Moon-Ho Ringo Ho · Jeffrey C. Kennedy ·
Marilyn A. Uy · Kim-Yin Chan *Editors*

Entrepreneurship–Professionalism–Leadership

A Multidimensional Framework for Human Capital and Career Development in the 21st Century

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Foreword

Back in 1989, Harvard Business School Professor Rosabeth Moss Kanter published an article entitled "Careers and the wealth of nations: a macro-perspective on the structure and nature of career forms."[1] In that article, she described how challenges around careers involved some combination of bureaucratic, professional, and entrepreneurial contributions to the world of work. The precise definitions of these forms reflect popular usage and can be found in the introductory chapters to this book. Kanter made the straightforward point that different combinations of the three forms might be found in any single organization. However, she asserted more broadly that "national differences in career structures" could also be examined through her framework, and that "the wealth of nations, after all, rests on how the efforts of people are channeled into jobs" and, over time, into careers.

Entrepreneurship–Professionalism–Leadership takes Kanter's sociological perspective and turns it into an alternative framework to consider individual careers. Most approaches to the study of careers are psychological. They begin by looking inside people's heads, and determining individual differences to account for career behavior. Popular examples are frameworks for describing an individual's values, interests, strengths, psychological type, "big five" personality traits, and more. These approaches leave open the larger question of their wider social and economic relevance. In contrast, this book begins with Kanter's sociological view as a point of departure. It asks, how can combinations of bureaucratic, professional, and entrepreneurial behaviors become channeled into wider social forces? In turn, it proposes Entrepreneurship, Professionalism, and Leadership (EPL) theory, where acts of individual entrepreneurship and professionalism contribute to what Kanter saw as wider social phenomena, and where acts of individual leadership contribute primarily to the functioning of established bureaucracies.

When you engage with this book, you need to be aware that it may challenge your own assumptions. If you think like a psychologist you may struggle with the sociological point of departure behind EPL theory. If you think like a sociologist

[1]Kanter, R. M. Careers and the wealth of nations. In M. B. Arthur, D. T. Hall and B. S. Lawrence, Handbook of Career Theory, New York: Cambridge University Press, pp. 506–521.

you may struggle with the reduction of broad ideas to an individual level of analysis. If you think like an economist you may wonder about the need for any behavioral science perspective at all. However, careers—evolving sequences of work experiences over time—provide a conceptual foundation for looking at what different viewpoints contribute to one another. It may not help the world to stay in the comfort of your own assumptions. In contrast, it may help the world to promote wider conversations about how careers evolve, and in turn contribute to wider economic and social progress.

I believe Entrepreneurship–Professionalism–Leadership is an important book that can help build an expanding and essential interdisciplinary conversation about careers, their development over time, and their overall significance to the wealth of nations. It is essential reading if you wish to join that conversation.

Andover, Massachusetts, USA Michael B. Arthur
September 2019

Preface

Writing about or researching careers involves making generalizations, of seeking patterns in structure and ways of distinguishing various forms which usefully describe the relationship between people and work over time. Changes in the nature of work, brought about by technological developments, globalization, shifts in institutional arrangements and the like, are mirrored in changed career patterns. New patterns emerge, some forms become more or less prevalent, but multiple forms coexist. Baruch's (2015) metaphor of a career ecosystem draws our attention to the fact that certain career forms are likely to be more adaptive in some environments than others.

Toward the end of the last century, career theorists started to observe the emergence of more dynamic, non-linear careers (Arthur, Hall, & Lawrence, 1989; Collins & Young; 2000) alongside existing stable, traditional organizational employment and career management arrangements (e.g., Arnold & Cohen, 2007). Today, volatile and uncertain work environments increasingly compel workers to adopt protean career mindsets (cf. Hall, 1996). New psycho-social career meta-competencies (cf. Coetzee, 2013) are needed in order to navigate a less structured, more boundaryless (Arthur & Rousseau, 1996; Cortini et al. 2011) career space.

Given the multiplicity of career forms, there is a tendency to focus on differences—to highlight ways in which a protean career mindset differs from that of one consistent with a long-term organizational career, or to contrast boundaryless with traditional careers. While these differences are important, it is also valuable to consider commonalities. Chan et al. (2012) proposed three dimensions of career space (entrepreneurial, professional, leadership) which can be used to describe jobs, and to map people's trajectory through work experiences over time. These dimensions are as useful in describing traditional organizational careers as they are helping us to understand new and more complex career types.

This book brings together both theoretical advances and empirical research derived from Chan et al. (2012) paper. Chan et al. initial research showed that entrepreneurial, professional, and leadership (EPL) motivations are collectively related to protean and boundaryless career attitudes, and to career adaptability (cf. Chan et al., 2015b) which are relevant to the changing nature of work and

employment in the twenty-first century. Until now, published research (e.g., Chan et al., 2012; Chan et. al., 2015a, 2015b; Uy et al., 2015) on the EPL framework has focused primarily on university student data using mainly cross-sectional research designs. This book updates and extends the EPL framework both theoretically and empirically. While Chan et al. (2012, 2015b) reported studies at the individual level of analysis, this book helps readers to appreciate how EPL can also be a framework to think of careers at the level of organizations, cities, and national workforces. This book also advances our understanding of the development of EPL motivations and efficacies. Finally, readers will appreciate the application of the EPL framework in a wider range of work and educational contexts such as research–innovation–enterprise, holistic workforce development, and entrepreneurial development (relative to leadership and professional development).

This book is organized into three sections that reflect the main directions of development following Chan et al. (2012) initial paper:

- *Part 1 Theoretical and methodological advances*: EPL was initially developed as a way of helping individuals think about how their careers might unfold over time. It was first used as a means for encouraging university students to think more broadly about their career aspirations, to challenge their default assumptions about career progression, and to give them a tool for considering how they could balance entrepreneurial, professional, and leadership development in ways that could fulfill their personal aspirations. Chapter 1 extends this into a broader consideration of EPL as a conceptual tool for envisioning and describing people's career journeys while recognizing the structural dimensions of work and careers that exist in nations and societies. It discusses the importance of considering both personal factors and social context, illustrating how the EPL framework can complement extant career development approaches such as intelligent career theory. Chapter 2 recognizes the embeddedness of individual careers and career development in multilevel contexts. It demonstrates how EPL can be applied to workgroups, organizations, cities, and even at the national level, providing a common language for linking individual career aspirations with collective considerations. Chapters 3–6 focus on methodological advances by reporting a study of the measurement equivalence of Chan et al. (2012) scales across U.S. and Singapore student samples; three studies conducted in various samples from both Singapore and New Zealand aimed at developing EPL motivation scales for use with working adults; a study of stability and change in EPL motivation over time using latent difference score analysis; and an effort to develop measures of developmental readiness in EPL dimensions.
- *Part 2 Empirical applications in career studies*: In a study that focuses more on EPL efficacies than motivations, Chap. 7 presents empirical evidence to show how E, P, and L efficacies additively contribute to the prediction of self-perceived employability in a large sample of undergraduates. The findings are discussed in terms of how the EPL framework can be represented by the popular "T-shaped" metaphor which captures the need for broad transferable skills with deeper specialized knowledge. Chapter 8 introduces a new construct

and measure called "Preferences for Non-standard Work" (PNSW). Options such as independent contracting, outsourced work, and work in start-up firms are increasingly common—whether engaged in voluntarily or as a result of organizational strategies around contingent workforces. The chapter explores empirical relationships between EPL (motivations and efficacies) and student preferences for non-standard work. Finally, Chap. 9 identifies relationship between individually held cultural and universal values and EPL motivations.

- *Part 3 Applications in Innovation and Enterprise*: Chapters 10 and 11 discuss how the EPL framework is especially valuable in understanding human capital in the R&D context, and to understanding the career preferences of Science, Technology, Engineering, and Mathematics (STEM) researchers in the context of innovation eco-systems. This is a particularly relevant context for EPL, given the importance of both entrepreneurship and leadership in the management and commercialization of large scientific research projects. Chapter 12 documents the origins of Chan et al. EPL research before describing a 3-year university-wide project to develop an IT system able to support students in more holistic "T-shaped" EPL career development. The final three chapters in Part 3 summarize specific contributions of the EPL line of research to our understanding of entrepreneurship and its development. Specifically, Chap. 13 reports a longitudinal study which examines the influence of social cognitive and environmental factors in shaping pre-university students' entrepreneurial intentions. Chapter 14 uses data from the 2012–2014 Singapore Global Entrepreneurship Monitor survey to identify how EPL can assist in predicting engagement in early entrepreneurship activities. Chapter 15 uses constructs from Social Cognitive Career Theory to investigate how these interact with environmental factors to affect students' entrepreneurial career intentions.

Research interest in the EPL framework continues to grow beyond this book. Recently, Setor, Joseph, and Chan (2018) won the Academy of Management Career Division's Best Applied Paper Award for their study of objective longitudinal career data in EPL dimensions. Looking ahead, we foresee more research utilizing interdisciplinary approaches to study both career and human capital development in twenty-first-century work and career settings using the multidimensional EPL framework. We also hope to see more research that illuminates the challenges of professions and professional development in the context of increasing requirements for innovation (and ever-present bureaucracy) in the world of work and organizations.

We hope that the many chapters in this book provide readers with a broader understanding of Chan et al. (2012) EPL framework, and its utility in describing vital aspects of career motivation and development. The dimensions capture important individual differences, but can also be used to describe key elements of jobs, and of the nature of successive work experiences over a career. These chapters illustrate how the original "person-centered" framework can be extended to higher levels of analysis, including organizations and national level workforce development. The framework is compatible with traditional (organizational) and

contemporary (e.g., protean, boundaryless) conceptualizations of careers. We also hope that readers will appreciate that measures of EPL motivation, efficacy, and intentions can provide many new perspectives to phenomena that have hitherto been studied only within the narrow confines of either the entrepreneurship, professionalism, or leadership fields.

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Part I
Theoretical and Methodological Advances

The chapters in Part 1 focus on efforts to advance EPL theory and measurement since Chan et al.'s (2012) initial paper. Chapter 1 begins by exploring the interrelationship between individual-level considerations of career, and the more sociological, macro-level consideration of organizational and societal contexts. The challenge of matching a person's skills and interests with the demands of a job has expanded and now needs to take into account a much more complex and dynamic context. Individuals are taking greater agentic control of their careers, either from choice or because institutional forces are denying them traditional organizational career forms. This chapter demonstrates how the EPL framework is a useful bridge between individual and contextual aspects of career development and explores how it complements Intelligent Career Theory.

Chapter 2 continues the theme of exploring how EPL can be extended from a theory of individual differences to a useful tool for understanding and researching careers at higher levels of analysis. Successful teamwork in firms requires people to fill a number of roles, and EPL dimensions are consistent with the most important of these—innovation and creativity, technical and professional knowledge, and leadership. Thus, work groups provide opportunities for fulfilling EPL motivation and developing EPL efficacies. At the organizational level, EPL offers potential for broadening out talent management programs, considering diverse requirements for organizational success beyond a narrow focus on leadership. The chapter concludes by suggesting ways in which EPL can be used to consider career-relevant issues at the level of the city or nation.

Besides its conceptual-theoretical contribution as a way for individuals to think about their careers subjectively, Chan et al. (2012) also contributed methodologically by developing self-report measures of E, P, and L motivations, efficacies, and intentions. The remaining chapters in Part 1 reflect several different methodological advances in the measurement of EPL dimensions. Chapter 3 examines the measurement equivalence of Chan et al.'s (2012) EPL scales across two very different English-speaking countries (Singapore and the United States). Measurement equivalence provides information on the extent to which items in the scale are being

interpreted in a conceptually similar way by different groups. In general, items in the scale loaded on the same factors and have similar loadings across the two countries.

The original EPL scales were developed for use with student populations. Chapter 4 reports three studies undertaken with the aim of adapting and validating the scales for use with working adults. Samples for developing and validating the initial set of items came mainly from working adults in the healthcare, research, innovation, and enterprise sectors in Singapore, with a third sample (from New Zealand) covering a more diverse range of occupations. Confirmatory factor analyses showed that the scales had acceptable psychometric properties, and measurements reflected expected differences between survey sub-samples. The chapter concludes with a discussion on the potential of the EPL framework for talent development in the innovation economy.

Chapter 1 notes the lack of studies into the stability of EPL aspirations, contrasting this with our knowledge of the stability of vocational interests. Chapter 5 is a first attempt to fill this gap. It reports on a 4-year longitudinal study involving over 1700 university students, providing information on the different growth trajectories identified across individual EPL dimensions. The similarities and differences between STEM and non-STEM students were noted and are discussed. The chapter concludes by exploring the potential of the latent difference score approach for modeling changes in EPL motivation over time.

Chapter 6 moves beyond the existing constructs of EPL motivation, efficacies, and intentions, taking inspiration from the emerging literature on leader developmental readiness (Avolio & Hannah, 2008). This construct is based on the proposition that individual characteristics will influence the extent to which a person is able to benefit from leadership development interventions. Chapter 6 extends this construct, describing an initial empirical effort to develop and validate a set of EPL developmental readiness measures to facilitate career development research and practice around the idea of developmental readiness.

Together, we hope that these six chapters provide readers with an appreciation of the broad range of theoretical and methodological advances deriving from Chan et al.'s (2012) EPL framework, and that they will stimulate further research and applications of the framework.

Chapter 1
Entrepreneurship-Professionalism-Leadership as Dimensions of Career Space: Career Agency in the Macro Context of Boundaryless Careers

Kim-Yin Chan, Jeffrey C. Kennedy and Regena Ramaya

Abstract The emergence of the boundaryless career paradigm in the 21st century has triggered new approaches to career guidance that aim to strengthen individual agency in the context of a wide variety of work arrangements and career forms. A divide has emerged between the person-centered, psychological approach to careers versus the sociological approach that focusses on macro structural factors in society that shape individuals' careers. While the former has focused on examining within- and between-person factors like personality traits, skills, new career mindsets and attitudes, the latter has focused on studying different forms of boundaryless careers. Chan et al. (2012) offered an alternative approach; drawing on Kanter's (1989) ideas, they reframed Entrepreneurship, Professionalism and Leadership (EPL) as the dimensions of subjective career space with which individuals may envision or think of their careers. This chapter discusses how Chan et al.'s EPL framework for subjective careers complements recent career education and guidance approaches such as Arthur's Intelligent Career Theory, and the vocational psychologists' focus on certain traits, attitudes, and psychological resources. We suggest that the EPL framework presents individuals with a conceptual tool to envision and describe their career journeys in context of the structural dimensions of work and careers that exist in nations and societies. We also discuss the implications of a multidimensional approach in relation to Intelligent Career development.

Keywords Entrepreneurial · Professional · Leadership · Boundaryless careers · Agency · Context · Intelligent careers

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Introduction: Psychological versus Sociological, Contextual Views of Careers

With the rise of the post-industrial age and the knowledge economy, the start of the 21st century has witnessed a paradigmatic shift in the fields of career theory and the science and practice of career development. Just over a century ago, the world witnessed the rapid rise of the industrial age which brought with it a proliferation of occupations and a wide range of paid employment in organizations. This spurred the field of vocational guidance and its underlying science of vocational psychology, which initially adopted a "person-job fit" model (cf. Parsons, 1909) that assumed that higher levels of job performance and satisfaction could be achieved via the empirical matching of individual characteristics to job requirements.

By the middle of the 20th century, Donald Super (1953, 1957) proposed a career development model which portrayed a career as the sequence of an individual's job experiences unfolding over a life span, in the context of a broader "life space". Super's early career development ideas were aimed at helping youths to achieve career maturity or "readiness". Implicit in early 20th century psychology-based career guidance was an assumed predictability of individual vocational choices and growth based on an assumed stability of person and job characteristics and fixed stages of human development. Until the 1980s, the field of career development also assumed that most careers would unfold within single organizational settings and was largely silent with regard to the macro-level societal, economic and political forces and dynamic contextual factors that affect individuals' careers over a lifetime.

While the science and practice of career development had roots in the psychological sciences, the study of careers (career theory) had roots in macro social scientific disciplines such as sociology and organizational studies. Like their psychological counterparts, these macro social scientists also tended to focus on careers in the context of paid employment in organizations at least until the 1970s (cf. Schein, 1978; Van Maanen, 1977). However, they saw career development as an interaction between personal and environmental factors with outcomes for both. For example, Van Maanen and Schein (1977) defined career development as a "lifelong process of working out a synthesis between individual interests and the opportunities (or limitations) present in the external work-related environment, so that both individual and environmental objectives are fulfilled" (p. 36).

