18	I just follow what other people learn	Student	568	4.39	0.81
		Alumni	488	2.77	1.70
11	I always expect my instructors to tell every student what should they do in the classroom	Student	568	4.01	1.17
		Alumni	488	2.79	1.60
10	I will give up when I found a stressful activity	Student	568	4.41	0.84
		Alumni	488	2.80	1.66
13	I develop employability competencies only if I have spare time	Student	568	3.73	0.96
		Alumni	488	2.83	1.34
44	I can't find any support from the university related to my employability competencies development.	Student	568	3.56	0.96
		Alumni	488	2.91	1.13

Note. The responses were obtained through the 5-point Likert Scale ranging from 1 (strongly disagree) to 5 (strongly agree)

Table 1 indicates that the motivation of the student participants engaged in competency development was extrinsic either by external or introjected regulation (i.e. in responding to I18, the motivation of an external regulated learner could be 'I engage in competency development activities because my friends asked me'). Unfortunately, this

motivation may prevent them from effectively adopting the concept of SR or engaging well in development process. Thus, when confronted by perceived barriers, they will easily to give up (I10) or lose their motivation (I13). The engagement of the alumni participants was also extrinsically motivated, although, they had taken one level higher than the student participants by had internalised their external contingencies into a new regulation. Consequently, the alumni participants feel a greater sense that the new regulation is an important part of their self-portrait, expressed through their responses to I1 (self-initiate), I10 (highly persistent) and I13 (highly motivated). Thus, these findings provide the evidence to support the appropriateness of autonomy for helping a learner to effectively internalise his/her external contingencies into a new proactive action including the capability to initiate the development plans, monitor the processes and evaluate the outcomes. The internalisation process also involves a capability to adjust their negative feelings about perceived barriers into new characteristics of self-responsible learners. These characteristics including persistence (responses to I10) and motivation (responses to I13). These new characteristics could also become the indicators of the levels to which external regulated learners have internalised. To examine the effect of internalisation on the participants over different time durations, we employed a one-way between groups ANOVA with post-hoc test (Figure 1).
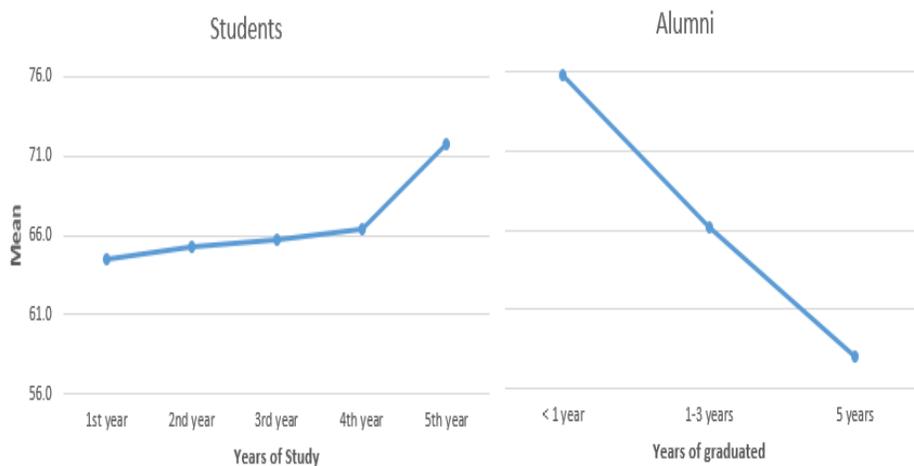

