

European Journal of Scientific Research
ISSN 1450-216X Vol.26 No.1 (2009), pp.66-79
© EuroJournals Publishing, Inc. 2009
<http://www.eurojournals.com/ejsr.htm>

Antecedents of Career Aspiration of R&D Professionals in Malaysian Public Organizations

Efizah Sofiah Ramly

*Department of Professional Development and Continuing Education
Faculty of Educational Studies, Universiti Putra Malaysia, Serdang, Malaysia
Tel: 603-89468111; Fax: 603-89467905*

Maimunah Ismail

*Department of Professional Development and Continuing Education
Faculty of Educational Studies, Universiti Putra Malaysia, Serdang, Malaysia
E-mail: mismail@educ.upm.edu.my
Tel: 603-89468111; Fax: 603-89467905*

Jegak Uli

*Department of Professional Development and Continuing Education
Faculty of Educational Studies, Universiti Putra Malaysia, Serdang, Malaysia
Tel: 603-89468111; Fax: 603-89467905*

Abstract

The paper analysed factors that influence R&D professionals' career aspirations in Malaysian public organizations. The study used Schein's Career Anchor Theory and Social Cognitive Career Theory (SCCT). The former describes the components that make up career aspirations, while the latter explains the cognitive-person variables (*e.g.* self-efficacy), external environment factors (*e.g.* organizational socialization) and behaviour (*e.g.* continuous improvement practices) in influencing career aspirations. The results were gathered from 158 R&D professionals of ten government research organizations in Malaysia through a survey research design. The data were analysed using descriptive statistics, Pearson Product-Moment correlation and multiple linear regressions. The results indicated that the three factors, namely, self-efficacy, organizational socialization and continuous improvement practices showed low positive linear relationships with the respondents' career aspirations. However, the results showed that self-efficacy and continuous improvement practices were found to be the main contributors to explain variations in career aspiration.

Keywords: Career aspirations, R&D professionals, Self-efficacy, Organizational socialization, Continuous Improvement (CI) practices.

1. Introduction

R&D professionals are one of the important groups of workforce in today's dynamic employment. The roles of R&D professionals are becoming all-rounded as organizations becoming more dependent upon technology and innovation and this resulted in diversity of their career path. Chen, Chang, and Yeh (2006) stated that one of the important career development programs for R&D professionals'

organizational initiative is to support their career aspirations. It is vital to provide these professionals' motivation and direction to help them to evaluate their future career development. Career aspiration is an important element in internal career that defines one's self-concept about career. This concept has also been recognized as career orientation or career anchor where it explains directions about employees' determination toward their career goals.

Research by Allen and Katz (1986) and Cordero, Ditomaso, and Faris (1994) stated that there are two distinct categories of R&D professionals namely technical and managerial groups. Nevertheless, there are certain professionals who are neither managerial nor technical aspiration category as they are more concerned with projects that capture their interest most. This alternative aspiration group is referred to as the project-oriented professionals (Allen & Katz, 1995).

Later, Petroni (2000) proposed four career aspirations route preferences for R&D professionals, which are managerial, technical, from project to project and technical transfer route. Technical transfer route is added in the aspirations as bridging the gap between basic research, engineering and production. This is an important route in transferring out R&D technology from lab to production site.

Kim and Cha (2000) argue that R&D professionals have a very distinctive nature in their career aspirations, value systems and reward preferences. They further add another type of career aspiration of R&D professionals that is entrepreneurial aspiration. Entrepreneur aspiration comes into place when the need to create profitable business on new products is soaring high in the millennium era. R&D professionals who are in this new aspiration are more liable to participate in a project that aims to build a new corporate business.

Mallon, Duberly and Cohen (2005) on the other hand identify four different terms of career aspiration among respondents of their study which are the impassioned scientist, the strategic opportunist, the balanced scientist, and the organizational careerist. The impassioned scientist is the R&D professional who is passionate about science and perceives that science is the driving factor for their career thinking and development. There are also R&D professionals who seek for opportunities and networks in their work. The balanced scientist resembles R&D professionals who accommodate science with other aspect of life, such as family, leisure, and hobby and the organizational careerist is like the managerial aspiration where they commit to research and administrative at the same time.

The various categories of R&D professionals have various views about their career aspiration. However, as Malaysian R&D professionals are concerned, little is known about their career aspirations and what affects their choices of career aspirations. These R&D professionals may differ from other senior executives in an organization, in terms of their work approach, motivations to work and the goals they wish to grasp (Reed, 2002). In view of this knowledge gap, there is a need to study about their aspiration as this would affect their career orientations and it gives implications for their career development aligned to the three career drivers particularly science, self and the organization (Mallon, Duberly and Cohen 2005). Hence, it is clear that there is an key urgent need to integrate these drivers as a model to explain R&D professionals' career aspirations.

In an effort to better understand the career aspirations of R&D professionals, this study examined the factors that might influence their career aspirations. This study was based on Schein's Career Anchor Theory as it compromises most of the career aspiration stated in past research. This approach is consistent with prior research on the career development in R&D field that has shown the influence of self-cognitive concept, environmental context and quality practices behaviour. This paper focuses on these selected factors: self-efficacy, organizational socialization and continuous improvement (CI) practices.