Several changes surfaced in the 1970s and 1980s that challenged the traditional paradigms in both career theory and career development. Tams and Arthur (2010), for example, highlighted four factors: (1) the reconfiguration of large organizations to focus more on core activities and the related flattening or delayering of organizational hierarchies and outsourcing of non-core functions; (2) increased efforts to privatize previously state-owned enterprises (e.g., utilities, transport and communications sectors); (3) popularization of a "regional advantage" view of industrial economies (cf. Porter, 1990) where work was envisioned to be more project-based, and jobs less permanent; and (4) introduction of a psychological concept of protean careers—a view that individuals can and should take charge of their careers (based

on personal values and relationships) to respond (or "change shape" in response) to opportunities or changes in the external environment (cf. Hall, 1976).

With these shifts, the boundaryless career paradigm (Arthur, 1994) emerged in the 1990s whereby careers were now seen as "owned" by the individual (an agent) existing in a broader social context beyond that of any single organization. Correspondingly, vocational psychologists and career counsellors realized the need to distinguish between (1) *vocational guidance* which aimed to help individuals to establish person-job fit (as an "Actor") for employment success within a job or kind of work; (2) *career education (and/or development)* which aimed to help individuals to strengthen their career adaptability (as an "Agent") for more sustained employability in context of work and career possibilities over a life time; and (3) *career counseling* which would employ interventions like Life Designing to help individuals to construct their careers in a broader context of their life space in the form of narratives or stories (like an "Author"; cf. Savickas, 1997, 2013; Savickas et al., 2009; Savickas & Porfeli, 2012). Therefore, in the 21st century, individual career development is recognized as driven by the need to adapt to the changing external context and requires individuals to construct their careers by identifying new opportunities and directions, and by acquiring new skills, relationships and mindsets for a future context.

Separately, organizational scientists recognized the breaking of traditional psychological contracts between employing organizations and employees (cf. Rousseau, 1995, 1996), and called for new approaches that emphasized individual agency and ownership of their careers and career development (Arthur & Rousseau, 1996). One approach that has captured much attention is Intelligent Career Theory (DeFillippi & Arthur, 1994; Arthur, Claman, & DeFillippi, 1995) which frames career development in terms of the individual's investment in one's own career capital or competencies—independent of organizational boundaries. Intelligent Career Theory is particularly relevant in the context of the post-industrial, global knowledge economy because it calls on individuals to nurture their career capital or knowledge capital in terms of three ways of knowing: (1) *knowing-why*, i.e., one's career identity and motivation, (2) *knowing-how*, i.e., one's knowledge, skills, expertise or human capital, and (3) *knowing-whom*, i.e., one's social networks and reputation in such relationships. Interestingly, this approach also portrays a somewhat person-centred, individualistic approach to career agency that appears to emphasize within-person factors largely independent of external, structures that also influence careers.

To Focus on Personal Career Agency or Career Forms/Structures?

Despite the alignment of both career theory and career development/vocational psychology fields toward a more boundaryless perspective where careers are decoupled from the organizational context, some (e.g., Gunz, 1989; Evetts, 1992; Collin &

Watts, 1996) have raised concerns regarding the divide between the mainly psychological (within/between-person) approach to careers and career development—one that focuses on strengthening individual agency, self-directedness/ownership of one's career and development and subjective criteria of "success"—versus the sociological approach that recognizes careers as shaped by social structures e.g., the economy, labor force, education and employment and employability support policy and systems, etc.

In 1989, Kanter attempted to bridge the gap between individual careers and the macro-level structures and outcomes. She examined the sociological literature on different "logics" of work and suggested that entrepreneurial, professional and bureaucratic careers are the three "principal career forms" that have emerged across societies to affect national economies. Subsequently, the emergence of the boundaryless career perspective also led to the examination of more specific boundaryless career forms. Tams and Arthur (2010) for example cite research that has examined contingent workers, skilled contractors, project workers, interim managers, entrepreneurs, and global itinerants as examples of boundaryless career forms. Looking at this list, one observes an unevenness in what qualifies as a career form. For example, contingent, contract and project work are descriptive of (non-standard) work arrangements, while managerial and entrepreneurial careers focus more on the kind of work that is actually performed. "Global itinerants" on the other hand focuses on the locational/mobility aspect of a career rather than the kind of work or task that is actually performed in a career.

Concerned, Tams & Arthur (2010) argued against the apparent proliferation of studies focusing on different boundaryless career forms by highlighting the risk of ignoring overlaps and similarities across different forms; and of ignoring variations within particular forms. They called on researchers instead to examine the "career dynamics that apply *across* a range of career forms" (italics added for emphasis). They defined career agency as "a process of work-related social engagement, informed by past experiences and future possibilities, through which an individual invests in his or her career" (p. 630; note: the idea of "investing" linking career agency to Intelligent Career Theory). They also called on researchers to recognize both independent and interdependent perspectives to career agency, which one can regard as the personal factors and psycho-social factors that shape one's career dynamics.

Implicitly then, career development (including education and guidance) for the 21st century context of boundaryless careers requires (1) a focus on the independent and interdependent aspects of the dynamics of career agency; (2) some way to represent the resources, capacities or capital in the person or the career agent; and (3) some way for individuals to understand or conceptualize careers in relation to the wide range of possible career forms, work arrangements and locations that exist in society. While it may be problematic to focus on different career forms or to assume these are fixed in some way, one cannot ignore the structural realities of the socio-economic space in which careers take shape. To avoid the problems of overlapping career forms and the proliferation of variations within career forms, a different approach may be needed for individuals to envision or describe their careers—one that allows for a wide range of possible career forms from linear to non-linear, from unidimensional

to multidimensional. This is where EPL expressed as the defining dimensions of career space provides a possible solution, enabling a diverse range of career forms to be captured with a parsimonious set of common dimensions.

EPL Framework: Reframing from Principal Career Forms to "Dimensions of Career Space"

Chan et al. (2012) adapted what Kanter (1989) had identified as principal career forms and re-expressed them as the "dimensions of subjective career space". They wrote: "Although Kanter described the career forms as three separate types, each with its own logic, we conceptualize entrepreneurship (E), professionalism (P), and leadership (L) as dimensions of career space such that all individual careers can be defined as vectors in a three-dimensional subjective career space. This career space is conceptualized as independent of Holland's (1959, 1997) RIASEC vocational interests" (p. 79). They therefore sought to propose a model that would allow for the possibility of multidirectional as opposed to simple linear career paths or trajectories (cf. Baruch, 2004); specifically, they proposed that individuals could think of their careers in terms of vectors that could move in any direction and intensity or speed over time. They argued: "our career framework can be helpful for young people who face many options among which the pursuit of expert knowledge and skills (i.e., a professional career path) is only one alternative. Instead of thinking of E, P, and L as competing career paths, students can take a more holistic view of their life-long career development by considering a three-dimensional EPL career space in which their careers may evolve over time" (p. 74).

Figure 1.1 illustrates Chan et al.'s (2012) metaphor of careers as vectors in EPL space. By reframing Kanter's (1989) principal career forms as dimensions, Chan

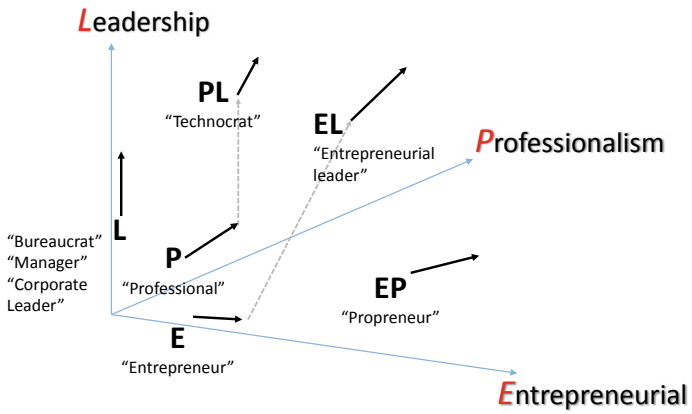

Fig. 1.1 Conceptualising careers as vectors in EPL space

et al. (2012) have provided a framework that allows individuals to envision and enact the unfolding of their careers in a space that has dimensions based on the socio-economic reality of work, while avoiding the limitations of having too many different or overlapping career forms. It also does away with the assumption of fixed career forms. To the extent that Kanter's principal career forms were derived from fundamental logics of work, the EPL dimensions relate directly to matters of career motivation and identity (i.e., knowing-why) and are not confounded with the nature of work arrangements or mobility.

One way to appreciate Chan et al.'s (2012) reframing of Kanter's typological approach is to consider this analogy: Imagine asking an architect to design a building in 3 dimensional space by identifying the 3 dimensions (e.g., length, breadth, height) versus asking the architect to design in relation to a set of well-established building forms (e.g., highrise apartments, bungalows, terrace, houses). The dimensional approach would allow for a greater range of possible building designs that can include established forms, but are not limited or bounded by them.

Career Agency and Dynamics in the Context of Multidimensional Career Space

Today, psychological and sociological/organizational approaches to careers and career guidance recognize the importance of career agency in the boundaryless paradigm. Savickas (2013) wrote: "Career education, from the subjective perspective of individual development, views clients as agents who may be characterized by their degree of readiness to engage developmental tasks appropriate to their life stages and who may be helped to implement new attitudes, beliefs, and competencies that foster their vocational adaptation" (p. 648). However, as Tams and Arthur (2010) highlight, it is also important to recognize both independent and interdependent perspectives to career agency.

Career development in the 21st century context of boundaryless careers therefore requires attention to both (1) *the independent psychological dynamics* (or the within-person interplay) between personal factors and the nurturing of what has been variously referred-to as career capital (cf. Inkson & Arthur, 2001), movement capital (Forrier & Sels, 2003), career competencies (Kuijpers & Scheerens, 2006), career resources (cf. Hirschi, 2012), and meta-competencies (Hall & Mirvis, 1995); and (2) *the interdependent psycho-social dynamics* between the career agent and the social environment (from global to national, societal to firm/organization/institution environments) in which one's career may unfold in the world. The latter includes the career space that is defined by the principal dimensions or logics of work (e.g., EPL), the variety of work arrangements and psychological contracts (e.g., full/part-time, outsourced work, etc.), the accessibility of locations (local/global; urban/suburban/rural) and physical/geographic mobility available to the individual.

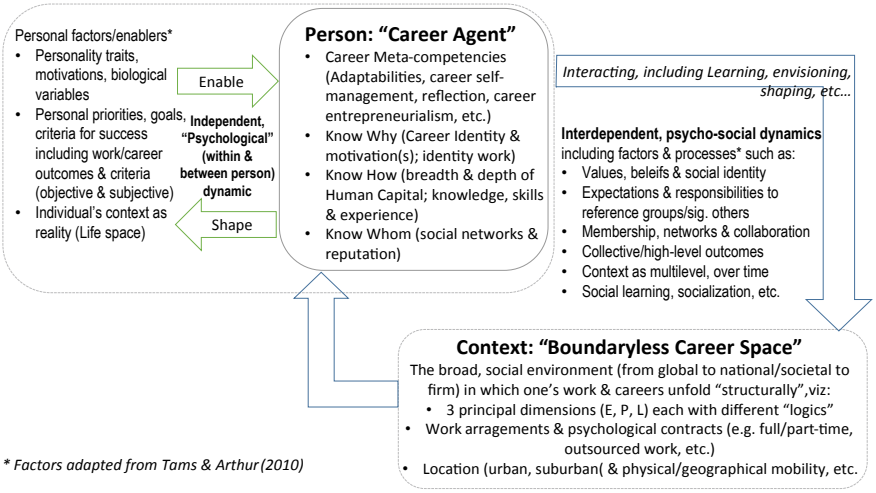

Fig. 1.2 Career education/development for agency and dynamics in boundaryless career space

Figure 1.2 incorporates Tams and Arthur's (2010) ideas regarding the independent and interdependent perspectives of career agency; it also situates Chan et al.'s EPL framework as part of the *interdependent dynamics of career development* for the 21st century context of boundaryless careers. Presented in this way, Chan et al.'s (2012) EPL framework does not replace or contradict Intelligent Career Theory. Instead it amplifies and expands the scope of the ways in which individuals can make career investments in dimensions that contribute to the wealth of nations, and is consistent with Van Maanen and Schein's (1977) definition of career development, which focuses on both within-person factors (e.g., traits, interests, values, goals, priorities) and opportunities or possibilities as they exist or are constructed in the external work related environment.

Implications: EPL and Intelligent Career Development

Intelligent Career Theory is a framework generic enough to articulate individual career development in a manner that is decoupled from organizational structures. However, the three ways of knowing (why, how and whom) still assume a person-centered view of career agency and career development and do not take into account the structures of careers as they exist in society. In a boundaryless career context, one may have to move away from assuming only fixed career forms like entrepreneurial, professional or bureaucratic careers. Instead, one could adopt more dynamic perspective suggested by Chan et al. (2012) where EPL are seen as principal dimensions of a space in which multiple career forms may be constructed or unfolded.

Table 1.1 illustrates how Chan et al.'s (2012) EPL framework amplifies and expands the scope of ways in which individuals can make career investments with respect to the different dimensions. By cross-tabulating the three ways of knowing with the E, P and L dimensions of career space, we are able to see new dimensions along which individuals may consider expanding or evolving their career identities and motivations (knowing-why) over a lifetime—either in pursuit of new opportunities or as a reaction to changes in their work/employment circumstances. Individuals whose career identities have primarily been defined vocationally or professionally may consider expanding their knowing-why along entrepreneurial and/or leadership dimensions. Similarly, individuals who have cultivated vocational/professional career networks may wish to consider building entrepreneurial and/or bureaucratic

Table 1.1 How the EPL framework amplifies and expands intelligent career theory

3 ways of knowing (Career investments or capital)	3 macro/contextual dimensions and logics of career space			Implications for 21st century career dev: People need to cultivate/manage
	Entrepreneurship (logic of value creation)	Professionalism (logic of expertise and reputation)	Leadership (logic of org. advancement)	
Why (career identity and motivation)	The value-creating and creative side of one's identity and passions	The deep/technical expert side of one's work identity and motivation	One's identity and motivation to lead, organize, influence, control	Multiple identities and motivations, varying in prominence over the course of a career
How (human capital: knowledge, skills and expertise)	Breadth viz. alertness to opportunities and the market; innovation; business planning; marketing of ideas, securing funding, etc.	Depth/specialization, currency/relevance, experiential basis underlying one's unique technical and vocation-specific knowledge skills and expertise	Breadth viz managing resources; influencing people through task, relations and change skills, styles, behaviors	Requirement for breadth and depth of human capital, complementarity of E, P, and L skills. i.e., importance of being "T-shaped"
Whom (social networks and reputation)	Investors, funders, shareholders, mentors, customers	Vocational or professional peers and community, societies, associations, etc.	Co-workers, subordinates, bosses, board, organizational regulators, etc.	Multiple functional networks, need to diversify to open up additional career options
Desired outcomes (in pursuit of)	Product, process, organizational innovations; translation from ideas to innovation	Technical excellence/Quality (standards)	Order, efficiency, direction, alignment and commitment (of people in the organization/team)	Multi-dimensional outcomes of one's work efforts

networks at some point in their careers. Finally, individuals who have only mastered professional/vocational know-how may wish to become more "T-shaped" by cultivating more transferable leadership and entrepreneurial knowledge and skills.

Table 1.1 also suggests some new research questions that may reflect the realities of career agency and development in the 21st century. Increasingly, it may be that individuals will need to develop meta-competencies to manage multiple career identities over a career life-time. Research is needed to validate if being more "T-shaped" in one's know-how or having more E, P and L networks translates into higher degrees of employability or career agency and dynamics.

Conclusion

This chapter responds to Tams and Arthur's (2010) call for "more systematic understanding of career agency and its interdependencies" (p. 630). It also attempts to relate Chan et al.'s (2012) subjective, person-centered articulation of the EPL framework to career structures as they exist in the working world. By connecting the EPL framework to Intelligent Career Theory, we also hope this chapter provides new ideas for career development and stimulates research aimed at greater understanding of the expanding range of novel work and employment contexts confronting employees in the 21st century.

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Chapter 2
Entrepreneurship-Professionalism-Leadership as a Framework for Careers and Human Capital Across Levels of Social Organization

Jeffrey C. Kennedy and Kim-Yin Chan

Abstract This chapter presents the EPL framework as a way of conceptualizing individual careers and the multilevel contexts which shape and facilitate them. We suggest ways in which the EPL framework can be used as a common language for considering careers across levels. Starting with a consideration of the EPL development of individuals over time, we discuss how EPL dimensions can relate to the concept of team roles, and how EPL profiles can assist by matching people to roles so as to facilitate skill development at the individual level as well as to benefit team performance. At the organizational level, the relevance of EPL to talent management is discussed, building on work which emphasizes the importance of moving beyond a "leadership pipeline" to a more comprehensive understanding of talent. Cities are seldom considered as contexts for careers, but urban planning has major impacts on employment opportunities, and the quality of working life. At the city level, city plans can influence the mix of entrepreneurs, professionals and leaders in the community, which in turn influences city success and attractiveness. Finally, at the national level, EPL can be used as a framework for considering workforce composition and development priorities.