Figure 1 The mean plots

Figure 1 indicate a significantly difference at the $p < 0.05$ level over the mean score among the student participants with of five different years of study [$F_{(4, 563)} = 2.9$, $p = 0.02$]. For example, the mean score for the first-year students (M = 64.56, SD = 9.54) was different with the mean score of the fifth-year student (M = 71.73, SD = 10.6). Although, the effect size was small (Eta squared value was 0.02), these findings still indicate that the effect of internalisation on the student participants had increase over their study time. However, the capability to internalise extrinsic motivation may fade out after a certain period of time where the results of a one-way between groups ANOVA with post-hoc test over three time durations after completed their study (under 1 year, between 1 to 5 years and more than 5 years) was significantly different [$F_{(2, 485)} = 57.82$, $p = 0.00$] at the $p < 0.05$ level. With the value of Eta squared was 0.19 or a large effect size, these findings showed that the new graduates showed a higher sense of SR than those who had graduated for a longer time. These finding was supported by the result of the Turkey HSD test that revealed the mean score for the alumni participants who have graduated for under one year (M = 75.7, SD = 8.3) was significantly different with those who graduated one to five years earlier (M = 66.15, SD = 10.9) or more than five years earlier (M = 58.00, SD = 0.0).

Collectively, these findings also indicate that the internalisation process is not an instant process. Learners need to activate sense of their agency within a certain period of time for enabling them to identify several behaviours which could help them to experience a greater level of freedom. Through the obtained responses, we classified these behaviours into five categories, namely: *self-organise*, *self-regulate*, *self-control*, *self-reflective* and *self-confidence*. These five behaviours are presented in Table 2.

Table 2 Descriptive statistic for five items loaded to the first-order construct SA

	Item	Group	n	Mean	SD
12	In the development process, I should decide what competencies I want to learn	Student	568	4.15	0.87
		Alumni	488	4.24	0.83
19	For particular competencies needed to be learned, I know what to do	Student	568	4.06	0.64
		Alumni	488	4.06	0.66
11	I always put a focus on my development goals without having anything that could become a distraction	Student	568	4.31	0.93
		Alumni	488	4.40	0.96
27	No one can force me to possess appropriate competencies	Student	568	4.47	0.82
		Alumni	488	4.48	0.90
37	A constraining environment won't stop me from achieving my goals	Student	568	4.56	0.80
		Alumni	488	4.61	0.81

Note. The responses were obtained through the 5-point Likert Scale ranging from 1 (strongly disagree) to 5 (strongly agree)

Table 2 reveals that self-organise (responses to I2) is one identified positive behaviour that strongly contributes to a valid sense of agency. The participants were positively valued their self-organised behaviour because *'they could make their own decision about what competencies they want to learn'*. This finding has become the evidence for supporting our earlier argumentation that the sense of SR are correlated with learners' level of autonomy. Thus, learners with a higher level of understanding to SR will gain a greater degree of autonomy and be able to develop self-organised behaviour which affect the capability to manage their own development process.

Self-regulation (responses to I19) is the second identified behaviour and under this proactive behaviour, the sense of agency provide a guidance for learners to execute the appropriate actions. The given guidance will help learner to '*know what to do*'. Without any self-regulated behaviour, the engagement only creates non-self-determined actions. In contrast, a learner with strong self-regulated behaviour tends to have a high level of confidence in executing his/her development plan and, therefore, understand what steps should be taken toward his/her career goals. Therefore, the self-regulated behaviours plays an important role in guiding learners to attain their career goals.

Self-control (responses to I11) is the third identified behaviour. As Bandura pointed the capability of an individual to control their own environmental events, attention should be given to the approach that could help learners to '*focus on their development goals without having anything that could become a distraction*'. This particular behaviour is strongly influenced by learners' personal motives or beliefs to participate in competency-enhancing activities, although, the performed actions will personally contributing to the chosen actions for achieving the formulised developmental goals. Therefore, the locus of learners' self-control behaviour should be internal to themselves and shifting from action causality to personal causality (Bandura, 2011).

Being self-reflective, the fourth identified behaviour (responses to I37), refers to the learner's current position in the labour market. The notion of self-reflection encompasses the capability of a learner to self-examine their development. Furthermore, self-reflection process will help learners to develop their independent thinking skills which allow them to create their own approaches to improve their weaknesses. The interpretation of the self-reflection process not only changes their level of the existing cognitive structures but also changes their willingness to take over the development responsibility. As the level of self-responsibility increases, the learners would confidently show a higher degree of control over the process. For example, a learner who engages in competency development for gaining employment may reflect his current position as outside of the labour market. However, the reflection process may help him/her to address weaknesses in the particular area of competencies and develop his/her own approaches to achieve the development goals.