Information about what factors affect career aspirations might be useful to assist R&D professionals in the process of advancing their career and have important implications for human resource development. This study would contribute by giving some insights into R&D professionals' career development in Malaysia where the career path of scientific personnel could be understood through their aspirations. It also provides practical implications as to how managers could improve R&D outcome by mitigating obstacles in their career development. Thus this study might help in policy formulation for managing the R&D professionals' career. Subsequently, it could draw the

attention of human resource development personnel in providing programs for junior researchers to increase their career aspirations as effective professionals.

This paper is structured as follows. First, we relate the literature on the influences of self-efficacy, organizational socialization and CI practices on R&D professionals' career aspirations. Then we present data from our study survey and finally, the conclusions of our findings are made.

2. Career Aspirations

Career is a chosen pursuit that called profession. It is about one's working life towards professional achievement. It has traditionally been seen as a course of successive situations that makes up a person's work life. In recent times, the notion of career embraces the dimension of time as not simply about what one does for a living, but about what has been done in the past, at the present and might do in the future. Career is believed to offer structure, direction, meaning and purpose to one's daily activities (Adamson, Doherty, & Viney, 1998). Without commanding of work experiences over time and no consistent linkages between the following occupied jobs, the path of one's career will come to an end as the career route implies 'direction' and 'purpose'. Therefore, career is not merely a job, but it is about embracing ideas of planned and structured advancement that lead to career development.

McLagan (1989) conceptualizes that career development as one of the three areas of practices for Human Resource Development. The most popular goal in career development activities is to encourage the exploration of many alternatives in the profession. One of the constructs of career development is career aspirations. A clearer knowledge of the dynamics of human aspirations is essential in understanding their career development better (Gottfredson, Holland, Gottfredson, 1975). Schoon and Parsons (2002) argue that occupational aspirations exert a major influence on the development of individuals' careers. This is due to the motivation of the employees themselves that has an ambition and desire to perform the best in their work. Powell and Butterfield (2003) explain that career aspirations refer to individuals' desires for future employment.

Career aspiration is an aspect of internal dimension of career that determines success of a career. Career aspiration essentially emerges from an individual, which in turn influences one's value, norms and beliefs. It is therefore influenced by the social context and strongly related to what motivates people to choose or remain in a certain career, job and lifestyle (Baruch, 2004). In a simpler manner, different organizational context will shape different employees' aspirations toward their career. The creation of better fit job environment will improve the quality of the employees and their perspectives towards their career. For example, according to Basa, Allen, and Katz (1990), if organizations give autonomy to their scientists to choose their own approach to problem solving, this will help them setting their own goals in their career. Giving this criteria chances will make these professionals understand what their desire in the future in order to develop their work life. Therefore, career aspiration should be analyzed as one of the criteria in R&D professionals' career management.

The Social Cognitive Career Theory (SCCT) has grown out of Bandura's social cognitive theory and developed later by Lent, Brown and Hackett (1994). SCCT describes career development as a complex interaction between an individual, his/her behaviour and the environment. In later study, Lent, Brown and Hackett (2000) divided SCCT into two with the first level consists of cognitive-person variables (such as self-efficacy) that facilitate people to exercise personal control within their own career development, while the second level consists of features of environment that influence career related interests and choice behaviour.

Several studies on career aspirations of R&D professionals also adopted Schein's (1975) career anchor theory as their conceptual framework (Igbaria, Kassicieh, & Silver, 1999; Kim & Cha, 2000; Petroni, 2000; Bigliardi, Petroni, & Ivo Dormio, 2005). Schein's career anchor theory stated that individuals hold a variety of career interests. It is a set of self-perceptions pertaining to motives and needs, talents and skills, and personal values that is secured in intrinsic side of an individual. It also provides reasons for choices, as a person is likely to fulfil his/her self-image. The career anchor influences decisions to build career aspirations, where it determines an individual's view of the future.

Schein (1996) had identified eight anchors of career that guide employees' career aspiration. The explanation of each anchor is as follows:

Technical/Functional. This is an aspiration that focuses on the importance of knowledge and skill. To remain in this orientation, R&D professionals will require constant updating and learning new knowledge and technology development.

Managerial. This is an aspiration to exist in the increasingly political environment, analytical and financial skills, and interpersonal competence to function in teams and in negotiations. He/she will be responsible for major policy decisions.

Autonomy. This aspirations focuses on the self-reliance that can reduce their dependency on any particular organization or job. Employees who have already built autonomous careers will be well adapted to the future.

Security (Job and Geographic). This is an aspiration that focuses on R&D professionals who seek stability and continuity as a primary factor of their lives. They avoid risk and wanting to remain with the same employer or place.

Sense of Service. This is an aspiration to maintain an adequate income and also something meaningful in a larger context

Pure Challenge. This is an aspiration that is driven by constant challenge stimulation and difficult problems.

Lifestyle Integration. This is an aspiration to stabilize life pattern and career by setting into a given region and refusing to be moved by their company every few years.

Entrepreneurial Creativity. This is an aspiration that focuses on R&D professionals who fond of inventing things, be creative and, most of all, to run their own businesses.

These orientations show that R&D employees will need more than technical skills for them to do a job. They must also meet the managerial and creativity requirement to survive in the era of technology. Studies have shown that compatibility between employees' desires and aspirations produces high levels of job satisfaction, commitment and retention within an organization (Igbaria, Greenhaus, and Parasuraman 1991; Petroni 2000).