Keywords Entrepreneurship · Professionalism · Leadership · Levels · Groups · Teams · Firms · Talent management · Human capital · Cities

Introduction

The individual worker has always been central to the concept of a career. The assessment of abilities and interests, matching individuals to jobs, exploring career stages, success, and satisfaction all place the individual at the center of attention. The context within which workers enact their careers is also fundamental, but has varied in its

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prominence in career theories over time. Vocational guidance, for example, focuses primarily on the match between individuals and jobs, with little attention being given to the context within which these jobs are situated. Studies of organizational careers, in contrast, have often given prominence to the structure, goals and processes of organizations as important constraints or facilitators of an individual's career.

Mayrhofer, Meyer, and Steyrer (2007) noted that while both individual and context are important, the careers field has historically been dominated by individual-centered perspectives. They sought to encourage a redressing of this imbalance by reviewing the range of contextual issues ("exogenous factors") addressed in past research, drawing on multiple disciplines to identify the importance of context to a full understanding of careers. Their discussion ranges from elements such as ethnicity and gender which (while having societal and institutional ramifications) can be seen as individual characteristics, through to broader contexts of culture, political structures and economic logics. They emphasize that consideration of context requires consideration of "the interplay between factors at various levels, starting from the individual and continuing up to societal factors" (p. 233).

The importance of multiple levels is also inherent in the concept of a career ecosystem, where "individuals, organizations, national and global institutions interact in a system that should be viewed as a single organism in symbiosis" (Baruch & Altman, 2016, p. 17). New ways of organizing work, trends in regulation of labor markets, global shifts in trade and migration, individual values around job security versus employability—these trends all require consideration of more than just the individual and the employing organization when seeking to understand careers (Baruch, 2015).

In this chapter, we describe a careers framework which is ideally suited for considering people's roles and aspirations across multiple levels—from individual career planning and development to the combination of career aspirations and efficacies at group, organization and even country or industry ecosystem level. Chan et al. (2012) proposed that careers could be considered as moving through three dimensions: entrepreneurship, professional/vocational specialization, and leadership (EPL)—a framework loosely based on the career forms Kanter (1989) identified as contributing to national economic success. Following a description of the EPL framework, we discuss how it can be operationalized at different levels. We give examples indicating the value of such an approach for considering the importance of EPL career motivations and trajectories at the level of individuals, groups, organizations, cities, and nations.

Description of EPL Framework

The EPL framework has its genesis in Rosabeth Moss Kanter's (1989) argument for an extension of career theory to the macro-level, a broader view encompassing more than just individuals and employing organizations. She presented three separate logics underpinning different career forms: *Bureaucratic careers* structured around

advancement in an organizational hierarchy; *professional careers* relying on ongoing enhancement of valued skills; and *entrepreneurial careers* centered on new value or capacity creation. Kanter suggested that economic consequences at the societal level flow from factors such as the mix of these career forms in society, tensions between them, combinations (e.g., the bureaucratization of professions), and the feasibility of transition between forms.

While Kanter's work was explicitly multilevel, the original formulation of EPL used a person-centered individual level of analysis, and focused on motivation to pursue entrepreneurial, professional/vocational or leadership careers. Unlike Kanter, who envisaged a typology of distinct career forms, Chan et al. (2012) viewed E, P, and L as dimensions rather than types. An individual's career aspirations would be informed by all three dimensions and their relative strengths, and these could change over time as the result of developmental experiences.

To develop their measures of EPL motivation, Chan et al. (2012) drew on earlier research by Chan and Drasgow (2001) that had identified three facets contributing to motivation to lead—whether a person liked leading (affective motivation), felt a sense of duty to lead (social-normative), or was willing to accept the costs of leading (non-calculative). The EPL framework uses the same three facets to consider individual career aspirations (including motivations, efficacies, and career intentions). These aspirations are seen as providing a link between other individual differences (such as personality or values) and competing career opportunities (Chan et al., 2012). Chan et al.'s early research with student samples confirmed a meaningful distinction between E, P, and L motivations, and that these could be measured with self-report questionnaires. Patterns of responses were consistent with students' majors (for example, with entrepreneurship programme students having higher E motivation, and those in Ph.D. programmes being higher on P). Furthermore, EPL motivations were distinct from Holland's RIASEC vocational interests (Holland, 1997), providing additional explanation of career intentions.

While early work focused on career aspirations of students, more recent studies have validated adult versions of the scales. The Chan et al. (2012) scales were adapted and used successfully with working adults in both Singapore and New Zealand (Chan et al., 2017; Ho, 2017; Kennedy, Winstone, & Forsyth, 2018), thereby demonstrating the relevance of the framework beyond early career stages.

Chan et al. (2012) ended their article with a number of suggestions for future applications of the EPL framework. They argued that it made a good basis for thinking about human capital capabilities of organizations, or even of national workforces. Aggregating data on EPL competencies and motivations could facilitate "organizational- or national-level human resource planning (e.g., for talent management or adjusting workforce development and education policies)" (p. 81).

EPL provides a way of bridging the gap between individual concerns and the wider consideration of context, space, and time in the evolution of careers. In addition to clarifying decisions and career paths at the individual level, it holds promise for exploring patterns in collective contexts (such as organizations and nations), and the linkages between these levels.

EPL at Different Levels

Over the last twenty years, theorizing and research in management has increasingly accepted the importance of incorporating context so as to capture the "general messiness of organizing across individuals, teams, and departments" (Paruchuri, Perry-Smith, Chattopadhyay, & Shaw, 2018, p. 797). The behavior or attributes of an individual influences outcomes not only for that individual (and others), but also contribute to outcomes at higher levels (such as the person's work group or organization). Similarly, policies and values enacted at group or firm level provide a context which shapes relationships between behavior and outcomes at the individual level.

Talent management is one example of an organizational process which seeks to create linkages between individuals and higher-level outcomes. Ployhart and Moliterno (2011), for example, use multilevel theory to propose ways in which knowledge, skills and abilities which exist at the individual level combine to create human capital at the unit level. While emerging from individual attributes (and partially isomorphic with them), this unit level capacity is not identical to the sum of the individual parts.

Turning to the EPL framework, consideration of issues at different levels opens up a number of avenues for extending our understanding of the interaction between individuals and contexts (such as work groups, organizations, cities, and nations) in the shaping and enactment of careers.

Individual Level

As noted above, a key difference between Kanter's typology and the EPL framework is that E, P, and L are conceptualized as *intra-individual dimensions* rather than as relatively fixed career forms or types. Different people vary in the strength of their motivation and efficacies relating to the three dimensions, and these levels are not fixed. This is important not just in terms of individual career paths, but also in terms of how the patterns of individual EPL motivations combine and develop in the context of groups and organizations.

To date, there have been no longitudinal studies of individual changes in EPL profiles over time. Chan and Drasgow (2001, p. 496) characterized motivation to lead as "a dynamic construct that is partially changeable through social-learning processes and experience" and the same is likely to hold for professional/vocational and entrepreneurial motivation. Changes could occur in the strength of E, P and L motivations, and such changes may also result in shifts to the relative ordering of EPL motivations.

Stability of EPL Motivations and Efficacies

Longitudinal studies of individual career motivation are needed in order to clarify the extent to which EPL patterns remain stable over time. We know that vocational interests show very high stability, particularly from the age of 18–22 or so (Low, Yoon, Roberts, & Rounds, 2005), and that these interests are highly predictive of occupation (see, for example, Fouad, 1999). On the other hand, careers involve movement through various jobs and roles over time. Savickas (2005) has noted how changes in the nature of the work environment have led to vocational interests becoming more dynamic. Career stages (such as exploration, establishment, or disengagement) take place in "minicycles" around career transitions. Given the stability of vocational interests, these transitions often occur within the same broad occupational area—but may well vary along EPL dimensions.

Transitions from one job into another which continues to emphasize ongoing use of vocational or professional skills and knowledge, perhaps at a more advanced or demanding level, are consistent with P motivation. Job transitions might also include increasing responsibility for other people, or for managing resources (L motivation). Finally, moves into establishing one's own business, or seeking opportunities for innovation within larger firms (intrapreneurship) represent the outcome of E motivation. Thus, understanding the process by which a career is created requires insights not only into vocational interests, but also into EPL motivation.

Figure 2.1 illustrates how these kinds of individual career development trajectories can be depicted using the EPL dimensions. Figure 2.1a illustrates the case of a person developing from a mainly professional or vocationally motivated individual into one with increasing motivation and self-efficacy for leadership roles. Figure 2.1b is more complex, depicting a person whose dominant professional or vocational motivation is supplemented with entrepreneurial and leadership aspirations. Seeking out roles to fulfil these aspirations (either as an intrapreneur or entrepreneur) provides the opportunity to build skills and self-efficacy, resulting in further strengthening of E

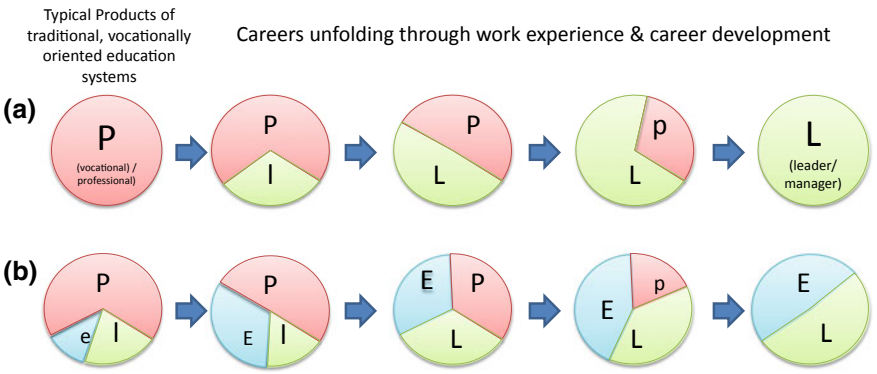

Fig. 2.1 Individual career advancement in EPL dimensions

and L aspirations. P motivation becomes less dominant, and the person's subsequent career is oriented around the role of entrepreneurial leader.

One pattern of transitions in particular, that of moving from one job into another of increased managerial responsibility, was, for many years, seen as synonymous with 'career' (Evetts, 1992). This 'reification' of careers involving moves along the L dimension of EPL space also had the effect of explicitly devaluing other forms of careers, and the people who followed them—the "teachers who would prefer to stay in the classroom" and the "nurses who would stay on the wards and prefer patient contact" rather than move into managerial roles (Evetts, 1992, p. 7). In contrast, the EPL framework does not prioritize one motivation over another, but provides a means for describing the patterns of choices made by individuals over time.

The spiral in Fig. 2.2 illustrates how a career might unfold (both subjectively and objectively) in 3-dimensional EPL space. This contrasts markedly with a traditional career characterized by reduced P and increased L responsibilities over time. Shifts might involve reducing L to increase P (e.g., a university or research institute manager stepping down to resume research), a shift from P to E (commercializing a research discovery), E to L (scaling up the business), and so on.

Identifying patterns in transitions is a start, but understanding the nature and antecedents of such transitions is also important. For example, do transitions (e.g., from P to L) occur on an incremental basis, with the strength of L motivation growing over time as a result of experiences in the workplace and increasing self-efficacy (Chan & Drasgow, 2001)? Or can certain experiences or external demands (similar to the idea of developmental challenges (McCauley, Moxley, & Van Velsor, 1998) or crucibles (Bennis & Thomas, 2002) in leader development) trigger a step change in the level of a particular motivation? How does the malleability of EPL motivations and efficacies vary across individuals, as a function of personality, values, or past experiences? How do the networks people interact with influence their motivations?

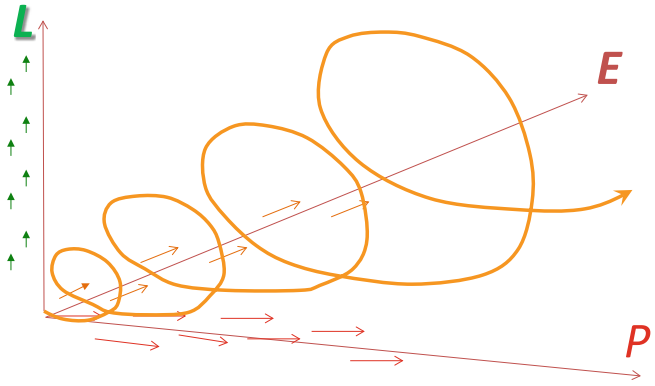

Fig. 2.2 Careers unfolding in EPL "space"

Which levers (e.g., experience, network influence, formal development, career interventions, etc.) are most powerful in bringing about change (and at what stage in a person's career are they most impactful)?

Intelligent career theory (Arthur, Khapova, & Richardson, 2017) provides a useful framework for considering EPL development over time. The theory distinguishes three inter-related forms of "career capital" (Inkson & Arthur, 2001). This capital is analogous to financial capital, providing individuals with a return on their investment, and opening up new possibilities as a function of increasing strength and diversity of their capital. The three forms of capital are based on the accumulation of different kinds of knowledge. *Knowing-why* relates most closely to motivation. As Arthur, Khapova and Richardson (2017) argue, this goes beyond basic vocational interests or the need to earn an income. Developing a deep understanding of knowing-why requires a breadth of experience, coupled with reflection aimed at uncovering one's uniqueness, and separating out subjective aspirations from the external forces and internalized definitions of career success which can subvert individual efforts to the service of organizational objectives.

Arthur et al. (2017) point out that employer requirements and external forces compete with more personal motivations (e.g., to be happy, or to follow one's own path) in determining where and how people work. Employer expectations, beliefs about "normal" career paths, family role models and other influences can all shape the direction a person follows. However, the EPL framework emphasizes the fact that all individuals have elements of all three motivations even if—in some individuals or at certain times—one of these is dominant. EPL therefore provides a multidimensional benchmark by which people can evaluate which different aspects of their work provide intrinsic satisfaction and fulfillment. Is it increasing mastery of a skill or knowledge area? The opportunity to innovate? Or to marshal people and resources in the pursuit of outcomes beyond those able to be accomplished by a single person?

The other two forms of knowing which comprise career-capital (knowing-how and knowing-whom) interact with knowing-why (and with each other). *Knowing-how* refers broadly to competency—the objective knowledge and personal experience which enable a person to be successful at work. Arthur et al. (2017) encourage a portfolio approach to knowing-how, seeking to build competency while "remaining open and flexible to new ways of work" (p. 68). While their concept of a portfolio goes beyond EPL efficacies, the three dimensions provide a useful structure for considering the extent to which skills development (with respect to vocation or profession, innovation and entrepreneurship, and leadership) are being developed in a way consistent with one's knowing-why.

Knowing-whom highlights the importance of other people (e.g., professional and social networks, community groups, mentors, work groups) in the development of both competency (knowing-how) and motivation (knowing-why). Mentors, for example, can share knowledge to enhance P efficacy; a community group could provide the opportunity to try out leadership skills, helping clarify L motivation and efficacy; choice of an appropriate reference group might open up new possibilities for moving into entrepreneurial or leadership roles.

Team/Group Level

A number of typologies have been developed for characterizing the various team roles needed in order for teams to operate effectively. One of the most influential is that by Belbin (1981, 1993) who delineated nine different roles (plant, resource investigator, co-ordinator, shaper, monitor evaluator, teamworker, implementer, completer finisher, and specialist). Belbin argued that individuals tend to have a propensity for a particular role, though "competent managers seem to be able to function well in both a primary and secondary team role" (1993, p. 115). Successful execution of these roles contributes not just to team effectiveness, but also to individual satisfaction and career capital. This suggests that EPL may offer a way to link experiences of group work with considerations of career success.

Roles can be defined as the "behavior patterns that are adopted, and performed, as a consequence of influences of personality, ability, values, motivations, experiences, learning, and context" (Ruch, Gander, Platt, & Hofmann, 2018, p. 190). Proponents of team role theory argue that team effectiveness requires the presence of the full range of roles (see, for example, Belbin, 1981, 1993; Margerison, McCann, & Davies, 1986; Ruch et al., 2018). Given the importance and prevalence of teamwork in contemporary organizations (Mueller, Procter, & Buchanan, 2000), it is important that firms have people willing to take on such roles. Understanding individual EPL motivations can provide insights into the likelihood that people will seek to engage in the variety of required team roles.

