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Psychological Determinants of Proactive Behavior in Semiconductor Human Resource Development

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Abstract: This study investigates how an industry–government–academia semiconductor human resource development program influences participants' psychological traits and proactive behavior. As the semiconductor industry expands rapidly, professionals are increasingly expected not only to possess technical expertise but also to proactively manage their careers and create value across organizational boundaries. Focusing on young engineers and researchers, the study examines three factors: Future Work Self, Career Adaptability (Concern, Curiosity, and Confidence), and the timing of program participation (during education, after employment, or both). An online survey was conducted among 300 young engineers and researchers, of whom 32 participants in semiconductor development programs were included in our analysis. Using fuzzy-set qualitative comparative analysis (fsQCA), the results showed that a clear Future Work Self and all three dimensions of Career Adaptability were necessary conditions for proactive behavior. Five combinations of sufficient conditions were identified, all involving Future Work Self, with Career Adaptability playing a particularly important role. Although participation timing was not a necessary condition, each participation pattern contributed meaningfully when combined with psychological traits. These findings support career construction and self-efficacy theories, emphasizing the importance of future orientation and adaptability in promoting proactive behavior. The study provides practical implications for designing training programs that enhance psychological readiness and proactive behavior among young semiconductor professionals.

Introduction

The rapidly expanding semiconductor industry in Japan has prompted the development of industry–government–academia human resource programs in regional areas (JEITA, 2023; Ministry of Economy, Trade and Industry [METI], 2023). These programs aim not only to enhance participants' technical knowledge and skills but also to foster their ability to proactively manage their careers and create value within and beyond organizational boundaries. This study examines how participation in such programs influences the psychological characteristics and behaviors of young engineers and researchers, with particular attention to proactive behavior. Focusing on Future Work Self and Career Adaptability, this study explores their relationships with proactive behavior among program participants and provides psychological

insights for designing effective workforce development initiatives in the rapidly growing semiconductor and digital industries.

Previous Research

Proactive behavior, defined as self-initiated and future-oriented actions aimed at creating constructive change in the workplace, has been linked to innovation, adaptation, and career success in dynamic environments (Parker et al., 2006). Examples include proposing new ideas, seeking feedback, and developing professional networks.

Future Work Self (FWS) has been identified as an important antecedent of proactive behavior. Strauss et al. (2012) described FWS as a salient image of one's desired future career self. A clear future image enhances career goal orientation and self-efficacy, thereby motivating proactive action.

Career Adaptability (CA) is another psychological resource associated with proactive behavior. Savickas (2005) defined CA as psychosocial resources that help individuals cope with career transitions and developmental tasks. Its four dimensions are Concern, Control, Curiosity, and Confidence (Savickas & Porfeli, 2012). Because Control has shown weaker associations with proactivity among younger populations, this study focused on Concern, Curiosity, and Confidence.

In addition, contextual experiences may shape proactive behavior. Based on Erikson's (1950) psychosocial development theory, the timing of participation in development programs may influence how individuals acquire psychological resources and engage in proactive behaviors.

Research Objective

This study aimed to clarify how psychological traits and their combinations promote proactive behavior among participants in semiconductor human resource development programs. The following research question guided the study:

Which psychological traits, or combinations of traits, promote proactive behavior among participants in semiconductor human resource development programs?

Method

A configurational approach using fuzzy-set Qualitative Comparative Analysis (fsQCA) was adopted. Unlike variable-centered approaches, fsQCA assumes that outcomes emerge through combinations of conditions and allows for multiple causal pathways leading to the same outcome. This method is particularly appropriate for small- to medium-sized samples.

The analysis examined five conditions: Future Work Self, Career Adaptability: Concern, Career Adaptability: Curiosity, Career Adaptability: Confidence, and Timing of Program Participation. Timing was classified into three categories: participation during schooling, participation after employment, and participation during both periods.

Data were collected through an online survey targeting individuals involved in semiconductor human resource development programs. The final sample consisted of 32 respondents aged 20–40 years with fewer than four years of work experience. Prior methodological studies suggest that fsQCA can yield meaningful findings with samples ranging from approximately 10 to 50 cases.