2.1. Antecedents of Career Aspiration

SCCT assumes that a variety of person, environmental and behavioural variables should be interrelated to increase people's career-related interests (Lent, Brown, & Hackett, 1994; Lent et al., 2005). Therefore, this study will take a further step in analyzing the important variables in SCCT that could predict the career aspirations of R&D professionals.

The first level of SCCT consists of cognitive-person variables. One of the most important cognitive-person variables that is pertinent to R&D surroundings is self-efficacy. Hackett and Betz (1981) stated that self-efficacy has implication in understanding of career development problems. Self-efficacy is a person's belief about his or her abilities to successfully carry out a task (Smith & Fouad 1999). It helps to determine how much effort people will spend on a task and how long they will uphold when confronting barriers. According to Pajares (1996) people with low self-efficacy will be depressed in confronting problems as they assume that things are tougher than they really are, while people with high self-efficacy will be more serene in approaching difficult tasks. Many studies have investigated that the key roles for growing the range of people's career options within science and technology field is by the early recognition of their self-efficacy in science, technical, engineering, and math-related (STEM) educational domains (Betz & Hackett, 1983; Lips, 1992; Foud & Smith, 1996; Nauta, Epperson, & Kahn, 1998; Buck, Clark, Leslie-Pelecky, Yun Lu, & Cerda-Lizarraga, 2008). Betz and Voyten (1997) had found significant correlation between self-efficacy beliefs and career exploratory intention among undergraduates students.

Recent studies have stated that self-efficacy is not just relevant for school students. It is also believed to have high impacts for employees especially in inventing careers that deal with patent development since scientific discovery inevitably faces technological obstacles that require sustained

effort and strong self-belief (Markman, Balkin, & Baron, 2002). Hellstrom, Hellstrom, and Berglund (2001) also found out that self-efficacy has been one of the major factors influencing R&D professionals to perceive their innovating ability and performance as they employed particular cognitive strategies to cope with certain nerve-racking aspects of the innovation process. Therefore this study suggests that self-efficacy will influence R&D professionals' career aspirations. This leads to the first research hypothesis:

H₁: Self-efficacy is positively related to R&D professional's career aspiration.

The second variable in the SCCT that is believed to have interaction with career aspiration is the environment in which organization is one of the pertinent components. Organizational socialization is the basic process by which people adapt to new organizational cultures, and new organizational roles. Organizational socialization is a process of how individuals acquire the social knowledge and necessary skills of the established ways of the organization to be a productive member in an organization (Cooper-Thomas & Anderson, 2005). Taormina (1997) defined organizational socialization of R&D professionals into four generalized construct, namely, training they received, the R&D professionals' understanding of their career in the organization, co-worker support and future prospects within the employer. Bigliardi, Petroni and Ivo Dormio (2005) found out that organizational socialization in the R&D environment had significant correlations with the R&D professionals' career aspiration. It is believed that the rapidly changing work environments encourage R&D professionals to modify their career aspirations (Allen & Katz, 1986). This leads to the second hypothesis:

H₂: Organizational socialization is positively related to R&D professionals' career aspiration.

Considering that behaviour as one of the variables in SCCT, Thomson and Heron (2006) discovered that knowledge-sharing behaviour in innovative performance of R&D professionals is significantly related to their job design. Quality-based behaviour also plays important role in the R&D environment. It had been identified that this behaviour plays significant role in enhancing R&D professionals' performance, thus affecting their career choices (Roger, 1995). A successful innovative and quality behaviour requires dynamic practices among R&D professionals while performing their work task. This dynamic behaviour that is believed to have compatibility with individuals' career aspiration is the continuous improvement (CI) practices. These practices suit the current organizational management that give priority to quality improvement behaviours in R&D. CI which is based on Deming's philosophy, one of the quality practices that describes a process consisting of improvement initiatives to increase successes and reduce failures over a duration of time. Bessant and Caffyn (1997) had developed the CI Capability Model which describes the essential behaviours for long-term success with quality improvement practices. As emphasized in this model, when employees practice CI concept throughout their work procedures, there is a tendency that they display the CI behaviour; and at the highest level of this model they might use CI as a dominant way of life. Therefore, the relationship between CI practices and career development in terms of their aspiration might be of significance. CI Capability Model is suitable to use in analyzing career aspiration of R&D professionals since the field of R&D highly emphasizes quality in the production of goods and services. This leads to the third hypothesis of this study:

H₃: The group of CI practices is positively related with R&D professionals' career aspiration.

3. Method

The data for this study were collected using a set of questionnaire. The questions on career aspirations were measured through the cumulative scores of nine dimensions proposed by Igarria, Kassiech and Silver (1999) based on the earlier work of Schein (1975). The measurement for self-efficacy used the 10-item scales developed by Schwarzer and Jerusalem's (1995). Organizational socialization was measured using 20-item Organizational Socialization Inventory established by Taormina (1994). CI practices were measured using the 30-item of CI capabilities survey created by Jorgensen, Boar and Laugen (2006). Before the actual study, the questionnaire was pre-tested on 20 R&D professionals from a selected R&D organization.