Using the Belbin (1993) framework as an example, it can be seen that EPL motivations are related to many of the key roles. Entrepreneurial motivation is consistent with the roles of Plant (creative, imaginative, unorthodox) and Resource Investigator (explores opportunities). Several roles comprise aspects of leadership, such as Co-ordinator (clarifies goals, promotes decisions) and Shaper (drive and courage to overcome obstacles). Finally, roles such as Specialist (provides knowledge and skills in rare supply) and Monitor Evaluator (sees all options, judges accurately) seem closely aligned to professional motivation in the EPL framework.

Understanding individual differences in EPL motivations therefore provides some access to ways in which people can be matched to different team roles. If EPL profiles are assessed as part of an organization's career management processes, this information will be available to individuals, and can assist them as they engage in team activities. The most prevalent team role models are accompanied by commercial survey instruments aimed at providing detailed information on individuals' preferences for different roles. Research into the relationship between EPL profiles and these team role inventories would provide a more robust basis for linking EPL to team participation.

Roles can also be seen as opportunities to try out skills consistent with different EPL dimensions, helping to clarify an individual's motivational preferences, contributing to development of self-efficacy, and shaping intentions for future career decisions. A high-P person who traditionally takes on the Specialist role in teamwork could be encouraged to explore roles more consistent with E or L as a low-stakes

way of skill-building, of gaining experience with which to flesh out a "work portfolio" (Arthur et al., 2017). Such experiences will help crystalize career intentions, identifying unattractive as well as more appealing career directions.

Firms might also consider the EPL composition of teams as a function of the tasks or challenges the team faces. For example, a scientific team engaged in innovative research with the intention of commercializing discoveries will require a preponderance of members with strong P motivation (leavened with L) in the early stages. However, as the focus shifts away from pure research and into the commercialization phase, E inputs will become more valuable. Figure 2.3 extends this idea by considering two different models for thinking about EPL roles in such teams. Figure 2.3a illustrates a somewhat hierarchical model of team leadership with a generalist manager leading a team comprised mainly of specialists, and acting as the boundary interfacing with an entrepreneur outside the team. Figure 2.3b illustrates the possibility of a more distributed-leadership team model. Everyone in the team presents different E, P, and L capacities, and one could think of the team-level EPL capacity as a macro-aggregate of the team members' strengths.

Chan et al. have demonstrated that people who are high on all three EPL motivation dimensions are highest in boundaryless and self-directed career attitudes (Chan et al., 2012). Is there a group analogue for this? Will the mix of individual EPL motivations have an impact on group-level processes and outcomes? One could imagine that different combinations at the individual level will shape the nature of deliberation and action within the group. A group with high levels of P (coupled with low levels of E or L) among its members is likely to differ in its approach to tasks when compared with a group which has a more even spread of EPL aspirations. EPL aspirations comprise three sub-dimensions (of motivation, efficacy and intentions), and each might influence different aspects of group processes.

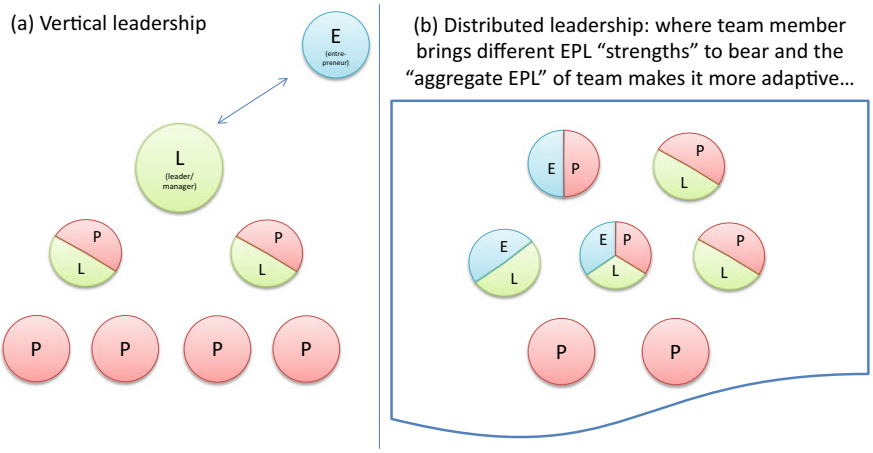

Fig. 2.3 Models of team leadership with members' EPL profiles

How can we move from individual EPL profiles, to a measure which captures a group level construct relevant to EPL? Chan (1998) outlines a typology of composition models for aggregating lower-level measures. A simple and commonly used approach is to take the average of lower level measures (an additive model). Thus, if all group members are high on EPL, the group-level analogue will also be assessed as high. While this might be functional for an individual, teams might benefit from greater variation. Instead of aggregating by averaging, perhaps a model based on identifying threshold values may be more predictive of group outcomes. Is it necessary for all members to be high on L aspirations? Or is the presence of only one high L enough to facilitate emergent leader requirements (in the absence of a formal leader)? Is it enough to have only one member high on E when a group needs innovative thinking to accomplish a task? Or is a larger critical mass required?

In contrast to the additive model, a dispersion model of composition (Chan, 1998) captures variation across individual EPL profiles. Having high diversity may be supportive of certain group processes. For example, processes such as leadership emergence, conflict, creativity, knowledge sharing and the like will be influenced by the extent to which different individuals in the group have motivation and efficacy to engage in related activities.

Top management teams of organizations are another example where the composition of EPL profiles should be carefully considered. We know that levels of personality traits (such as conscientiousness) and leadership style have measurable effects on organizational performance (see, for example, Colbert, Barrick, & Bradley, 2014). The nature of a firm's challenges and external environment also suggest that levels of EPL motivation at senior management levels will affect performance. For firms operating in dynamic markets where innovation is a key component of attaining competitive advantage, it is important that the top management team includes high-E managers, comfortable with entrepreneurial roles even if part of a large organization (Teece, 2016).

This discussion of EPL in teams is necessarily speculative, but it is consistent with studies into team composition using team roles (as discussed above) as well as other work considering individual differences (e.g., in ability, personality, specific skills, team skills, etc.) in teams. Mathieu, Tannenbaum, Donsbach, and Alliger (2014) provide an excellent summary of various team composition models, highlighting the importance of considering more than just technical skills in selection of team members. We therefore suggest that consideration of EPL will also be valuable in the context of team performance, and using teams for skill development.

Organization/Firm Level

In this section, we discuss how EPL can provide a useful framework for viewing a firm's talent management processes. Often narrowed down to a focus on filling the "leadership pipeline", talent management requires consideration of more than just leadership identification and development.

Achieving the right balance of talent in an organization is a key concern of senior management (Groysberg & Connolly, 2015). A recent PwC survey of 1,378 Chief Executives around the world (PwC, 2019) revealed "availability of key skills" to be the third most highly ranked threat to their organizational growth, and over half of respondents felt that the lack of key skills was impeding their ability to innovate effectively. Shortages in particular skills (e.g., science, technology, engineering, maths—STEM skills) were affecting companies' ability to benefit from new technologies (e.g., AI, robotics).

It's not just talent scarcity which is a problem. Practitioners are questioning traditional bureaucratic talent management approaches, pointing to their lack of responsiveness in volatile and dynamic business environments. Vansteenkiste (IEDP, 2019) argues that talent must be "managed from the employee up, not from the system down." Leaders need to "create broader based talent pools and tap into the key capabilities represented in those pools, in line with what is required strategically for future growth of their organisation." Such an approach requires understanding not just individual skills, but the aspirations and expectations of individual employees regarding their development (as leaders, specialists, or intrapreneurs).

Teece (2016), while acknowledging the need for operational management and leadership in large firms, also highlights a critical requirement for entrepreneurial management. While entrepreneurship has historically been associated with smaller new ventures and startup firms, the importance of entrepreneurial behavior to the strategic competitiveness of large firms is receiving increased emphasis. Firms that are unable to adapt to shifts in technology, market structures or competition are at greater risk of failure, compared with better adapted rivals (Hannan & Freeman, 1984). Strategic success in rapidly changing markets requires firms to develop dynamic capabilities (Teece, Pisano, & Shuen, 1997). Such capabilities depend on managers with strong entrepreneurial and leadership abilities, the "ability to sense opportunities and shifts in the business environment, to coordinate the resources to exploit promising new avenues, and to develop plans to adapt the organization and its business model for maximum advantage" (Teece, 2016, p. 207).

In a similar vein, Collings, Mellahi and Cascio (2019) argue for a definition of global talent management which "broadens the agenda beyond the senior organizational leaders who are often assumed to be its focus and underscores the importance of other pivotal positions that disproportionately contribute to the organization's sustainable competitive advantage" (p. 543). Over the past thirty years, large firms have increasingly moved away from developing talent internally and embraced external recruitment to fill key positions (Cappelli & Keller, 2017). The shortage of key talent creates pressure for a return to internal development, but (as noted by Cappelli and Keller), this will require innovation in both the approaches taken and the types of development required.

Thus, while organizational talent management programs have traditionally focused on the "leadership pipeline", they must also increasingly address development of entrepreneurial, technical and professional skills required for ongoing and sustained future business success. The EPL framework has three key aspects which make it ideally suited for this broader orientation towards talent management.

Firstly, it focuses on individual career aspirations in a manner which generalizes across vocational specializations, providing a basis for a "bottom up" approach to talent development. Secondly, it provides a way to measure individual self-efficacy with respect to the EPL components. Finally, it can also be applied to individual jobs and roles within organizations, identifying the extent to which they require (or can be used to develop) EPL competencies.

In Chap. 6 of this book, Chernyshenko, Ho, Chan, & Yu (2020) propose the development of a short suite of diagnostic items which could assist organizations to implement an EPL-based process for talent management. Existing measures (Ho, 2017) can identify employee EPL aspirations, with efficacy measures being used to assess current competency for a particular career track. These measures could be supplemented by monitoring employees' motivation and desire to develop EPL skills. Together, these three constructs relate to developmental readiness, a key antecedent of a person's likeliness to benefit from formal (Maurer, Lippstreu, & Judge, 2008) and informal (Cerasoli et al., 2014) learning. With jobs and team roles differentiated according to the mix of skills required in terms of leadership, innovation, and professional or technical skills, it becomes possible to match developmental readiness with developmental assignments and promotions.

Use of the EPL framework in talent management also holds potential for broadening out the range of career options which are valued in organizations, and seen as feasible options by employees. This can be illustrated by considering two contrasting perspectives on career progress. Earlier, we noted the strong historical tendency to equate upward movement through higher levels of management with career success (Evetts, 1992). In contrast, organizations employing many professionals (e.g., health sector, professional services firms, universities) often face challenges enticing specialists to move into leadership roles. Dickinson, Ham, Snelling and Spurgeon (2014, p. 123) write of "the need to value doctors who become leaders and to avoid the perception that in doing so they are going over to 'the dark side'". Similarly, Rottman, Sacks and Reeve (2014, p. 356) found a strong sense of "cognitive dissonance between their [respondents'] professional identities as engineers and their views of leadership as antithetical to these strongly held identities".

How can these self-limiting perspectives on career success be challenged? Different jobs in organizations can be profiled in terms of their E, P, and L components. Instead of viewing a clinician's move into management as an either/or transition, workforce planning and employee development processes can emphasize the multidimensional nature of jobs throughout the organization. Workforce planning coupled with consideration of individual career aspirations can seek to develop EPL efficacies through person-job matching, identifying E, P, and L attributes of specific jobs, and signaling the importance of all three dimensions (and their coexistence in varying levels in all jobs) rather than elevating one above the other. By providing opportunities to build self-efficacy in EPL, employees will be better placed to follow careers which match their own interests and aspirations, and the organization will be more likely to have a diverse pool catering to intrapreneurial (Chan et al., 2017), professional and leadership roles.

Cappelli (2017, p. 36) comments on the "startling lack of evidence detailing contemporary internal careers" and that we know little about the "factors that predict the path an individual is likely to take". Using EPL to map demands and developmental potential of jobs, and to link these to employee development and talent management, will provide an additional perspective on how internal careers are shaped. Network analysis could be used to explore "knowing-whom" connections in an organization. Do the clinical specialists in Dickinson et al. (2014) have strong knowing-whom links to managers, enabling them to enhance their awareness of the importance, challenges, and contributions of leadership in the health sector, thereby enhancing motivation (knowing-why) to take on roles which develop their leadership skills?

An organization's success depends on its ability to "integrate, build, and reconfigure both internal (e.g., human capital) and external resources in response to dynamic global business and environmental contexts", and this ability is a function of "how individual competencies are combined and how employees interact in productive combinations" (Collings et al., 2019, p. 544). As we have argued above, firms need combinations of entrepreneurial (or intrapreneurial), specialist and leadership competencies. Figure 2.4 illustrates how a firm or organization's human capital may be depicted in terms of various project teams, different EPL talent compositions that are based on the EPL capacities (motivations and skills) of the members. In the same way that important economic consequences for society flow from the pattern of career forms in society, important consequences for organizational performance flow from the EPL profiles of a firm's human capital.

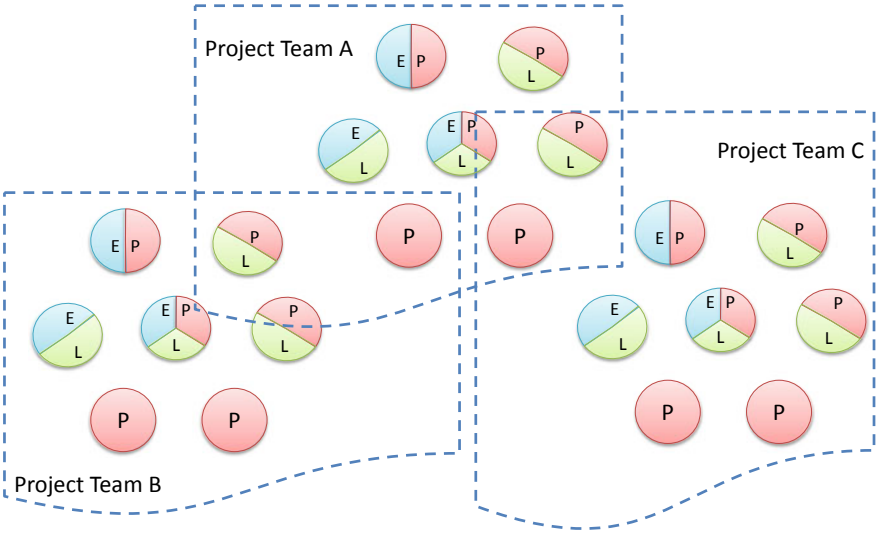

Fig. 2.4 EPL model of firm with various project teams

City

Cities are an under-researched context within which careers unfold (Kennedy, Chan, & Arthur, 2016). Cities create employment opportunities, and their characteristics (such as housing, amenities, transport infrastructure) significantly influence the quality of working life. Urban geographers, sociologists, economists and others have explored aspects of employment in cities (see, for example, Glaeser, 2011; Moretti, 2012; Tonkiss, 2013) but careers researchers have been largely silent. The EPL framework provides one perspective for opening up the interrelationships between individual careers and cities, and for also exploring links between careers and the economic success of cities.

Entrepreneurship is often given a position of prominence when discussing the economic performance and attractiveness of cities; Glaeser, for example, argues that "[s]mart, entrepreneurial people are the ultimate source of the city's economic power" (2011, p. 132). Entrepreneurs are clearly important—creation of every new high-tech job results in as many as five additional jobs being created (Moretti, 2010), and the number of small entrepreneurial firms is an important predictor of employment growth (Glaeser, Kerr, & Ponzetto, 2010). However, entrepreneurship is not enough on its own.

A seminal study of the US biotechnology industry (Zucker, Darby, & Brewer, 1998) demonstrated the importance of deep scientific knowledge coupled with entrepreneurship in the success of these businesses. Scientist-entrepreneurs combining high E and P motivations facilitated the creation of these firms, but an ecosystem of specialists (finance, law, logistics, consulting and other fields) is necessary for entrepreneurial ventures to scale (Moretti, 2012). The presence of universities in a city is further evidence of the importance of having a critical mass of people with deep professional skills, with knowledge spillovers benefitting the private sector (Jaffe, 1989). More broadly, 'knowledge-based occupational communities' (DeFillippi, Arthur, & Lindsay, 2006, p. 65) are an important means for creating and sharing knowledge. While it might be argued that modern information and communications technology allow such communities to exist across a dispersed geography, past studies (e.g., Gaspar & Glaeser, 1998; Saxenian, 1996) suggest that geographic proximity (as provided for in cities) will still be an important determinant of information sharing.

While leadership is typically a less salient component of an entrepreneur's identity (Kempster & Cope, 2010), leadership is required for new business ventures to make the transition to successful larger organizations contributing to employment and economic growth. The performance of cities (not just economically, but in terms of sustainability and livability) is also a function of leadership (Hambleton, 2015), and leadership effectiveness contributes significantly to firm performance (see, for example, Bertrand & Schoar, 2003; Hambrick & Quigley, 2014). Entrepreneurship, professional/vocational expertise, and leadership combine in creating cities as contexts facilitating diverse career paths.