Self-confidence (responses to I27), as the fifth identified behaviour, is a desirable outcome when a learner takes the initiative and believes that *'no one could force him/her to engage in the development process'*. Thus, it is important for learners to have personal confidence in their own abilities to manage the perceived barriers of competency development. Indeed, they should confidently create alternatives to overcome their barriers and deliberately execute appropriate actions for achieving their goals. When the alternatives are sufficient enough to overcome the barriers, learners will gain confidence and would be better able to handle the next level of development difficulties with a minimum guidance from others.

When reviewing the role of self-awareness and evaluation in the competency development process, it is necessary to know who has experienced self-awareness and what is experienced. Table 3 reveals that the participants' behaviours (I28), accomplishment (I21), self-affected ambition (I14) and cognitive contents (I12 and I7) were the objects of the reflective self-awareness and evaluation practise.

Table 3 Descriptive statistic for five items loaded to the first-order construct SAE

	Item	Group	n	Mean	SD
28	I really ascertain about the impacts of my behaviours on my development progress	Student	568	4.23	0.64
		Alumni	488	4.17	0.60
21	I can tell whether I possess the proper competencies to gain a job	Student	568	4.38	0.84
		Alumni	488	4.50	0.81
14	It is important for me to find another more challenging task after accomplished a certain goal	Student	568	3.93	0.73
		Alumni	488	3.94	0.69
12	When I find a difficult problem, I won't give up but actively seek a solution	Student	568	4.55	0.77
		Alumni	488	4.63	0.68
7	I have no problem to stick with my development's aims and goals	Student	568	3.83	0.79
		Alumni	488	3.90	0.72

Note. The responses were obtained through the 5-point Likert Scale ranging from 1 (strongly disagree) to 5 (strongly agree)

Table 3 indicates that the role of self-awareness in competency development process were positively addressed by the participants of this study. The responses to the five items in the SAE construct also reflect how the participants' consciousness have shaped their self-awareness and provides necessary evaluations. Thus, self-awareness emerges from situations where an individual conducts a personal evaluation related to his/her responsibility in navigating competency development. This sense of self-awareness is one of the major keys to improving the competency development process. By implication, to create effective development process, the learners' interest should be shifted into a level where could develop an awareness of the necessary approaches in managing the process. However, the effectiveness of the development process is not solely depend on these particular three constructs only, but also influenced by another construct, namely: self-management.

Self-management has become an important topic in recent years as globalisation issues have forced job seekers to actively engage in the competency development processes for effectively managing their careers. The central component of self-management is the willingness of a learner to take proactive responsibility for managing competency development regarding his/her future career. Interestingly, the obtained responses reveal that the student and alumni participants have different opinions about Self-management (Table 4).

Table 4 Descriptive statistic for three items loaded to the first-order construct SM

	Item	Group	n	Mean	SD
41	I could undertake my development better if received more support from my friends	Student	568	3.53	1.15
		Alumni	488	2.86	1.22
40	I could undertake my development better if received more support from my family	Student	568	3.44	1.19
		Alumni	488	2.88	1.23
42	I could undertake my development better if received more support from my instructors	Student	568	3.56	0.96
		Alumni	488	2.91	1.13

Note. The responses were obtained through the 5-point Likert Scale ranging from 1 (strongly disagree) to 5 (strongly agree)

From Table 4, we can see that most of student participants were lack of proactive capability to individually manage their engagement in competency development as their range of mean scores was 2.86 to 2.91 which is below the median point. This analysis also indicated that they showed a high level of dependency on their friends (responses to I41), families (responses to I40) and instructors (responses to I42). Unless learners can demonstrate proactive actions in managing their own personal competency development process, they are less ready for navigating the process.

By contrast, the range of mean scores of the alumni participants were 3.44 to 3.56 or above the median point, indicated that most of them have developed self-management behaviours in their competency development. The alumni responses to I40, I41 and I42 indicate that the alumni participants felt a greater sense that SR is an integral part of themselves, expressed through their capability to be self-initiated, highly persistent, motivated and independent in navigating their competency development without relying on their friends, families or instructors.