Ten public R&D organizations in Malaysia from the following sectors: agriculture, energy, transportation, medicine and defence agreed to participate in this study. Each organization was contacted through their Human Resource (HR) Division using emails, personal telephone calls and letters to explain the purpose of the research and procedures of the data collection. Respondents of this study were selected by the HR Divisions through simple random sampling procedures based on two selection criteria. The criteria include: (1) the R&D professionals must be at least have five years of working experience in R&D and (2) held at least a Bachelor degree on related field of engineering and science. A total of 158 respondents were obtained from these ten public R&D organizations. The data were then analysed using appropriate descriptive and inferential statistics. Specifically, the Pearson Product-Moment correlation and multiple linear regression analyses were used for the various specific research objectives.

4. Results and Discussion

4.1. Profile of the Respondents

As depicted in Table 1, the results indicated that 52.5 % of the respondents were males and 47.5 % females. Their average age of the respondents was 39.06 years, with 25 years as the youngest and 55 years as the oldest and a mode of 30 years. For their educational attainment, 40.5 % possessed a bachelor degree, 41.8 % with a master degree, and the remaining 15.8 % had a doctoral degree. Less than two-third (57.0 %) of respondents had 10 or less years of work experience, about one fourth (25.9 %) had between 11 to 20 years of work experience. A small percentage (16.5%) had between 21 to 30 years of experience and only 0.6% had worked as R&D professionals for more than 31 years.

Table 1: Profile of Respondents (n=158)

Profile	Frequency	Percentage
Age group (years) (M = 39.06, SD = 7.691)		
< 25	1	0.6
26 – 35	61	38.6
36 – 45	63	39.9
> 46	33	20.9
Gender		
Male	83	52.5
Female	75	47.5
Educational attainment		
Diploma/ Advanced diploma	0	0.0
Bachelor degree	67	42.4
Master degree	66	41.8
PhD	25	15.8
Working experience (years)(M = 12.40, SD = 7.563)		
< 10	90	57.0
11 – 20	41	25.9
21 – 30	26	16.5
>31	1	0.6

4.2. Levels of Career Aspirations, Self-Efficacy, Organizational Socialization, and CI Practices

Table 2 shows the levels of career aspiration, self-efficacy, organizational socialization, and CI practices of R&D professionals studied. The career aspiration had a mean score of 3.68 with a standard deviation of 0.47 based on a 5-point Likert scale implying that overall their career aspiration was relatively high. A closer look at the data reveal that half of the respondents experienced a moderate level while another half (49.4%) was at high level. The mean score for R&D professionals' self-efficacy based on a 10-point Likert-like scale was 8.01 with 0.85 standard deviation suggesting that in general, the self-efficacy level was also quite high. Closer examination of the data showed that 89.2 %

of the R&D professionals had high level of self-efficacy while the rest (10.8%) had moderate level. High level of self-efficacy among most of R&D professionals in this study indicated that they have strong beliefs about their capability and ability in their innovative-related careers.

Organizational socialization had a mean 5.23 and 3.65 and its standard deviation was 0.93 based on a 7-point Likert-like scale implying that the level was also relatively high. A more detail examination of the data shows that a total of 64.6 % had high level of organizational socialization, 33.5 % moderate level and a few (1.9%) had low level of organizational socialization. This indicated that the R&D professionals had excellent socialization in the R&D environment.

It was also found that 92.4 % of the R&D professionals received high level of CI practices and the rest of them had moderate CI practices (7.6 %). The mean score for CI practices was 3.60 and the standard deviation is 0.65 based on a 5-point Likert scale. The result showed that the majority of the R&D professionals had high innovative and quality behaviours while performing their R&D tasks.

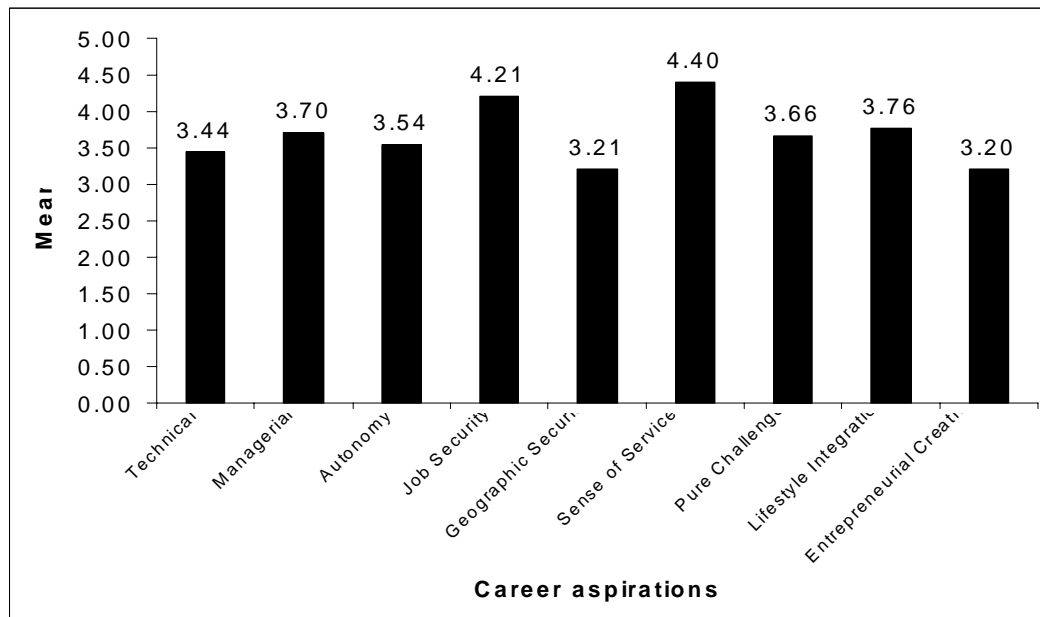
Table 2: Levels of Career Aspiration, Self-efficacy, Organizational Socialization and CI Practices