From this brief discussion, it is clear that all three dimensions of the EPL framework are important, and that strategies to create 'magnet'

cities (Haynes & Langley, 2014) must go beyond just the consideration of entrepreneurs. Pathways which enable people to move from specialist to entrepreneurial roles, move from professional or entrepreneurial roles into leadership, or to operate along dual dimensions (technopreneur, technocrat) are needed. Firms are increasingly less likely to invest in developing their own staff, preferring to rely instead on external recruitment (Cappelli & Keller, 2017). As most people who change employers shift to another in the same city (e.g., Schmutz & Sidibe, 2015), cities have important responsibilities in the field of careers.

City planners already attend to multiple issues relating to the livability of a city. The cost of housing, availability of services, commuting times, environmental quality and other factors are important considerations in facilitating or constraining career options, and in contributing to quality of working life. The EPL framework provides a language and a dynamic model through which careers researchers and urban planners can work more closely to influence career flexibility. Jointly, there is the potential to fully realize the city's promise as "a diversified portfolio of employers" (Glaeser, 2011, p. 71).

An example of how this might work is demonstrated by the design of spaces created to facilitate work and non-work interaction. Singapore's high-tech business cluster one-north is typical of many such developments in proclaiming to create "the integration of industry-centric developments with residential communities, lifestyle options and educational institutes to provide a vibrant environment for innovative minds to congregate, collaborate, and create" (JTC Corporation, 2019). Companies operating in this cluster represent concentrations and amalgamations of all three EPL dimensions—including specialist university research centres, entrepreneurial ventures, and large corporates.

Cities can influence the creation of such environments, designed to facilitate greater career flexibility across organizations, public/private sectors, and through EPL space. Creating spaces to allow integration across boundaries has the potential to accelerate the evolution of friendship, alumni, community, religious and other networks which facilitate information and idea sharing. Common spaces where scientists, entrepreneurs, and managers from different firms and industries meet will increase linkages between people having strong E, P or L motivation. Knowing-whom influences knowing-why, expanding people's views of career options, and enhancing their willingness to extend their careers in new directions.

Nation

This summary of ways in which the EPL framework can be used to explore multilevel contexts for careers ends where it began. EPL had its genesis in Kanter's (1989) discussion of ways in which different career forms can contribute to the wealth of nations. In her concluding comments, Kanter notes how the organization of careers at the societal level has important implications for "the level and kind of productive capacity and economic output of that society, … and with the aggregate well-being

of its citizens" (p. 520). Baruch (2015) highlights the importance of the national level (country) as a key component of the careers ecosystem, shaping economic progress, legal systems, education and other key systems affecting careers.

By viewing individual careers as trajectories through three-dimensional EPL space, it is possible to create a much more dynamic and multilevel conceptualization of the impact of careers at the national level, moving well beyond Kanter's relatively static structure of career forms. In Chap. 10 of this book, Chan, Lim and Uy (2020) provide a detailed illustration of how EPL can link individual and organizational career considerations with national objectives (using the science and technology innovation ecosystem as an example).

Conclusion

While individual careers continue to be an important focus of careers research, and a central concern for employees, increasing consideration is being given to the contexts in which those careers unfold. Over the last fifty years, career forms have morphed well beyond the point where they can be adequately explored in a simple framework comprising the individual and the employing organization. The context for careers has become more complex, captured by the concept of a career ecosystem (Baruch, 2015), operating at multiple levels—the individual, institutions, cities, nations and the global economy.

The EPL framework measures motivation, efficacy and intentions related to three core career forms—entrepreneurial, professional, and leadership. The three dimensions transcend differences in vocational interests or educational status, and are as relevant to a sole-practitioner as they are to a corporate employee. In addition to characterizing individuals, they can also be used to describe the requirements of a particular job. These properties make EPL uniquely suited as a common language for considering careers at multiple levels, from individual concerns through to workforce planning at the national level.

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Chapter 3
Measurement Equivalence of the Entrepreneurship, Professionalism, and Leadership Career Aspiration Scale

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Abstract Measurement equivalence is often neglected when conducting research. This is especially the case when scales are used in different contexts that share the same language but have different cultural backgrounds. In this chapter, we examined the measurement equivalence of Entrepreneurship, Professionalism, and Leadership (EPL) career aspiration scale (Chan et al., 2012), which measures EPL intent, motivation, and efficacy, across two English speaking countries with different cultures (Singapore and the United States). Confirmatory factor analysis was used to assess equivalence. Overall, measurement equivalence analysis showed that most of the EPL sub-scales demonstrated configural and metric invariance but not scalar invariance. Despite commonality in language, we found that negatively-worded items were problematic and at times loaded poorly on the hypothesized latent factors. Our results highlight the importance of establishing measurement equivalence when importing scales across cultures and even between cultures that share a common language. The practical implications of these results for scale creation as well as future directions are discussed.

Keywords Career aspiration · Measurement equivalence · Measurement invariance · Cross-cultural comparison · Mean and covariance structures · Entrepreneurship · Professionalism · Leadership

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Introduction

Careers in the 21st century are increasingly characterized by greater malleability in the careers undertaken over the course of peoples' work lives (Briscoe & Hall, 2006; Gubler, Arnold, & Coombs, 2014). Vocational and career researchers have proposed new theoretical models and constructs to characterize this changing nature of the career space. Interestingly, careers occur not just as a function of time; they also take on different meanings in different cultural contexts. The careers a person pursues are, in part, a function of opportunities available in their country as well as the cultural social-norms regarding what that career entails. Thus, any new career construct should also be subject to external validity tests that are vital for theory generalization and development. Correspondingly, before a legitimate career construct comparison between cultures can be made, the measurement equivalence of the scales used to measure the construct (in a different measurement context) needs to first be established (Vandenberg & Lance, 2000).

The goal of this chapter is to investigate the cross-cultural validity of recent career constructs from the Entrepreneurship, Professional, and Leadership (EPL) framework. Specifically, we examine the measurement equivalence of the EPL career aspiration scales in a Singapore student sample (SG; where the items were developed) and in a student sample from the United States (US; Chan et al., 2012). A secondary goal of this research is to highlight that measurement nonequivalence can occur between two samples even if those samples share a common language.

In this chapter, we first outline the value of the EPL framework for examining careers as well as the potential limitations behind its broader use in different cultures. Second, we discuss some possible reasons why the item content of original scale may be differentially interpreted by respondents from non-Confucian cultures (i.e., the US). Finally, we discuss how we sought to establish the measurement equivalence of the EPL scales between two samples.

Value of the EPL Framework

The EPL framework proposed by Chan and colleagues (2012) represents a contemporary operationalization and adaption of career ideas by Kanter (1989) and Super (1980). The EPL framework suggests that careers trajectories can be portrayed as unfolding in a three dimensional entrepreneurial, professional and leadership "career space". Notably, the EPL framework brings together career research areas such as "professionalism" that have been examined separately from other career trajectories such as leadership or entrepreneurship. While some researchers (e.g., Stewart & Roth, 2001) have treated entrepreneurs and leaders as distinct non-overlaping types of careers, the EPL approach provides a more flexible view such that a person can have varying levels of entrepreneurial, leadership, and professional career inclinations simultaneously; no other current career framework operationalizes and examines more than two career trajectories simultaneously. Such an approach is useful

given that career choice is often constrained by the local work context of the individual and the opportunities or resources they have to direct their choice elsewhere (Lent, 2005); consequently, to examine each career axis of a three dimensional "career space" in isolation is to potentially ignore how other competing careers may influence an individual's final career choices. Because the EPL framework draws from motivation theory, it is ideally suited to answer research questions linked to not only what career trajectories a person undertakes, but also the motivating forces as to why they choose one career over another.

Despite the usefulness of the EPL framework for examining careers, one potential issue regarding the original scales is its use of a Singapore (SG) sample for scale development. The psychometric properties (e.g. factor structure, reliability, and validity) obtained in one context may not necessarily be comparable in a different measurement context. Given the changing nature of careers occurs across different measurement contexts such as countries, cultures, and demographic groups, it is imperative for researchers to establish the measurement equivalence between the two measurement contexts where the EPL scales are used. Indeed, the importance of establishing such equivalence has been observed for other contemporary career constructs such as career adaptability where the measurement equivalence of the scale in up to 13 countries has been investigated (cf. Savickas & Porfeli, 2012). To date, there have been no studies examining the measurement equivalence of the EPL scales between two cultures. Thus, this chapter represents a first-step in establishing the equivalence for the EPL scales with another culture: one that has been the largest sources of career research samples, the US.

Differences Culture Leading to Potential Item Bias

To the extent that the concepts linked to a theory or framework carry context-specific meanings, the more likely it is a construct derived from the concept and its subsequent operationalization (scale) will be emic (dependent on context) rather than etic (independent of context; Triandis, 1972). Thus, people may share a common language, but item-bias can still occur due to differences in how each cultural group understands the concept behind the item content or how they might respond to the scale in a culturally-idiosyncratic manner (Davidov, Meuleman, Cieciuch, Schmidt, & Billiet, 2014). SG and the US both extensively use the English language in their survey samples and yet their cultural backgrounds greatly differ.

One example of how differences in culture may affect scale interpretation is how SG-based samples could be influenced by its predominantly Confucian background (Yum, 1988). This Confucian socio-environmental context in SG influences not only national-organizational career choices, but also how individuals may interpret the items of the scale in comparison to non-confusion cultures like the US (Tan, 1989). Confucian-influenced samples place a different emphasis on values such as family, education, honor, and duty; consequentially they may interpret item contents that feature these concepts differently compared to non-Confucian cultures. This

difference in interpretation may be the case especially for EPL scales because the motivation subscales were developed based on the previously established *motivation to lead* scales that features a social-normative component (Chan & Drasgow, 2001). The social-normative component refers to the extent people are motivated by a sense of duty and obligation. If a culture influences how an item is interpreted and subsequently how the person responds (Tourangeau, Rips, & Rasinski, 2000) to items on the EPL scales, then a Singaporean sample may interpret duty concepts of the social-normative motivation items through a more familial/social harmony-focused lens than a non-Confucian US sample (Oh, 1991). Examples of such items from the EPL motivation scale include: "I feel I ought to live up to my parents' expectations to work in an entrepreneurial business environment." and "It is a privilege and honour for me to excel in my chosen area of study." Here, the focal emphasis for *honor* in a Confucian sample may be construed as more linked to familial honor, whereas in non-Confucian samples *honor* may be construed as more linked to personal honor. Consequently, the presence of potential item bias highlights the need for measurement equivalence to be tested prior to further analysis involving the scales.

Testing the Measurement Equivalence of EPL Scales

Several methods have been proposed to test measurement equivalence (e.g., Item Response Theory or Mean and Covariance Structures). Past simulation studies have shown the Mean and Covariance Structures (MACS) approach for testing measurement equivalence does not require the large sample sizes often required by the Item Response Theory methods (Stark, Chernyshenko, & Drasgow, 2006). Additionally, the MACS analysis is the more widely used method for establishing measurement equivalence (Little, 1997; Vandenberg & Lance, 2000). One notable advantage of the MACS approach to measurement equivalence is its examination of the scale at the latent construct level whilst parsing out unique (error) variance simultaneously. Thus, for the measurement equivalence testing of the EPL scales we adopted the MACS approach.

The recommended number and order of steps for testing measurement equivalence have been quite varied (Vandenberg & Lance, 2000). However, the most commonly tested are three levels of equivalences with each subsequent level imposing further constraints (i.e., increasingly stricter) on the latent model. These levels are: configural, metric, and scalar equivalences (Steenkamp & Baumgartner, 1998).

Configural equivalence is the first and least restrictive of the three levels (Vandenberg & Lance, 2000). This level of equivalence examines whether within the pattern of factor loadings from indicators to the latent constructs are the same for both groups (samples). This, in essence, tests whether the factor structure is consistent between both groups (items load onto the expected factors). The model fit from configural equivalence then forms the baseline that subsequent equivalence models are compared against.

Metric equivalence is the second step. For this level, not only are the pattern of indicator loadings onto the expected latent factors similar for both groups, but factor loadings of both groups are fixed to be equivalent ($\Lambda_{referent} = \Lambda_{comparison}$). Given the greater number of restrictions imposed on the model, it is generally expected that worse model fit will be observed. We discuss below the cutoffs used for determining whether the worse model fit occurred is of concern (Schmitt & Kuljanin, 2008). Metric equivalence entails that intervals on the latent factor for a construct across comparison groups are equivalent. In other words, metric equivalence allows the comparison of covariation and difference scores between two groups (Steenkamp & Baumgartner, 1998).

The final step is scalar equivalence that in addition to the constraints highlighted above also introduces constraints to the intercept between latent factors ($\tau_{referent} = \tau_{comparison}$; Steenkamp & Baumgartner, 1998). Scalar equivalence entails that the differences observed from the items of the scale are observed at the latent level as well (Davidov et al., 2014). Scalar equivalence allows the mean scores of the scales between two groups to be meaningfully compared.

In comparing the different models with increasingly restrictive constraints, there is an expectation for a worse model fit in each successive model tested. Guidelines for assessing the reduction of model fit such as the likelihood ratio test have been proposed. Although this fit index provides a significance test, it is sensitive to sample size possibly resulting in the false rejection of a model (Davidov et al., 2014; Schmitt & Kuljanin, 2008). When comparing models we sought to use a cutoff indicative of whether the increase in model *misfit* was of practical importance (Schmitt & Kuljanin, 2008). We, therefore, used a change in CFI greater than 0.01 as indicative of sufficiently worse model fit and consequently did not proceed to test the next stricter equivalence model (Cheung & Rensvold, 2002).

Method

Participants and Procedure

We recruited 272 students from a large public Singapore University, with 53% males and 47% females ($M_{age} = 21.93$, $SD_{age} = 2.56$). Students participated in the survey for a chance to win prizes in a University wide lottery. We also recruited 235 students from a large Mid-western University, with 37% males and 63% females ($M_{age} = 19.12$, $SD_{age} = 1.30$). Students participated in the survey for course credit. Both groups of students came from a variety of degree majors (e.g., Social Sciences, Engineering, Science, and Business). Our sample size ($n > 200$) was deemed sufficient to have the power to reasonably detect the lack of measurement equivalence (Meade, Johnson, & Braddy, 2008).

Measures

The items used for this study were similar to those created by Chan and colleagues (2012). Under the EPL framework, career aspirations are measured in terms of the intent, motivation, and efficacy, for three possible career trajectories: Entrepreneurial (E), Professional (P), and Leadership (L). For each career trajectory, the motivation scale can be further split into three subscales to capture 3 underlying aspects of motivation: affective/Identity, calculative, and social-normative.

EPL intent scales. EPL intent was measured using 8 items (E intent = 2 items, P intent = 3 items, and L intent = 3 items) examining respondent's intentions to pursue each of the three career trajectories. Respondents rated whether they agreed or disagreed with a statement on a 5 point scale (1 = Strongly Agree to 5 = Strongly Disagree).

EPL motivation scales. The EPL motivation was measured using 27 items (E motivation = 9 items, P motivation = 9 items, and L motivation = 9 items). Respondents rated whether they agreed or disagreed with a statement on a 5 point scale (1 = Strongly Agree to 5 = Strongly Disagree).

EPL efficacy scales. EPL efficacy was measured using 16 items from the original scale (E efficacy = 7 items, P efficacy = 5 items, and L efficacy = 4 items). Three L efficacy items were not included because they were found to cross-load with the E efficacy factor in the original paper (Chan et al., 2012). Thus, we excluded these cross-loaded items because we wanted the item indicators and their corresponding factors to have simple structure for the measurement invariance tests. Respondents rated whether they felt confident in performing E, P, or L related activities on a 5 point scale (1 = "Not at all Confident" to 5 = "Extremely Confident").

Analysis

In testing configural equivalence, a poor fitting configural model may be due to either: (1) a good model fit in one sample but not in the other or, (2) potentially poor model fit for both samples (Meade et al., 2008). As such, prior to testing configural equivalence, our initial step was to perform a confirmatory factor analysis on both samples separately to ensure the model specified had a good fit with the data. The MACS approach to measurement equivalence only continued when an appropriate model was found for both groups.

For the specification of the model, we followed the factor structure similar to the one outlined by Chan and colleagues (2012). EPL intent was specified as a 3 factor model with one factor for each E, P, and L domain. Similarly, EPL efficacy was specified as a 3 factor model with one factor for each E, P, and L domain. EPL motivation was modeled as a hierachical factor model with 3 second-order factors (one for each E, P, and L domain) and 9 first-order subscale factors per EPL domain (affective/identity, calculative, and social-normative).