4.3 Comparative analysis

In this paper, we applied t-test and ANOVA as the methods of comparative analysis in examining the strong relationship between the opinions of the participants related to the role SR in competency development process and their gender (*H1*), age (*H2*), level of education (*H3*), location of current competency development (*H4*), location of previous competency development (*H5*) and parents' education background (*H6*). The results of these analyses are presented as follows:

(1) There is no statistically significant gender effect on the perceptions of SR [$t(1054) = -1.68$, $p = 0.09$]. To provide stronger evidence, we separately applied another independent t-test to the two groups of participants (students and alumni). However, the results still indicate non-significant differences between gender and the group of participants [Student: $t(568) = -1.74$, $p = 0.025$]; [Alumni: $t(488) = -1.18$, $p = 0.08$]. Therefore, the hypothesis (H1) that the gender has effect on the perceptions of the participants about SR was rejected.

(2) Despite significant difference in the perception of SR between groups of alumni and student [$F(1, 1046) = 21.5$, $p = 0.001$], the results of the two-way ANOVA test reveals differences in the perceptions of SR of students and alumni participants over five age groups [$F(4, 1046) = 2.8$, $p = 0.02$]. However, both effects of the size were small and very weak (partial $\eta2$ were 0.02 and 0.001, respectively). Another result also shows that the interaction effect was not statistically significant [$F(4, 1046) = 0.4$, $p = 0.81$]. This finding of no-interaction effect was supported by the results of post hoc test using Turkey HSD which stipulated that there were no significantly differences among the mean scores in all age groups. Thus, this finding was simply interpreted as the perceptions of SR between students and alumni participants were not influenced by their groups of age. Consequently, H2 was rejected.

(3) With respect to the levels of education, this study shows that there was significant relationship between the main effect of participants' group [$F(2, 1046) = 20.94$, $p = 0.001$] and levels of education [$F(4, 1046) = 13.38$, $p = 0.001$] on the perceptions of SR with a strong effect for group related differences (partial $\eta2 = 0.05$) and weak effect of education levels (partial $\eta2 = 0.05$). However, the interaction effect [$F(4, 1046) = 0.97$, $p = 0.421$] presented in Table 5.12 was not statistically significant. Thus, H3 was rejected or we can say that the various level of education have no effect on the perception of SR for students and alumni

(4) The two-way ANOVA test indicates a significant interaction effect [$F(5, 1043) = 5.94$, $p = 0.001$] of recent experiences on the development process influencing the perceptions of students and alumni participants about SR with large effect size (partial $\eta2 = 0.13$). In addition, a separate one-way ANOVA test was employed to examine the nature of this effect. At probability level 0.05, the differences on the perceptions of SR for the seven schools on groups of students [$F(6, 561) = 8.75$, $p=0.001$] and alumni [$F(5, 482) = 40.1$, $p = 0.001$] were statistically significant. Correspondingly, the results of the post hoc test using Tukey HSD which examines the significant difference between the mean score of students and alumni participants within seven participating schools. For example, when learners participating in competency development in School A, they tends to have a significant higher perception of SR than those who developing their competencies in Schools D and E. However, there were no perception differences between students from School A and B. Thus, the finding is simply interpreted as *the current experience of competency development has positively influenced students and alumni on their perceptions of SR* and H4 was accepted.

(5) The result of the independent t-test at $p < 0.05$ in Table 5.16 indicate no significant difference in the student group regarding the perceptions of the participants who graduated from Australian high schools (M = 65.01, SD = 10.16) and those who graduated from non-Australian high schools (M = 66.67, SD = 10.54; $t(566) = 1.867$ $p = 0.06$). However, the results of the t-test at $p < 0.05$ for the alumni group show that the difference between alumni participants who graduated from Australian High Schools and from non-Australian High Schools was significant [$t(453.93) = 3.67$, $p = 0.001$] with a large effect ($\eta2 = 0.37$). These results created a confusion particularly in determining whether learners' previous development experiences have affected their perceptions about SR or not. Therefore, we separately conducted an independent t-test using a combination of both group responses as the data. The result of this t-test reveals no difference in the perception of SR from the participants who graduated from

Australian high schools (M = 69.11, SD = 10.69) and non-Australian high schools (M = 68.91, SD = 10.69; t(1054) = 0.29 p = 0.77). Therefore, H4 was also rejected.