Variables	Level	Frequency	Percentage	Mean	S.D.
Career Aspiration	Low (1 – 2.33)	1	0.6	3.68	0.47
	Moderate (2.34 – 3.66)	79	50.0		
	High (3.67 – 5)	78	49.4		
Self-Efficacy	Low (1 – 4)	0	0	8.01	0.85
	Moderate (4.01 – 6.99)	17	10.8		
	High (7-10)	141	89.2		
Organizational Socialization	Low (1-3)	3	1.9	5.23	0.93
	Moderate (3.01 – 4.99)	53	33.5		
	High (5 – 7)	102	64.6		
CI Practices	Low (1 – 2.33)	0	0	3.60	0.65
	Moderate (2.34 – 3.66)	12	7.6		
	High (3.67 – 5)	146	92.4		

4.3. Career Aspirations of R&D Professionals

The average score of each of the nine career aspirations components was calculated in order to compare their levels among the R&D professionals. The results are graphically represented in Figure 1. The average scores for each of the nine career aspirations ranged from 3.20 to 4.40. Sense of services (M = 4.40), job security (M = 4.21), and lifestyle integration (M = 3.76) were the strongest aspects of aspiration; followed by managerial (M = 3.70), pure challenge (M = 3.66), autonomy (M = 3.54), technical (M = 3.44), geographic security (M = 3.21), and the lowest was the entrepreneurial creativity (M = 3.20).

The findings of this study highlight the importance of understanding antecedents of career aspirations among R&D professionals. The findings revealed a variety of career aspirations held by R&D professionals. The study suggests that R&D professionals cannot be classified just as either managerial or technical in their career aspiration as the data showed that R&D professionals did not score high on those two aspirations. However sense of services, job security, and lifestyle integration were the highest aspirations for them. Therefore, the study indicated that the dual career ladder does not provide a complete model to accommodate the career aspirations of R&D professionals. The power of the sense of services, job-security, and lifestyle integration aspirations of R&D professionals have changed today's scientific career. Therefore, employers need to realize that R&D professionals have different desires and wish to serve the community and spend more time with their families and communities (Igbaria, Kassiech, & Silver, 1999).

Figure 1: The mean scores for career aspiration components of R&D professionals.

4.4. Relationship between Selected Variables and Career Aspirations

The relationship between career aspiration, and self-efficacy, organizational socialization and CI practices was investigated using Pearson product-moment correlation coefficients. Preliminary analyses were performed to ensure no violation of the assumptions of normality and linearity. Since there were three bivariate pairs, Bonferroni adjusted alpha of 0.017 (0.05/3) was used to test null hypothesis of the bivariate pairs.

As depicted in Table 3, the highest linear relationship was found to exist between career aspiration and CI practices ($r = .316$, $p = .0001$). The positive correlation coefficient of .306 indicates that as the score for career aspiration increases so do the ratings for CI practices. The second highest was found between career aspiration and self-efficacy ($r = .301$, $p = .0001$) and the correlation coefficient indicates that there was a low positive linear relationship between career aspiration and self-efficacy. Finally, career aspiration also showed a low positive correlation with organizational socialization ($r = .291$, $p = 0.0001$). From the above data, it would seem logical to say that career aspiration is more apt to increase when self-efficacy, organizational and CI practices increase.

4.4.1. Relationship between Self-Efficacy and Career Aspiration

Table 3 shows that there was a low positive linear relationship between self-efficacy and career aspiration with $r = 0.301$ ($p = 0.0001$). This indicates that when self-efficacy increases, career aspiration increases too. This finding corresponded to the findings of previous studies (Hackett & Betz, 1981; Betz & Voyten, 1997; Smith & Fouad, 1999; Hellstrom, Hellstrom, & Berglund, 2001) and supported to SCCT. Although numerous studies of self-efficacy on career aspirations (Betz & Hackett, 1983; Lips, 1992; Foud & Smith, 1996; Nauta, Epperson, & Kahn, 1998; Buck, Clark, Leslie-Pelecky, Yun Lu, & Cerda-Lizarraga, 2008) were tested in STEM subjects of college students, similar results were found in this study on R&D professionals where self-efficacy is a significant antecedents for career aspiration based on the prediction equation. It is also believed that strong self-belief helps to overcome technological obstacles in inventing patents as scientific discovery requires sustained effort (Markman, Balkin, & Baron, 2002). This is because if an individual has a high sense of self-efficacy, they will believe that they will be able to do the task well and ultimately they will persist in challenging task and aspire for high achievement in their career. Therefore, this supports H1 that self-efficacy is positively related to R&D professionals' career aspiration.

4.4.2. Relationship between Organizational Socialization and Career Aspiration

Table 3 also shows that there is a low positive linear relationship between organizational socialization and career aspiration with $r = .291$ ($p = 0.0001$). This indicates that when organizational socialization increases, career aspiration increases, too. This finding corresponded to the findings of previous studies (Allen & Katz, 1986; Bigliardi, Petroni, & Ivo Dormio, 2005). Gottfredson, Holland, Gottfredson, (1975) also stated that as a result of socialization, people come to have aspirations. The creation of an even better fit job environment should improve the quality of the worker and help the productivity needs of employer. Therefore this supports H_2 that organizational socialization is positively related to R&D professionals' career aspiration but at a low magnitude. This might due to the saturation factor stated by Basa, Allen, & Katz (1990) that those who had been in deeply socialized would have been saturated with particular socialization that would inhibit their internal needs and aspirations.