For assessing model fit, several authors have argued for the inclusion of different fit indices in order to overcome the problems associated the single use of any one index (e.g., sample size sensitivity or not penalizing overly complex models). The following indices were used: Consistent Akaike Information Criterion (CAIC, Bozdogan, 1987), Sample size adjusted Bayesian Information Criterion (SBIC, Sclove, 1987), χ^2, χ^2/degrees of freedom (Jöreskog, 1969), Root Mean Squared Error of Approximation (RMSEA, Steiger, 1980), Comparative Fit Index (CFI, Bentler, 1990), Standardized Root Mean Squared Residual (SRMR, Bentler, 1995). For χ^2, CAIC and SBIC lower the values indicates better model fit; χ^2/df values lower than 5 are considered acceptable (Bozdogan, 1987; Jöreskog, 1969; Sclove, 1987). For CFI values of 0.95 (0.90), the RMSEA values of 0.06 (.08) and SRMR values of 0.08 indicate good model fit (Hu & Bentler, 1999), values in parentheses indicate adequate fit (Browne & Cudeck, 1993).

Results

EPL Intent Equivalence

From Table 3.1, initial specification of the model A yields comparatively poorer fit in both SG ($\chi^2/df = 6.04$, RMSEA = 0.14, CFI = 0.87, SRMR = 0.08) and US samples ($\chi^2/df = 3.80$, RMSEA = 0.11, CFI = 0.89, SRMR = 0.06), suggesting the models specified were a poor fit for the data. We note that the variance accounted for was low for the negatively-worded item, "I do not see myself as a leader or manager (in charge of others) in my future working life." Such differences may be attributed to rater effects such as inattentive responding or acquiescence tendencies resulting in responses that were not based on the content of the item (DiStefano, Morgan, & Motl, 2012; Huang, Curran, Keeney, Poposki, & DeShon, 2012). Removal of this negatively-worded item yielded a model (Model B) with better fit. It may be the case that participants did not respond to the negatively-worded items in a same manner compared to other intent items that were framed in a positive (affirmative) manner. Most indices were within the range of adequate to good fit values for both SG ($\chi^2/df = 3.95$, RMSEA = 0.10, CFI = 0.94, SRMR = 0.05) and US samples ($\chi^2/df = 2.59$, RMSEA = 0.08, CFI = 0.96, SRMR = 0.04). This 7 item, 3 factor model was used as the configural model for subsequent MACS analyses.

With reference to Table 3.2, in fitting the configural model, we found the model fitted the data adequately across most fit indices ($\chi^2/df = 3.16$, RMSEA = 0.10, CFI = 0.95, SRMR = 0.05). The fit indices results were used as the baseline for the metric equivalence step. Constraining the factor loadings for both groups to be equal, we found the ΔCFI = 0.008. The metric equivalence model still fitted the data adequately well ($\chi^2/df = 3.22$, RMSEA = 0.09, CFI = 0.94, SRMR = 0.06). Finally, we fitted the scalar model by constraining the intercepts to be equivalent. This model fitted the

Table 3.1 Initial CFA for configural model step

	χ^2	df	χ^2/df	CFI	SRMR	RMSEA	AIC	BIC	ABIC
Singapore sample									
Model A: EPL intent 3 first-order factors	102.72	17	6.04	0.87	0.08	0.14	5528.11	5625.58	5539.97
Model B: EPL intent 3 first-order factors[a]	43.50	11	3.95	0.94	0.05	0.10	4784.96	4871.50	4795.40
Model C: EPL motivation 9 first-order and 3 second-order factors	572.59	314	1.82	0.86	0.07	0.06	18485.85	18813.98	18525.44
Model D: EPL motivation 9 first-order and 3 second-order factors[a]	443.80	242	1.83	0.88	0.07	0.06	16253.10	16462.24	16278.34
Model E: EPL efficacy 3 first-order factors[a]	300.75	101	2.98	0.93	0.05s	0.09	10197.38	10381.27	10219.57
United States sample									
Model A: EPL intent 3 first-order factors	64.56	17	3.80	0.89	0.06	0.11	5132.03	5225.44	5139.86
Model B: EPL intent 3 first-order factors[a]	28.46	11	2.59	0.96	0.04	0.08	4439.15	4522.18	4446.11
Model C: EPL motivation 9 first-order and 3 second-order factors	627.76	316	1.99	0.86	0.09	0.07	15741.28	16049.19	15767.10
Model D: EPL motivation 9 first-order and 3 second-order factors[a]	424.01	243	1.74	0.91	0.07	0.06	13736.18	13933.37	13752.71
Model E: EPL efficacy 3 first-order factors[a]	301.76	101	2.99	0.89	0.07	0.09	9155.25	9331.69	9170.04

Note $n_{SG} = 272$, $n_{US} = 235$, E = Entrepreneurship, P = Professional, and L = Leadership

[a]Denotes model selected for configural equivalence test. Model C negative error variances were constrained to zero. CAIC: Consistent Akaike Information criterion, SBIC: Sample size adjusted Bayesian Information Criteria

Table 3.2 Multigroup CFA results

	χ^2	*df*	χ^2/df	CFI	SRMR	RMSEA	AIC	BIC	ABIC
Model B: EPL intent 3 first-order factors									
Configural	71.95	22	3.27	0.95	0.05	0.10	9224.11	9427.07	9274.72
Metric	83.63	26	3.22	0.94	0.06	0.09	9227.78	9413.84	9274.18
Scalar	94.90	30	3.16	0.93	0.06	0.09	9231.05	9400.19	9273.23
Model C: EPL motivation 9 first-order and 3 second-order factors									
Configural	869.60	487	1.79	0.90	0.07	0.06	29987.09	30464.91	30106.23
Metric (first-order)	915.13	502	1.82	0.89	.08	0.06	30002.60	30417.00	30105.93
Metric (second-order)	873.75	493	1.77	0.90	0.07	0.06	29979.22	30431.67	30092.04
Metric (first- and second-order)	923.30	508	1.82	0.89	0.08	0.06	29998.77	30387.79	30095.78
Scalar	1039.88	532	1.95	0.86	0.08	0.06	30163.35	30653.86	30285.66
Model E: EPL efficacy 3 first-order factors									
Configural	602.51	202	2.98	0.91	0.06	0.09	19352.62	19783.93	19460.17
Metric	616.58	215	2.87	0.91	0.07	0.09	19340.70	19717.03	19434.54
Scalar	703.23	228	3.08	0.90	0.07	0.09	19401.34	19722.71	19481.48

Note $n_{SG} = 272$, $n_{US} = 235$, E = Entrepreneurship, P = Professional, and L = Leadership; CAIC: Consistent Akaike Information criterion, SBIC: Sample size adjusted Bayesian Information Criteria

Table 3.3 Cronbach's Alphas

Scale	Items	SG	US
E intent	2	.79	.75
P intent	3	.76	.61
L intent	2	.75	.76
E motivation	9	.81	.89
P motivation	8	.78	.82
L motivation	7	.70	.73
E efficacy	7	.91	.89
P efficacy	5	.90	.80
L efficacy	4	.84	.81

Note n_{SG} = 272, n_{US} = 235, E = Entrepreneurship, P = Professional, and L = Leadership

data adequately (χ^2/df = 3.16, RMSEA = 0.09, CFI = 0.93, SRMR = 0.06) with the ΔCFI = 0.008. In both configural to metric and metric to scalar, the change in CFI was lower than the ΔCFI = 0.01 threshold for practical equivalence (Cheung & Rensvold, 2002). Altogether, these results suggest the reduced 7 item EPL intent scale possessed configural, metric, and scalar equivalence. EPL intent scales exhibited reasonable levels of Cronbach's Alpha comparable to those of found previously (Chan et al., 2012; $\alpha_{SG.scales}$ = .75 to .79; $\alpha_{US.scales}$ = .61 to .76; see Table 3.3). We note that the reliability of some scales such as professional intent in the US sample were lower than .70. This may be attributed to the small number of items in the scale (Cortina, 1993; Schmitt, 1996). The list of items that exhibited scalar measurement invariance can be found in the Appendix at the end of this chapter.

EPL Motivation Equivalence

As shown in Table 3.1, when specifying the second-order factor model C for EPL motivation for the original 27 items, we found the model to be a reasonable fit for both SG (χ^2/df = 1.82, RMSEA = 0.06, CFI = 0.86, SRMR = 0.07) and US samples (χ^2/df = 1.99, RMSEA = 0.07, CFI = 0.86, SRMR = 0.09). The CFI for both models was close to but lower than the CFI benchmarks outlined. However, we found the CFIs obtained were similar to the second-order model fit results reported in the original paper (CFI = 0.89, Chan et al., 2012). In specifying the first-order factors for EPL motivation in the SG sample, we note that the error variance for the first-order factors (e.g., P social-normative and L social-normative) were negative. In specifying the first-order factors for EPL motivation in the US sample, we found that the error variance for first-order factors (P social-normative and L social-normative) were also

negative. In addition, the entrepreneurship factors of affective-identity and social-normative were also negative. Since this is not theoretically possible, we constrained these values to zero.

We note that in both groups the negatively-worded motivational items exhibited lower loadings and consequentially the variance accounted for was lower. For example, the P motivation item "I doubt that becoming a skilled professional in my field would result in sizable monetary or social status gains." exhibited fairly low loadings in both US and SG samples ($\lambda_{US} = 0.36$ and $\lambda_{SG} = 0.24$). Consequentially, we tested models for both groups without the negatively-worded items. This new model D yielded slightly better CFI fit for the SG sample ($\chi^2/df = 1.83$, RMSEA = 0.06, CFI = 0.88, SRMR = 0.07) but especially for the US sample ($\chi^2/df = 1.74$, RMSEA = 0.06, CFI = 0.91, SRMR = 0.06). Overall, this suggests that removal of three negatively-worded items (one item from the P calculative, L affective/identity, and L calculative) from the motivation scale yielded a more appropriate model for the data in both models. The resultant Model D consisting of 24 indicators, 3 second-order factors, and 9 first-order factors was used as the configural model for subsequent MACS analyses.

In performing the set of measurement invariance tests on the second metric step, the E calculative factor exhibited negative variance. This was slightly different from the CFA model found in the previous step and as such each step of measurement invariance was re-tested with the E calculative factor constrained to zero. From Table 3.2, fitting the configural model, we found the model fitted the data reasonably well ($\chi^2/df = 1.79$, RMSEA = 0.06, CFI = 0.90, SRMR = 0.07). The fit indices results were used as the baseline for the metric equivalence step. For the metric equivalence model, we examined CFI change after constraining the factor loadings of first-order factors (metric 1; $\chi^2/df = 1.82$, RMSEA = 0.06, CFI = 0.89, SRMR = 0.08) and the second-order factors (metric 2; $\chi^2/df = 1.77$, RMSEA = 0.06, CFI = 0.90, SRMR = 0.07). Constraining both first- and second-order factors also yielded a model that fitted the data reasonably well (metric 1 and 2; $\chi^2/df = 1.82$, RMSEA = 0.06, CFI = 0.89, SRMR = 0.08). Change in CFI for both metric models was less than 0.01 in both instances. Finally, we fitted the scalar model by constraining the intercepts of both groups to be equivalent. The model fitted the data adequately ($\chi^2/df = 1.95$, RMSEA = 0.06, CFI = 0.86, SRMR = 0.08) with the ΔCFI = 0.034—higher than the ΔCFI = 0.01 cutoff, suggesting the scale did not have scalar equivalence (Cheung & Rensvold, 2002). Overall, these results suggest that the reduced 24 item EPL motivation scale possessed configural and metric equivalence but not scalar equivalence (see Appendix for list of motivation items that exhibited metric measurement invariance). The 24 item EPL motivation scales had reasonable levels of reliability in both SG and US samples ($\alpha_{SG.scales} = .70$ to .81; $\alpha_{US.scales} = .73$ to .89; see Table 3.3).

EPL Efficacy Equivalence

Specifying model D (See Table 3.1) with 3 EPL factors with 16 indicators yielded reasonable fit for both SG ($\chi^2/df = 2.98$, RMSEA = 0.09, CFI = 0.93, SRMR = 0.05) and US ($\chi^2/df = 2.99$, RMSEA = 0.09, CFI = 0.89, SRMR = 0.07) samples. This model consisting of 16 indicators and 3 latent factors (one for each EPL domain) was used as the configural model for subsequent MACS analyses.

We found configural model had reasonable fit to the data ($\chi^2/df = 2.98$, RMSEA = 0.09, CFI = 0.91, SRMR = 0.06). The configural fit indices results were used as the baseline for the metric equivalence step. The metric model fitted the data almost as well as the configural model ($\chi^2/df = 2.87$, RMSEA = 0.09, CFI = 0.91, SRMR = 0.07). As the CFI change for the metric model was lower than 0.01 (ΔCFI = 0.000), we proceeded to the scalar equivalence step. When we fitted the scalar model to the data, we found the model fitted the data adequately ($\chi^2/df = 3.08$, RMSEA = 0.09, CFI = 0.90, SRMR = 0.07) but the ΔCFI = 0.016 was greater than ΔCFI = 0.01 (Cheung & Rensvold, 2002). This suggests the EPL efficacy scale did not have scalar equivalence between the two groups. Altogether, these results suggest that the reduced 16 item EPL efficacy scale possessed configural and metric equivalence but not scalar equivalence. The 16 item version of the EPL efficacy scale demonstrated reasonable levels of reliability comparable to those found previously by Chan et al., (2012; $\alpha_{SG.scales}$ = .84 to .91; $\alpha_{US.scales}$ = .80 to .89). See Appendix for the list of EPL efficacy items that exhibited metric measurement invariance.

Discussion

We examined the measurement equivalence of the scales from the EPL framework in SG and US samples, that were administered in the same language (Englishis an official language both countries). Overall, these findings serve to inform the two goals of the chapter. First, we sought to examine the measurement equivalence of the EPL scales. The new career constructs introduced by the EPL framework bring with it questions of whether these nascent constructs are etic or emic in nature. To address this question, comparisons of these new constructs must occur across more than one measurement context. Correspondingly, comparisons of these constructs in different contexts are only reasonable if the operationalization of the constructs in these contexts demonstrate measurement equivalence. Using the MACS approach to measurement equivalence, we found that the EPL motivation and efficacy scales possessed at least metric equivalence while the EPL intent scale possessed scalar equivalence. These results represent one of the first attempts at measurement equivalence for EPL Career Aspiration Scales.

Second, we were able to demonstrate that the use of a common language between the two measurement contexts does not necessarily entail that the scales (or items in the scales) will be interpreted by the two samples in the same manner; and that

there are cultural differences in how they are understood. Measurement equivalence has an important application for cases where translation of a scale into a different language is needed (Davidov et al., 2014). Our findings, therefore, highlight the need for measurement equivalence statistics to be established to support scale use even if the samples share a common language. We also argue that there may even be a need to establish measurement equivalence within the same country, provided there is an expected difference in scale construal such as between groups of different demographic characteristics (Steinmetz, Schmidt, Tina-Booh, Wieczorek, & Schwartz, 2008).

Limitations, Implications, and Future Directions

Although we found the most EPL scale items possessed at least metric equivalence, this was at times based on a reduced set of indicators. In the initial CFA step prior to examining equivalence, we had to remove negatively-worded items in order to find a set of indicators for a model that had adequate fit to the data. We note that negatively-worded items have been problematic when trying to establish measurement equivalence in previous studies across different fields, such as individual differences and personality (e.g., Nye & Drasgow, 2011) as well as attitudes (e.g., DiStefano, Morgan, & Motl, 2012). Although one possible solution is to model the negatively-worded items as a separate methods factor, the lack of sufficient negatively-worded items in some scales can preclude that option as in the case of the EPL intent scales (Bentler, Jackson, & Messick, 1971; DiStefano et al., 2012). Furthermore, even if the negatively-worded items were to be modeled as a separate latent methods factor, it is unclear as to whether it is appropriate to constrain the loadings for both samples since a number of other extraneous factors, e.g., inattentive responding versus a genuinely substantive difference in items may be driving the atypical responses.

Future career researchers intending to develop scales for their constructs are advised either not to use negatively-worded items at all or to include a sufficient numbers of items for modeling of a negatively-worded methods factor. Where negatively-worded items are removed, however, the reduced number of items could result in lower content validity of the scale. In practice, not all items from one measurement context may be equivalent in another context. Thus, for the identification purposes when using a MACS approach, we recommend more than four indicators per facet should be included in the initial scale, given that items may need to be removed prior to the configural equivalence step.