(6) The results of the ANOVA test reveal no significant differences on the mother's education background [F(5,1055) = 1.67, p = 0.14] or father's education background [F(5,1055) = 5.05, p = 0.10] at the probability level of 0.05 in the perceptions of SR. Thus, H6 was rejected and the finding was interpreted as the capacity for accepting SR is driven by learners' own willingness, not their parents.

The results of the comparative analyses provide evidence that the opinions of students and alumni related to SR are not influenced by their gender, age, level of education, prior development experience or parent's educational background differences. This means that older and more experienced respondents may have a higher awareness of SR, but this kind of awareness does not make them automatically develop SR during the process of developing appropriate competencies. Indeed, the different interests of individuals in accepting SR are not related to their gender, age or levels of education, but to learners' current experience in the competency development process. When Candy (2004) examined the effect of learning environments on learners' capability to construe knowledge, he emphasised the transformation of knowledge from one domain to other domains. Therefore, when a learner experiences a new event, the new obtained knowledge may support or oppose his/her previous understanding of a particular subject. In several cases, this new knowledge may provide a new motivation or willingness (Oliveira, Silva, Guglielmino, & Guglielmino, 2010). Therefore Brookfield (2012) argues that the structures of understanding are obtained from how well learners construe the events. For those who are experiencing Australian engineering schools as new places to develop their competencies, the new understanding of SR in their current development environment, depending on their interpretation, may become a support or barrier for them to possess appropriate competencies.

5. Conclusion

This study has outlined the perceptions of the Australian engineering student and alumni about the role of SR in their employability competencies development process. The results of statistical analyses positively support the importance of SR and its four factors in the process of assisting students to find their own approaches in managing their own competencies development. With respect to this capability, the participants also have a common perspective about the freedom to manage their own development process along with the consequences. This sense of freedom is easier to be conceptualised than to be implemented in real development situations. For learners who come completed high school overseas, the freedom to self-manage the development process is probably a new concept. For years, they have depended on teachers/instructors in managing their personal development where all learning decisions were made by other persons. Therefore, learners' role was to passively wait to be directed by the others and fail to effectively engage in competency-enhancing activities.

This failure was shown by some student participants, particularly those who were new to the engineering school environment. Unless they could less-depend on their friends, instructors and institutions, they could not fully exercise the concept of SR in their own development process and may easily give up when confronted by perceived barriers. In contrast, self-responsible learners could develop their own approaches for effectively managing their own development process. This capability was demonstrated by the alumni participants who had internalised/integrated their external motivations into positive behaviours associated with being self-responsible learners, such as: self-organise, self-control, self-regulate, self-confidence and self-reflective. At this stage, the alumni participants understood the importance of SR for their competencies development process and transformed the concept of SR into their own development philosophy. As a consequence, the alumni participants felt a greater sense that SR is an integral part of themselves, expressed through their capability to be self-initiated, highly persistent, motivated and independent in navigating their competency development without relying on their friends, families or instructors.

This finding has implications for how SR could help learners at university level to internalise their external motivations. Like the process of constructing knowledge, SR is not something that is teachable or that automatically appears during the development process. Rather, SR is a self-determined process, guided by learners' consciousness, reflected in their awareness to self-examine their own structure of their development, including their competencies weaknesses. Therefore, when an engineering school provides an effective design of constructivist instructional environments, the perceived experiences may support learners' previous experiences and, in a positive way, become a stimulus for learners to accept SR for their own development process. On the micro level of instructional design, the effect of recent experiences in the development process also point to the creation of supportive environments that enrich their prior development experiences.

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Biography

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