4.4.3. Relationship between CI Practices and Career Aspiration

Table 3 further shows that there is a low linear positive relationship between CI practices and career aspiration with $r = .316$ ($p = .0001$). This indicates that CI practices are associated with career aspiration among R&D professionals. The findings of this study on CI practices behaviour support those of earlier researches and the concept of SCCT (Thomson and Heron, 2006; Roger, 1995). Bessant and Caffyn (1997) had developed the CI Capability Model which describes the essential behaviours for long-term success with quality improvement practices. These behaviours play significant roles in enhancing R&D professionals' performance, thus affecting their career aspirations (Roger, 1995). A successful innovative and quality behaviour requires dynamic practices among R&D professionals while performing their tasks. Therefore, the results support H_3 where the group of CI practices is positively related with the R&D professionals' career aspiration.

Table 3: Correlation of Career Aspiration, Self-efficacy, Organizational Socialization and CI practices.

	Variables	Y	X ₁	X ₂	X ₃
Y	Career Aspiration (25)				
X ₁	Self-efficacy (10)	0.301**			
X ₂	Organizational socialization (20)	0.291**	0.331**		
X ₃	CI practices (30)	0.316**	0.117	0.652**	

Note: Figures in parentheses are the number of items measuring each construct

** Correlation is significant at the 0.01 level (1-tailed).

4.5. The Predictors of Career Aspiration

The multiple regression statistical procedure was used to predict the independent variables that exert significant influence on the career aspirations of R&D professionals. To find out the best set of predictors of career aspiration among R&D professionals, a-three predictors multiple linear regression model was used. The three predictor variables are self efficacy (X_1), organizational socialization (X_2), and CI practices (X_3). The equation of the proposed multiple linear regression model is as follows:

$$Y = b_0 + b_1(X_1) + b_2(X_2) + b_3(X_3) + e$$

To determine the best set of predictor variables in predicting career aspiration, regression analysis using stepwise method was used. It shows that only two predictor variables were found to be significant in explaining career aspiration. The two predictor variables were self-efficacy (X_1), and CI practices (X_3). Organizational socialization (X_2) was excluded because it did not yield enough evidence ($t = 0.312$, $p = 0.755$) to contribute to the variation in career aspiration. As depicted in Table 4, the estimate of the model coefficients for b_0 is 1.738, b_1 is 0.145 and b_3 is 0.193. Therefore, the estimated model is as follows:

$$Y \text{ (QWL)} = 1.738 + 0.145 (X_1) + 0.193 (X_3) + e$$

Where:

- Y = Career aspiration,
- b_0 = Constant (Intercept)

- b_{1-3} = Estimates (Regression coefficients)
 X_1 = Self-efficacy,
 X_2 = Organizational socialization, and
 X_3 = Continuous improvement practices
 e = Error

The adjusted R-squared of 0.155 implies that the three predictor variables explain 15.5% of the variance in the career aspiration. This is quite a reasonable result for a model with three predictors of 158 respondents (Cohen & Cohen, 1983). The F-statistics (10.609) is quite large and the corresponding p-value is highly significant (0.0001).

Table 4: Estimates of Coefficients for the Model

	Unstandardized Coefficient		Standardized Coefficient		
	B	Std Error	Beta	t	p-value
Constant	1.738	0.364		4.772	0.00
Self-efficacy (X_1)	0.145	0.044	0.260	3.309	0.001
Organizational socialization (X_2)	0.016	0.052	0.032	0.312	0.755
CI practices (X_3)	0.193	0.071	0.265	2.711	0.007

Notes: $R = 0.414$; $R^2 = 0.171$; Adj. $R^2 = 0.155$
 $F = 10.609$, $p = 0.0001$

As depicted in Table 4, CI practices had the largest standardized beta coefficient (Beta = 0.265). This means that this variable makes the strongest contribution in explaining the career aspirations when the variance explained by all other predictor variables in the model is controlled for. It suggests that one standard deviation increase in CI practices is followed by 0.265 standard deviation increase in career aspirations. The Beta value for self-efficacy was the second highest at 0.260. Organizational socialization has been excluded in this prediction equation because of its low beta coefficient 0.032 and the p-value is not significant ($t = 0.312$ and $p = 0.755$). This result supports the study of Chang, Choi, and Kim (2008) where they believed that R&D professionals, who had over seven-year period after their organizational entry, would have high levels of intrinsic values toward leaving the organization and not in terms of their career aspirations. As individuals become deeply familiar with their job they concern less toward socialization but they are more liberated toward their performance and accomplishment instead of their aspirations (Katz, 1997).

5. Conclusions

CI practices were found to have the strongest linear relationship with career aspiration with moderate correlation. It also serves as an important predictor in R&D professionals' decision about their career goals. Self-efficacy was found to be important in encouraging their career aspirations. There was a significant and positive linear relationship between self-efficacy and career aspiration with moderate correlation. Finally, career aspiration showed a weak positive correlation with organizational socialization and it is not a good predictor of career aspirations. With reference to the framework of this study, it can be concluded that cognitive-person factors (self-efficacy) and behaviour (CI practices) contributed more than environmental factors (organizational socialization) to the career aspiration among the R&D professionals.