Future Work Self was measured using the Future Work Self Scale (Strauss et al., 2012). Career Adaptability was assessed using the Japanese version of the Career Adapt-Abilities Scale based on Savickas and Porfeli (2012). Proactive Behavior was measured using Ogata's Japanese adaptation covering innovative behavior, feedback-seeking behavior, and networking behavior. All psychological constructs were assessed using five-point Likert scales.

Results

The necessity analysis indicated that Future Work Self and all three dimensions of Career Adaptability—Concern, Curiosity, and Confidence—met the criteria for necessary conditions for proactive behavior. In contrast, the timing of program participation did not emerge as a necessary condition.

The sufficiency analysis identified five distinct configurations associated with high levels of proactive behavior (Table 1). All configurations included Future Work Self, suggesting that a salient image of one's future career self is a fundamental component of proactive action. Career Adaptability dimensions also played central roles across the identified pathways, although their specific combinations varied.

Table 1

Analysis of Sufficient Conditions

Condition	Configuration				
	1	2	3	4	5
Future Work Self	●	●	●	●	●
Career Adaptability: Concern	●	●	●	×	●
Career Adaptability: Curiosity	×	●		●	●
Career Adaptability: Confidence			●	×	●
During Schooling		●			
After Employment				●	●
Both	●		●		
Raw Coverage	0.097	0.433	0.223	0.085	0.259
Unique Coverage	0	0.433	0.127	0.007	0.181
Consistency	0.939	0.968	0.996	0.914	0.962
Solution Coverage			0.923		
Solution Consistency			0.959		

Note. ● = presence of the condition, × = absence of the condition.

Although participation timing alone did not explain proactive behavior, all three participation patterns contributed meaningfully when combined with psychological characteristics. Participation during schooling was associated with pathways emphasizing exploration and future orientation. Participation after employment appeared to strengthen practically oriented motivation and confidence. Participation during both periods was linked to broader psychological resources supporting behavioral transformation.

These findings suggest that proactive behavior can emerge through multiple developmental pathways rather than a single universal mechanism.

Discussion

The findings support theoretical perspectives emphasizing future orientation and adaptive resources in career development. The central role of Future Work Self is consistent with Strauss et al.'s (2012) argument that a salient future self motivates present action by providing direction and meaning. Similarly, the importance of Career Adaptability aligns with Savickas's (2005) career construction theory, which views adaptability as a critical resource for navigating changing career environments.

The results also resonate with Bandura's (1977) self-efficacy theory. Individuals who possess confidence in their capabilities and maintain clear future aspirations may be more willing to initiate actions, persist through challenges, and influence their environments proactively.

Furthermore, differences associated with participation timing suggest developmental mechanisms. Educational experiences may promote identity exploration and openness to possibilities, whereas post-employment experiences may enhance practical motivation grounded in workplace realities. Participation across both stages may facilitate cumulative psychological growth and reinforce proactive tendencies.

References

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, *84*(2), 191–215.

Erikson, E. H. (1950). *Childhood and Society*. W. W. Norton & Company.

Japan Electronics and Information Technology Industries Association (JEITA) Semiconductor Board. (2023). *Semiconductor Strategy 2023*: *Realizing Enhanced International Competitiveness*.

Ministry of Economy, Trade and Industry (2023). *Semiconductor and Digital Industry Strategy (Revised)*.

Ogata, M. (2016). An empirical study on proactive behavior and its antecedents promoting organizational socialization of young employees. *Japanese Journal of Administrative Science*, 29(2/3), 77–102.

Parker, S. K., Williams, H. M., & Turner, N. (2006). Modeling the antecedents of proactive behavior at work. *Journal of Applied Psychology,* 91, 636–652.

Savickas, M. L. (2005). The theory and practice of career construction. In S. D. Brown & R. W. Lent (Eds.), *Career development and counseling*, 42–70. John Wiley & Sons.

Savickas, M. L., & Porfeli, E. J. (2012). Career Adapt-Abilities Scale: Construction, reliability, and measurement equivalence across 13 countries. *Journal of Vocational Behavior*, 80, 661–673.

Strauss, K., Griffin, M. A., & Parker, S. K. (2012). Future work selves: How salient hoped-for identities motivate proactive career behaviors. *Journal of Applied Psychology,* 97(3), 580–598.