The extent that career theory and the constructs created can be generalized across cultures will depend on whether the constructs examined are truly etic in nature. Overall, our research provides evidence that the EPL career aspiration scales possess at least metric invariance across two samples with reliabilities comparable to those found in the original set of studies by Chan et al. (2012). Given the usefulness of the EPL framework, future research can capitalize on its potential by investigating

how socio-environmental factors in different cultures and different countries influence their people to pursue different EPL career trajectories. As highlighted in this chapter, even with the administration of a scale on samples with similar demographic characteristics (University students) and language, measurement invariance cannot be assumed and even more so when different languages are used in cross-cultural comparisons. We posit that the difference in EPL scale interpretation could be due to the SG sample being strongly influenced by Confucian values. Future research could examine the veracity of this explanation by testing the measurement invariance of the EPL scales in other cultures similarly influenced by Confusion values but administered using different languages, for example, in South Korea and Japan (Yum, 1988).

The establishment of measurement invariance between groups is an essential first step for examining the validity of career constructs in different contexts, cultures, and/or countries. Future research could also expand and examine the robustness of the nomological network of the EPL framework in other cultural (non-Singaporean) contexts. For example, how it may relates to other career constructs such as Boundaryless and Protean careers (e.g., Chan et al., 2015) or how personality may differentially predict career motivations in other cultures (e.g., Chan, Uy, Chernyshenko, Ho, & Sam, 2015).

Appendix

Items that show at least metric invariance in both US and SG samples.

Scale	Sub-facet	Item content
EPL intent		
1	E	I am definitely going to be an entrepreneur after my studies and am prepared to do anything to achieve that goal
2	E	I have a viable business idea and intend to start my own business soon after graduation
3	P	My main career goal is to be a technical expert, specialist or professional in my field of study
4	P	I would much prefer a career as a specialized expert or professional in a large and stable organization
5	P	I see myself continuously furthering or advancing in my specialization and professional/technical expertise throughout my working life
6	L	I plan to become a leader or manager in the near future
7	L	My main career goal is to rise up the ranks as a leader or manager in charge of others in organizations

(continued)

(continued)

Scale	Sub-facet	Item content
EPL motivation		
1	E AI	I am the kind of person who constantly has ideas about making money
2	E AI	Ever since I was a kid, I have dreamed about opening my own business
3	E AI	I like thinking of ways to create new products/and services for the market
4	E CL	The easiest and fastest way to make lots of money is to start my own business
5	E CL	The rewards and satisfactions of starting and running a business far outweigh the risks and sacrifices needed
6	E CL	I see working for myself as the best way to/escape the rigidity and routines of organizations
7	E SN	This country needs more entrepreneurs and I feel obliged to "give it a go"
8	E SN	I have a strong sense of duty to take over a/family-related business
9	E SN	I feel I ought to live up to my parents' expectations to work in an entrepreneurial business environment
10	P AI	I like to be highly specialized and experienced in a specific area of expertise
11	P AI	I like others to depend on me for my highly/specialized knowledge, skills, and experience
12	P AI	I am the kind of person who strives to be highly specialized in my field of study
13	P CL	Being a highly specialized professional in my chosen field will assure me of a steady income
14	P CL	If I stick to becoming a professional in my field of study, I am guaranteed to make a good living
15	P SN	My parents hope that I will be a highly skilled/professional in my chosen area of expertise
16	P SN	It is a privilege and honour for me to excel in my chosen area of study
17	P SN	The best way to increase my country's competitiveness is for people like me to become highly skilled professionals in my field of study
18	L AI	I have always enjoyed leading others and have assumed leadership roles whenever I could
19	L AI	I am the kind of person who likes influencing and managing people more than doing anything else
20	L CL	If I agree to lead a group, I would never expect any advantages or special benefits
21	L CL	I don't expect to get any privileges if I agree to lead or be responsible for a project
22	L SN	If I am nominated to be in charge of a project/or a group, I feel it is an honor and privilege to ac…
23	L SN	I agree to lead whenever asked or nominated by the other group members
24	L SN	I feel that I have a duty to lead others if I am asked

(continued)

(continued)

Scale	Sub-facet	Item content
EPL efficacy		
1	E	Come up with ideas for products and services that may be needed in a market
2	E	Plan a business (including market analysis, pricing, financing/costs, and marketing/sales)
3	E	Build a network of contacts or partners who will support my business
4	E	Manage the financial assets and performance of a company or firm
5	E	Start a firm and keep it growing
6	E	Identify opportunities to start-up viable businesses
7	E	Design an effective campaign for marketing a new product or service
8	P	Become one of the best experts or professionals in my field of specialization
9	P	Teach or share with others my knowledge, experience, and expertise in my chosen area of work specialization
10	P	Conduct research to further advance knowledge in my area of expertise, specialization, or profession
11	P	Write research papers/books and make presentations at professional meetings
12	P	Constantly keep up with the advancing knowledge and skills in my area of expertise, specialization or profession
13	L	Plan, direct, organize and prepare others as to what they need to do
14	L	Take charge of decisions needed for a group or organization
15	L	Use rewards and punishments to get people to work harder
16	L	Develop and train future leaders for an organization

Note E = Entrepreneurship, P = Professional, and L = Leadership; AI = Affective/Identity, CL = Calculative, and SN = Social-normative

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Chapter 4
Development of Entrepreneurship-Professionalism-Leadership Motivations Scale for Working Adults Population

Moon-Ho Ringo Ho and Kim-Yin Chan

Abstract In this paper, we report the adaptation and validation of Chan et al. (2012) "Entrepreneurship, Professionalism and Leadership" (EPL) motivation scales for use in the working adult population. Three studies were conducted. In the first study, 214 working adults from healthcare, research, innovation and enterprise sectors were surveyed for the development of an initial item set. Data from another 464 adult working samples from similar sectors were collected with the revised version of the measurement. Confirmatory factor analyses showed that the scales had acceptable psychometric properties. Scale means compared across the various survey groupings (e.g., healthcare high-potentials vs. research scientists vs. entrepreneurs vs. administrative staff) seemed to be in expected directions. Moreover, Chan et al.'s finding that the more "multidimensional" an individual's E, P and L motivations, the stronger their boundaryless mindset and protean career attitudes, was replicated. In the third study, 231 working samples from New Zealand were recruited to check the factor replicability cross-culturally. The potential of the EPL framework for talent development in an innovation economy is discussed.

Keywords Entrepreneurial · Professional · Leadership · Motivation · Scale construction · Cross validation

Introduction

Toward the end of the last century, career theorists observed that new forms of more dynamic, non-linear careers were emerging (e.g., "Protean careers" by Hall, 1996; "Boundaryless careers" by Rousseau & Arthur, 1996) that were in contrast to traditional (i.e., more stable and predictable) organizational employment and career management arrangements (e.g., Arnold & Cohen, 2008). These new work and career

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forms coincided with the focus of Organisation for Economic Co-operation and Development (OECD) on the economic policy concepts of "innovation" and the "knowledge-based economy" (OECD, 1992, 1996, 1999). At about the same time, several career theorists and researchers (e.g., Arthur, Inkson & Pringle, 1999; Parker, Arthur, & Inkson, 2004; Saxenian, 1996) started to relate such new career concepts to the idea of innovation and knowledge-based economies.

Today, countries like Australia and Singapore are aggressively shifting their economies towards more innovation-driven strategies (Australian Government, 2015; Singapore Government, 2016). Work and careers in such new, innovation-driven economies are likely to demand even more protean and boundaryless career mindsets in the workforces (Creed, Macpherson & Hood, 2011). Some have even called for more "career entrepreneurship" (i.e., self-directed career development in terms of more deliberate building of one's "career capital" and proactive seizing of career opportunities) among workers (Korotov, Khapova, & Arthur, 2010). It is thus timely to examine new frameworks and metrics for organizational talent and sectorial workforce human capital in the context of more dynamic, mobile and boundaryless workforce in innovation economies.

In 2012, Chan et al. proposed that "Entrepreneurship, Professionalism and Leadership" (EPL) could act as three dimensions of the subjective space in which people could think of their career growth. They justified these dimensions in relation to Kanter's (1989) framework of the three "career logics" in the workforce and Schein's (1978) three-dimensional "cone" model of organizational careers. Using survey data from over 10,000 university students, they showed that E, P and L motivations could be measured independently and that people who were high in E, P and L motivations were most boundaryless and protean (self-directed) in their career attitudes. They thus suggested that the EPL framework could be used to operationalize the extent of boundarylessness in the subjective career "space" of different individuals as they think of and construct their career paths/trajectories.

Subsequent research by Chan et al. (2015) also reported that the higher a person scored across all three EPL motivations, the higher their global career adaptability as measured by Savickas and Porfeli's (2012) Career Adapt-abilities Scale. Although their empirical research focused on "within-person" (e.g., motivations, efficacy) operationalisations of the EPL framework, Chan et al. (2012) suggested that with its theoretical bases in Kanter (1989) and Schein's (1978) more macro-level ideas, "the EPL framework can be readily adapted for conceptualizing and diagnosing the human resource capacities of organizations and segments of a national workforce" (p. 81). To enable further research in these contexts, there is thus a need to adapt or develop measures of EPL motivations for use in the working adult population, and to validate the measures in relation to measures of boundaryless mindset and other 21st century career attitudes and behaviours.

The Present Study

This paper reports the development and validation of Chan et al. (2012) EPL career motivation scales for use in the working adult population through three studies. Study 1 involved 214 working adults from healthcare, research, innovation and enterprise sectors in Singapore and were surveyed in our development of an initial item set. In study 2, another 464 adult working samples from similar sectors were collected with the revised version of the scale. Confirmatory factor analyses showed that the scales had good psychometric properties. In study 3, 231 working samples from New Zealand were recruited to cross-validate the scale cross-culturally.

Study 1

Items Generation for EPL Motivation Scale (Working Adults Version)

The original 27-item EPL motivation measure by Chan et al. (2012) was built upon Chan and Drasgow's (2001) 3-factor motivation to lead (MTL) measure consisting of affective/identity, non-calculative, and social-normative motivations. It was developed for the use with student population in tertiary institutions. In developing the working adults version of the EPL motivation scale, we revised some of the original items to be relevant to the working population. For example, we reworded one leadership social-normative motivation item from "I agree to lead whenever asked or nominated by the other group members" to "I would agree to be a project leader whenever asked by my coworkers" as the term *coworkers* is more relevant in the work context. In another example, we reworded one entrepreneurial social-normative motivation item from "I feel I ought to live up to my parents' expectations to work in an entrepreneurial business environment" to "If my family or friends asked me to be a partner in a business venture, I would definitely consider doing it" to reflect the shift from a young adult wanting to meet parental expectations to a working adult being able to decide on one's career. One other example would be rewording a professional affective/identity motivation item from "I like to be highly specialized and experienced in a specific area of expertise" to "I am best suited for professional jobs where I can make use of the knowledge I have gained in the past" to show that working adults already possess expert knowledge as compared to a student's aspirations to gain expert knowledge. A total of 18 items were adapted and developed to form the working adults version of the EPL motivation scale.

Initial Validiation

In study 1, we attempted to validate the EPL motivation scales for working adults by examining their relationships with proactive career behaviours. Taber & Blankemeyer (2015) found that career adaptability increases the likelihood in engaging various proactive career behaviours. Hermann, Hirschi & Baruch (2015) showed that protean career orientations can predict proactive career behaviours beyond personality dispositions (proactivity and core self evaluations). Based on the university students' data, Chan et al. (2012) showed that individuals concurrently high in E, P, and L career motivations and those high in E and L career motivations were also highest in boundaryless and protean career attitudes, while those with only high P or low EPL career motivations were lowest on these career attitudes. Furthermore, Chan et al. (2015) reported a similar relationship between the eight EPL profiles and global career adaptability as measured by Savickas and Porfeli's (2012) Career Adapt-abilities Scale. Hence, we hypothesized that the more "multidimensional" an individual's E, P and L motivations, the stronger his/her self-reported proactive career behaviours. Therefore, to establish the concurrent validity of this newly developed scale, we administered the proactive career behaviours scale (Strauss, Griffin, & Parker, 2012) which measures career consultation, career planning, network building and proactive skill development, along with the 18 items EPL motivation scale for working adults.

Effort was also made to recruit certain unique samples to demonstrate that our proposed scale can differentiate working adults with different strengths of EPL motivations. For example, we obtained access to some "high potentials" (including medical, allied health and managerial staff) from a highly specialised hospital in the healthcare sector and also recruited doctoral-level research scientists, research technical, managerial and administrative staff from a public sector research institute. We also surveyed a handful of entrepreneurs from a university's innovation centre that incubates "start-ups" to provide more variance in the "entrepreneurial motivation" scales. We expected the medical and nursing "high potential" healthcare staff, doctoral scientists and research technicians to have significantly higher professional motivation than the administrative, managerial personnel. We also expected that those holding managerial positions would have higher leadership motivations, while the entrepreneurs would have the highest entrepreneurial motivations.

Method

Sample and Procedure

A total of 214 working adults (41% male; 59% female) participated in our pilot survey. 80% were aged 21–40 years old, with the remaining 20% above 40 years. The average working experience was 10.4 years with a standard deviation of 8 years.

33 of the participants were identified by their employers as "high potentials" and they included medical, allied health and managerial staff who were recruited from a highly specialised hospital in Singapore's healthcare sector. 30 of the participants were doctoral-level research scientists individually recruited from a public sector research institute. 6 of the participants were entrepreneurs from a large public university's innovation centre that incubates "start-ups" with 6 other administrative staff from the same centre, while the remaining 139 participants were more regular, administrative, managerial personnel and research technical staff who were recruited from a large public sector agency in Singapore. Except for the healthcare and university innovation centre staff who answered online surveys, the rest were administered paper and pencil surveys. Informed consent was obtained from all participants at the start of the surveys. The healthcare sector staff received a small, non-monetary token of appreciation, and all remaining participants received a S$5 incentive for their voluntary participation in the survey which took about 15–20 min to complete. The survey procedures were approved by the authors' university Institutional Review Board.

Measures

EPL motivation scales for working adults (18-item verison). As mentioned above, we reviewed Chan et al.'s 27-item measure—which was designed for university students—and selected 6 items per E, P and L factors which we adapted for working adults. Participants indicated their response to each item using a 5-point scale from strongly disagree to strongly agree.

Proactive career behaviour scale. Based on the highest loading items from Strauss, Griffin and Parker's (2012) four-factor proactive career behaviours scale (i.e., Career planning, Proactive skill development, Career consultation, Network building), five items were selected to reflect the participants' overall proactivity in career development.

Results

Confirmatory Factor Analysis of EPL Motivation Scales for Working Adults

Table 4.1 summarizes the fit indices for the various measurement models that were fitted to the data collected on the EPL motivation scales for working adults. Confirmatory factor analysis with MLR estimation procedure (Muthén & Muthén, 1998–2017) was used to examine the fit of the EPL motivation measurement model. First, fitting a single common-factor to the 18 items of EPL motivation scales generated poor model

Table 4.1 Fit indices from confirmatory factor analyses of EPL scales (Study 1)

Model	χ^2	df	χ^2/df	CFI	SRMR	RMSEA
Confirmatory factor analysis of 18 items (6-items per scale)						
EPL motivation 1 factor model (18 items)	584	135	4.33	0.41	0.16	0.13
EPL motivation 3 factors model (18 items)	325	132	2.46	0.75	0.09	0.08
EPL motivation 9 first-order factors, 3 second-order factors model (18 items)	202	124	1.63	0.90	0.08	0.06
Confirmatory factor analysis of 17 items (after dropping a negatively worded MTL item)						
EPL motivation 1 factor model (17 items)	554	119	4.65	0.43	0.17	0.13
EPL motivation 3 factors model (17 items)	299	116	2.58	0.76	0.09	0.09
EPL motivation 9 first-order factors, 3 second-order factors model (17 items)	178	107	1.66	0.91	0.08	0.06

Note $N = 214$

fit (CFI = 0.41; SRMR = 0.16; RMSEA = 0.13; see Table 4.1), indicating that the three scales did not measure the same construct. Next, we compared this to the fit of the model with three first-order factors. From Table 4.1, the model with three first-order factors fitted the data better (CFI = 0.75; SRMR = 0.09; RMSEA = 0.08; see Table 4.1). Similar to the results reported in Chan et al. (2012, p. 77), the current EPL motivation scale is best represented as a measurement model with three second-order factors (E, P, and L motivations), each with three first-order factors following Chan and Drasgow's (2001) framework of affective/identity, calculative/non-calculative, and social-normative motivations (CFI = 0.90; SRMR = 0.08; RMSEA = 0.06; see Table 4.1). However, a negatively worded leadership motivation item seemed to load relatively poorly on the leadership motivation factor (standardized factor loading <0.30). Removing this item did not affect the fit of the model with second order factors model (see the bottom panel of Table 4.1 for results on model with 17 items). We, therefore, decided to drop this item from the computation of leadership motivation for the analyses. Table 4.2 shows the descriptive statistics, scale reliabilities, and inter-scale correlations among the EPL career motivation scales, and with the proactive career behaviour scale.