The majority of the R&D professionals did not get the high score in technical aspiration and even management aspiration. This showed that the R&D professionals have a variety of career aspirations that is beyond the traditional notion of technical versus managerial careers. Therefore, this study supports the perception that the dual career ladder is limited for managing R&D professionals' career aspiration (Igbaria, Kassiech, & Silver, 1999). Taking into consideration of the R&D environment in Malaysia, CI practices contributed more in explaining variations in career aspiration. Therefore, this study suggests that CI practices should be included in the existing model of SCCT behaviour variables by considering the R&D settings. This is believed to be a contribution to the

theory. It also supports that self-efficacy of R&D professionals plays an important role in person-cognitive variables in the SCCT.

Career aspirations can be a good catalyst in career development. Therefore, this study gives several implications for R&D professionals' career development. Junior and middle level researchers should be introduced to this concept so as to encourage them to explore their values and orientations while gathering work experiences. They should understand the importance of career aspiration so that they can define and plan clearer their career path. R&D organizations need to realize that technical and managerial orientations are not the only focus for career aspirations among R&D professionals. This suggests that organizational planning must involve individual interests and motives to encourage productive career decision making. Ganrose and Portwood (1987) also supported that a better match between R&D professionals' aspirations and organizational plans would increase their career satisfaction.

A very important implication of this study is that the factor of CI practices plays an important role in R&D professionals' career aspirations. Due to this, Human Resource Development (HRD) practitioners need to restructure the work practices of R&D professionals by strengthening the quality improvement work-procedure as it is believed this quality approach will enhance their career aspirations. Since self-efficacy was also found to be contributed to R&D professionals' career aspiration, HRD practitioners must understand why this factor plays an important role in their career-decision. This would help HR to formulate new career development programs to develop R&D professionals' self-efficacy.

Although it had been identified that there were several career aspirations held by the R&D professionals, however, this study did not explore their career aspirations with different career stages. Therefore, future study is necessary to delve into the stability of their career aspirations over time. Similarly, there are also career adjustment issues in relation to phases of career such as growth, stabilization and maintenance that can be incorporated in future research. Further research on career adjustment of R&D professionals after having new positions or promotions is worth to explore in order to gauge their personal and professional orientations in higher job environment.

References

- [1] Adamson, S.J., Doherty, & N., Viney, C. (1998). The meanings of career revisited: Implications for theory and practice. *British Journal of Management*, 9, 251-259.
- [2] Allen, T.J., & Katz, R. (1986). The dual ladder: motivational solution or managerial delusion?. *R&D Management*, 16(2), 185-197.
- [3] Allen, T.J., & Katz, R. (1995). The project-oriented engineer: a dilemma for human resource management. *R&D Management*, 25(2), 129-140.
- [4] Basa, F., Allen, T.J., & Katz, R. (1990). Work environment, organizational relationships and advancement of technical professionals. Massachusetts Institute of Technology: Sloan School of Management
- [5] Baruch, Y. 2004. *Managing careers: Theory and practice*. Harlow: Prentice Hall.
- [6] Bessant, J., & Caffyn, S. (1997). High involvement innovation through continuous improvement. *International Journal of Technology Management*, 14(1), 7-28.
- [7] Betz, N. E., & Hackett, G. (1983). The relationship of mathematics self-efficacy expectations to the selection of science-based college majors. *Journal of Vocational Behavior*, 23, 329-345
- [8] Betz, N. E., & Voyten, K. K. (1997). Efficacy and outcome expectations influence career exploration and decidedness. *Career Development Quarterly*, 46, 179-189.
- [9] Bigliardi, B., Petroni, A., & Ivo Dormio, A. (2005). Organizational socialization, career aspirations and turnover intentions among design engineers. *Leadership & Organization Development Journal*, 26(6), 424-441
- [10] Buck, G. A, Clark, V.L.P., Leslie-Pelecky, D., Yun Lu, & Cerda-Lizarraga, P. (2008). Examining the cognitive processes used by adolescent girls and women scientists in identifying science role models: A feminist approach. *Science Education*, 92(4), 688-707.
- [11] Chen, T. Chang, P., & Yeh, C. (2006). The effects of career development programs on R&D personnel in Taiwan. *Asia Pacific Journal of Human Resources* 44(3), 318-341
- [12] Chang, J. Y., Choi, J. N., & Kim, M. U. (2008). Turnover on highly educated R&D professionals: the role of pre-entry cognitive style, work values and career orientation. *Journal of Occupational and Organizational Psychology*, 81(2), 299-317.
- [13] Cooper-Thomas, H. D., & Anderson, N. (2005). Organizational socialization: a field study into socialization success and rate. *International Journal of Selection and Assessment*, 13(2), 116-128.
- [14] Cordero, R., Ditomaso, N., Faris, G. F. (1994). Career development opportunities and likelihood of turnover among R&D professionals. *IEEE Transactions on Engineering Management*, 41(3), 223-233.
- [15] Hackett, G., & Betz, N. E. (1981). A self-efficacy approach to the career development of women. *Journal of Vocational Behavior*, 18, 326-336.
- [16] Hellsrom, Hellstrom, & Berglund (2001). The innovating self: exploring self among a group of technological innovators. *Journal of Managerial Psychology*, 17, 4, 267-286.
- [17] Farmer, H.S. (1985). Model of career and achievement motivation for women and men. *Journal of Counseling Psychology*, 32(3), 363-390.
- [18] Fouad, N. A., & Smith, P. L. (1996). A test of a social cognitive model for middle school students: Math and science. *Journal of Counseling Psychology*, 43, 338-346.
- [19] Granrose, C. S., & Portwood. J. (1987). Matching individual career plans and organizational career management. *Academy of Management Journal*., 30(4), 699-720.
- [20] Gottfredson, G.D., Holland, J.L., & Gottfredson, L.S. (1975). The relation of vocational aspirations and assessments to employment reality. *Journal of Vocational Behavior*, 7, 135-148.
- [21] Igbaria, M., Greenhaus, J.H., & Parasuraman, S. (1991). Career orientations of MIS employees: An empirical analysis. *MIS Quarterly* 15(2), 151-169.

- [22] Igbaria, M., Kassicieh, S., & Silver, M. (1999). Career orientations and career success among research and development and engineering professionals. *Journal of Engineering and Technology Management*, 16(1), 29-54.
- [23] Katz, R. (1997) *The human side of managing technological innovation*. Oxford: Oxford University Press.
- [24] Kim, Y., & Cha, J. (2000). Career orientations of R&D professionals in Korea. *R&D Management*, 30(2), 121-137.
- [25] Jorgensen, F., Boer, H., & Laugen, B.T. (2006). CI implementation: an empirical test of the CI maturity model. *Creativity and Innovation Management*, 15(4), 328-337.
- [26] Lent, R.W., Brown, S.D., & Hackett, G. (1994). Toward a unifying social cognitive theory of career and academic interest, choice, and performance. *Journal of Vocational Behavior*, 45, 79-122.
- [27] Lent, R.W., Brown, S. D., Sheu, H., Schmidt, L., Brenner, B., Gloster, C.C, Wilkins, G., Schmidt, L., Lyons, H., & Treistman, D. (2005). Social cognitive predictors of academic interests and goals in engineering: utility for women and students at historically black universities. *Journal of Counseling Psychology*, 52, 84–92.
- [28] Lent, R.W., Brown, S.D. & Hackett, G. (2000). Contextual support and barriers to career choice: A social cognitive analysis. *Journal of Counseling Psychology* 47 (1), 36-49.
- [29] Lips, H.M. (1992). Gender and science-related attitudes as predictors of college students' academic choices. *Journal of Vocational Behavior*, 40, 62-81
- [30] Markman, G. D., balkin, D. B., & Baron, R. A. (2002, December). Inventors and new venture formation: the effects of general self-efficacy and regretful thinking. *Entrepreneurship Theory and Practice*, 149-165
- [31] Mallon, M., Duberly, J., & Cohen, L. (2005). Careers in public sector science: Orientations and implications. *R&D Management* 35(4): 395-407.
- [32] McLagan, P. A. (1989). Models for HRD practice. *Training and Development Journal* 43, no. 9: 49-59.
- [33] Nauta, M. M., Epperson, D. I., & Kahn, J. H. (1998). A multiple-group analysis of predictors of higher level career aspirations among women in mathematics, science, and engineering majors? *Journal of Counselling Psychology*, 45, 173-183
- [34] Pajares, F. (1996). Self-efficacy beliefs in academic setting. *Review of Educational Research*, 66(4), 543-578
- [35] Petroni, A. (2000). Strategic career development for R&D staff: A field research. *Team Performance Management*, 6(¾), 52-62.
- [36] Powell, G.N., & Butterfield, D.A. (2003). Gender, gender identity, and aspirations to top management. *Women in Management Review*, 18, 88-96.
- [37] Reed, C. (2002). To recruit the best R&D professionals, understand what drive them. *Nature Biotechnology* 20, 525-526.
- [38] Roger, M (1995). Applying quality practices to R&D. *Research Technology Management*, 38(2), 18-51.
- [39] Schein, E.H. (1975). How career anchors hold executives to their career paths. *Personnel*, 52(3), 11–24.
- [40] Schein, E. H. (1996). Career anchors revisited: Implications for career development in the 21st century. *Academy of Management Executive*, 10(4), 80-88.
- [41] Schoon, I., & Parsons, S. (2002). Teenage aspirations for future careers and occupational outcomes. *Journal of Vocational Behavior* 60, 262-88.
- [42] Schwarzer, R., & Jerusalem, M. (1995). Generalized Self-Efficacy scale. In *Measures in health psychology: A user's portfolio. Causal and control beliefs*, J. Weinman, S. Wright, & M. Johnston (Eds.), 35-37. Windsor, UK: NFER-NELSON.

- [43] Smith, P.L., & Fouad, N.A. (1999). Subject-matter specificity of self-efficacy, outcome expectancies, interest, and goals: Implications for the social-cognitive model. *Journal of Counseling Psychology*, 46(4), 7-27.
- [44] Taormina, R.J. (1997). Organizational socialization: A multidomain, continuous process model. *International Journal of Selection and Assessment* 5(1), 29-47.
- [45] Thompson, M., & Heron, P. (2006). Relational quality improvement and innovative performance in R&D based science and technology firms. *Human Resource Management Journal*, 16(1), 28-47.