Table 4.2 Reliabilities, correlations, means and standard deviations (sd) of scale scores used in Study 1

Scale	Mean	sd	1	2	3	4
1. Entrepreneurial motivation (6 items)	3.09	0.81	(0.85)			
2. Professional motivation (6 items)	3.93	0.53	−0.04	(0.70)		
3. Leadership motivation (5 items)	3.48	0.64	0.19**	0.47**	(0.73)	
4. Proactive Career Behaviours (5 items)	3.53	0.77	0.33**	0.30**	0.32**	(0.82)

Notes $N = 214$; $^{**}p \leq 0.01$ (two-tailed test); $^{*}p \leq 0.05$ (two-tailed test); Cronbach's alphas are listed in diagonals

Comparing Group Means

Table 4.3 summarises the means and standard deviations of the various groups surveyed on the E, P and L motivation scales. These statistics are also plotted in Fig. 4.1. Note that some of the comparisons should be viewed with caution given the very small sample sizes of some groups.

As expected, the healthcare "high potentials" (means from 4.19 to 4.50) were significantly higher in professional motivation than the regular (i.e., non-high potential) staff from the public sector research institute and the university innovation centre (means from 3.78 to 3.95). Entrepreneurial motivation was highest among the 6 entrepreneurs surveyed (mean = 3.56) as expected. In contrast, the healthcare professionals (medical, nursing and allied health with means from 2.50 to 2.92) and the university innovation centre's administrative/managerial staff (mean = 2.89) were the

Table 4.3 Mean values of EPL motivations across the 10 different job samples (Study 1)

Group/sample	*n*	Entrepreneurial motivation (6 items)		Professional motivation (6 items)		Leadership motivation (5 items)	
		Mean	sd	Mean	sd	Mean	sd
Healthcare high-potentials	33	2.84	0.92	4.33	0.49	3.68	0.69
1. Medical doctors	6	2.92	0.31	4.19	0.76	3.43	0.77
2. Nurses	7	2.83	0.66	4.50	0.33	3.77	0.64
3. Allied health professionals	10	2.50	1.30	4.40	0.48	3.40	0.74
4. Administrative staff	10	3.13	0.86	4.22	0.42	4.04	0.49
Public-sector research inst	163	3.13	0.79	3.85	0.52	3.46	0.63
5. Scientist/Engineer (Ph.D.)	30	3.18	0.82	3.88	0.65	3.41	0.65
6. Research technician	18	3.16	0.58	3.88	0.39	3.42	0.59
7. Manager	22	3.27	0.79	3.95	0.56	3.78	0.68
8. Administrative staff	93	3.04	0.81	3.78	0.47	3.39	0.60
University Incubation Centre	12	3.22	0.80	3.90	0.30	3.28	0.65
9. Entrepreneurs	6	3.56	0.50	3.97	0.37	3.37	0.81
10. Administrators	6	2.89	0.95	3.83	0.21	3.20	0.51
One-way analysis of variance							
F	1.18			3.46**		2.08*	
LSD	NA			2, 3 > 5, 6, 7, 8, 10; 4 > 8^{+}		4 > 3, 5, 6, 8, 9, 10; 7 > 5, 8, 10	
η2	0.05			0.14		0.09	

Notes $^{**}p \leq 0.001$ (two-tailed test); $^{*}p \leq .05$ (two-tailed test). $^{+}$indicates groups that are significantly different on the motivation scale at .05 level, e.g., 2,3 > 5 means group 2 and 3 are significantly different from group 5 but no significant difference between group 2 and 3 on a particular motivation scale. 6 participants from the Public Sector Research Institute did not provide data on their job group and thus were not included in this list

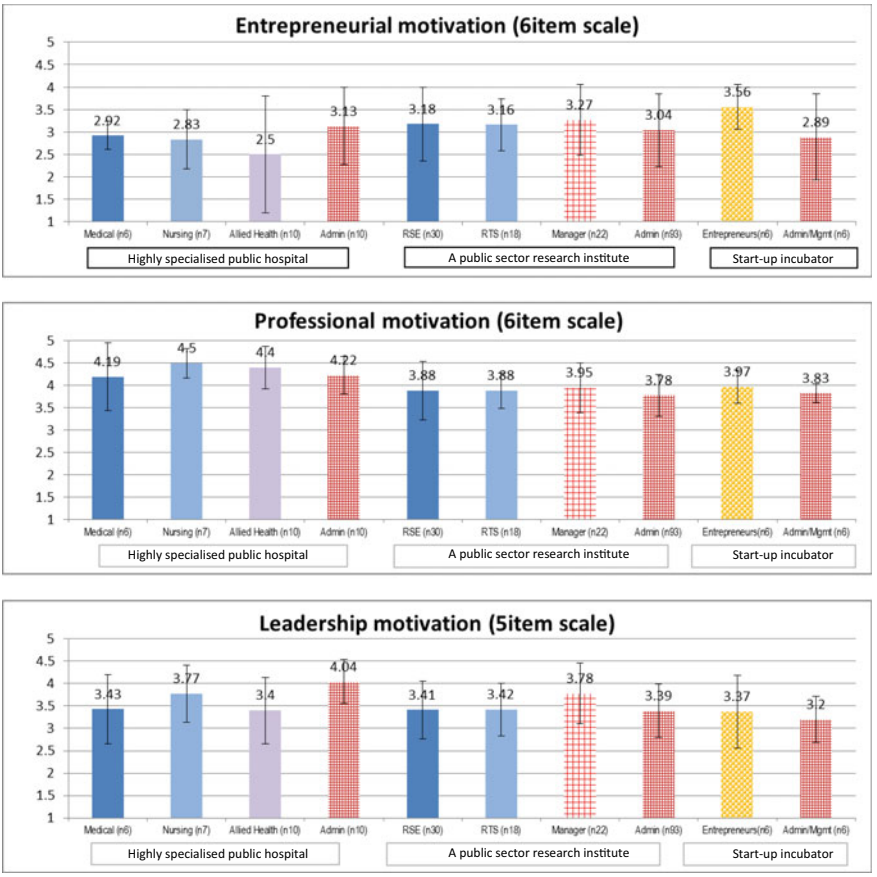

Fig. 4.1 EPL motivation of various groups/samples (Study 1)

least entrepreneurially motivated. Interestingly, the scientific, technical and managerial employees of the public-sector research institute (means from 3.04 to 3.27) were moderate in their entrepreneurial motivation—probably reflecting the "innovation and enterprise-oriented" mission of the research institute.

Not surprisingly, leadership motivation was highest among the 10 healthcare administrative/managerial high-potential staff (mean = 4.04), followed by the 22 research institute managerial staff (mean = 3.78) and 7 healthcare nurses (mean = 3.77).

Relationship Between EPL Career Motivation and Proactive Career Behaviours

Regression analyses show each of the three E, P, and L career motivations significantly (standardized regression coefficients are 0.31, 0.24 and 0.15 for E, P, and L motivations respectively and all are statitially significant at 0.01 level) and positively predict higher proactive career behaviours, $F(3,209) = 19.51$, $R^2 = 0.22$, $p < 0.01$.

The results imply that those who are high in EPL motivation tend to engage in more proactive career behaviours. In short, the EPL motivation scales for working adults demonstrated good psychometric properties similar to the university population (e.g., similar scale reliabilities as university population), showing a second-order factor structure with 9 first order factors following Chan and Drasgow's (2001) framework of affective/identity, calculative/non-calculative, and social-normative motivations and 3 second-order factors of the E, P, and L motivations. In addition, the EPL motivation scales for working adults were shown to measure some forms of career aspirations, where those who had low EPL motivations reported significantly lower proactive career behaviours than all groups except for the high-L only group. These findings lend further support to EPL motivations as being able to operationalize 21st century career concepts, with E, P, and L motivations jointly predicting proactive career behaviours and higher "multidimensionality" of E, P, and L motivations (with eight EPL profiles) relating to stronger proactive career behaviours. However, we note that some EPL sub-domains contain only one item (e.g. entrepreneurial social/normative and professional calculative sub-domains) which may limit the scale's representiveness in measuring EPL sub-domains and thus Study 2 aims to address this issue by adding additional items.

Study 2

Scale Revision

Following feedback from Study 1's participants and organisations, we revised and added more items to the EPL motivation scales for working adults to ensure greater relevance for use with working adults. In Study 2, nine new items were added to the EPL motivation scale to ensure that each of the subdomains (affective/identity, calculative/non-calculative, and social-normative) contain three items, resulting in a 27-item measure (See Appendix 1). Similar to Study 1, participants responded to each item using a 5-point scale from strongly disagree to strongly agree.

Validation of Revised Scale

Chan et al. (2012) found that university students with simultaneously high levels of E, P and L motivations was associated with stronger boundaryless mindsets and protean career attitudes. We attempted to replicate such finding with working adults as part of the validation effort. We also included Briscoe et al. (2006) organizational mobility preference measure, because Chan et al. (2012) observed that students high in L career motivation, including those concurrently high in PL or EL motivations, generally scored the highest in organizational mobility preference. In contrast, those who scored highest only on P or EP career motivations had the lowest organizational mobility preference scores. Therefore, we were interested in finding out if this pattern would be replicated with a working adult sample. Finally, effort was made to recruit participants from different organizations and job-types (e.g. research versus administrative staff versus MBA students with working experience) to increase representativeness of the working adult samples.

Method

Sample and Procedure

A total of 464 working adults volunteered to participate in our research survey and were recruited from three different organizational/work settings where employee innovation was considered relevant: (1) 360 research scientists, technical and administrative staff (47% male, 53% female; 62.3% were aged between 20 and 35 years old, 27.1% were aged between 36 and 45 years old, 10.6% were aged above 45 years old; and mean working experience of 9.1 years, SD of 8.5 years) from a large public sector research organization were individually approached through recruitment posters and through word-of-mouth; (2) 65 nurses from a public sector hospital in Singapore (28% male, 72% female; 23.1% were aged between 20 and 35 years old, 38.5% were aged between 36 and 45 years old, 38.5% were aged above 45 years old; mean working experience of 19.6 years, SD of 12.7 years); (3) 39 MBA students (77% male, 23% female; 82% aged between 27 and 39 years old; and mean working experience of 7.8 years. SD of 3 years) voluntarily responded to an invitation email from the researchers that was forwarded by their personnel department. Informed consent was obtained from all participants at the start of the surveys. All participants completed the survey online and acknowledged the informed consent form before beginning the survey in accordance to procedures approved by the Institutional Review Board. Respondents answered the questionnaire anonymously and most took 15–20 min to complete it online. Participants from the public sector research organization were offered and accepted monetary compensation for their participation. However, the nurses from the public sector hospital volunteered to participate without taking any compensation.

Measures

EPL motivation scales for working adults. After reviewing feedback from participants and organisations in Study 1, we added 9 items to the initial 18-item measure to form a 27-item EPL Motivation scale for working adults. The measure consisted of 9 items for each of the 3 E, P, and L motivation domains, with each motivation domain containing 3 items per sub-domain, following Chan and Drasgow's (2001) framework of affective/identity, calculative/non-calculative, and social-normative motivations. Participants indicated their response to each item using a 5-point scale from "strongly disagree" to "strongly agree". The 27 items can be found in Appendix 1 at the end of this chapter.

Boundaryless mindset, Protean (self-directed) career attitude and Organizational Mobility Preference scales. These were measured using items from Briscoe, Hall & DeMuth's (2006) measure. Respondents indicated on a 5-point scale the extent to which they felt the item statements were true (1 = to little or no extent, 5 = to a great extent).

Results

Confirmatory Factor Analysis of EPL Motivation Scales for Working Adults

Table 4.4 summarizes the fit indices for the various measurement models that were fitted to the data collected on the EPL motivation scales. Confirmatory factor analysis was used to examine the fit of the EPL motivation measurement model. All models were fitted by Mplus with MLR estimation method (Muthén & Muthén, 1998–2017). First, fitting a single common-factor to the 27 items of EPL motivation scales generated poor model fit (CFI = 0.68; RMSEA = 0.14), indicating that the three scales did not measure the same construct. Next, we compared this to the fit of the model with three first-order factors. From Table 4.4, the model with three first-order factors fitted the data better (CFI = 0.87; RMSEA = 0.09). Similar to the results reported in Chan et al. (2012, p. 77), the current EPL motivation scale is best represented

Table 4.4 Fit indices from Confirmatory Factor analyses of EPL motivation scales (Study 2)

Model	χ^2	df	χ^2/df	CFI	RMSEA
EPL motivation 1 factor model (27 items)	3291	324	10.16	0.68	0.14
EPL motivation 3 factors model (27 items)	1581	321	4.93	0.87	0.09
EPL motivation 9 first-order factors, 3 second-order factors model (27 items)	1326	312	4.25	0.90	0.08

Notes $N = 464$

as a measurement model with three second-order factors (E, P, and L motivations), each with three first-order factors following Chan and Drasgow's (2001) framework of affective/identity, calculative/non-calculative, and social-normative motivations (CFI = 0.90; RMSEA = 0.08).

Confirmatory Factor Analysis of Boundaryless/Protean Career Attitudes Scale

Confirmatory factor analysis showed that there were 3 individual factors underlying the scale ($\chi^2 = 237.81, df = 87, \chi^2/df = 2.73$, CFI = 0.94, RMSEA = 0.06, SRMR = 0.051, rather than a 1-factor model: $\chi^2 = 839.28, df = 90, \chi^2/df = 9.33$, CFI = 0.68, RMSEA = 0.13, SRMR = 0.11). Cronbach's alpha for the boundaryless mindset scale (6-items) was $\alpha = 0.88$; that for the 6-item Protean/self-directed career attitude scale was $\alpha = 0.84$; while that for the 4-item Organizational Mobility Preference was $\alpha = 0.74$.

Relationship Between Eight EPL Career Motivation "Profiles" and Boundaryless/Protean Career Attitudes

Table 4.5 shows the descriptive statistics, scale reliabilities, and inter-scale correlations among the EPL career motivation scales, and with the EPL intent and boundaryless/protean career attitudes scales. Figure 4.2 plots the mean values (see Table 4.6) of self-reported boundaryless mindset, protean/self-directed career attitude and organizational mobility preference for the eight EPL motivation profile with high EPL right-most and low-EPL profile on the left. On the whole, the results replicated and, to some extent, supported Chan et al.'s finding that the more "multidimensional" an individual's E, P and L motivations, the stronger their boundaryless mindset (see bold line). Those who are high-EL profiles are highest in self-reported boundaryless mindset and protean/self-directed career attitudes, followed by those who with high-EPL profiles. In contrast, those with low-EPL and low-E profiles are lowest in self-reported boundaryless mindset and protean/self-directed career attitudes. Boundaryless mindset seems highest when high L-motivation is combined with high E or P or EP motivations; those with an only "high-E" profile are lower in boundaryless mindset. Except for those with a high-EPL profile, those with high-P (including high-PL and high-EP) are notably lower in their protean/self-directed career attitudes.

We also noted that those with a high P profile (including high-EP, high-PL, and high-EPL) had the lowest organizational mobility preference scores, while those with high-E or high-L had the highest organizational mobility preference scores. In summary, these results are similar to Chan et al. (2012) findings and together lend support to the distinctive differences between organizational mobility preference and

Table 4.5 Reliabilities, correlations, means and standard deviations (sd) of scale scores used in Study 2 and 3

	Mean	sd	1	2	3	4	5	6
1. Entrepreneurial motivation (9 items)	3.12[a]/3.01[b]	0.70[a]/0.75[b]	(0.87[a]/0.85[b])	0.25[b]	0.27[b]			
2. Professional motivation (9 items)	3.88[a]/3.75[b]	0.53[a]/0.55[b]	0.29[a, **]	(0.80[a]/0.74[b])	0.43[b]			
3. Leadership motivation (9 items)	3.58[a]/3.56[b]	0.62[a]/0.53[b]	0.52[a **]	0.58[a **]	(0.85[a]/0.70[b])			
4. Self-directed/protean career attitude (6 items)	3.78	0.74	0.17**	0.32**	0.36**	(0.84)		
5. Boundaryless mindset (5 items)	3.52	0.81	0.31**	0.38**	0.52**	0.62**	(0.88)	
6. Organizaitonal mobility preference (5 items)	3.20	0.88	−0.08	−0.24**	−0.12*	−0.09	−0.02	(0.74)

Notes $N = 464$; $^{**}p \leq 0.01$ (two-tailed test); $^{*}p \leq 0.05$ (two-tailed test); Cronbach's alphas are listed in diagonals. [a]Statistic was computed based on Singapore samples in Study 2; [b]Statistic was computed based on New Zealand samples in Study 3. Statistic for self-directed/protean career attitude, boundaryless mindset and organisational mobility preferences were based on Singapore samples in Study 2

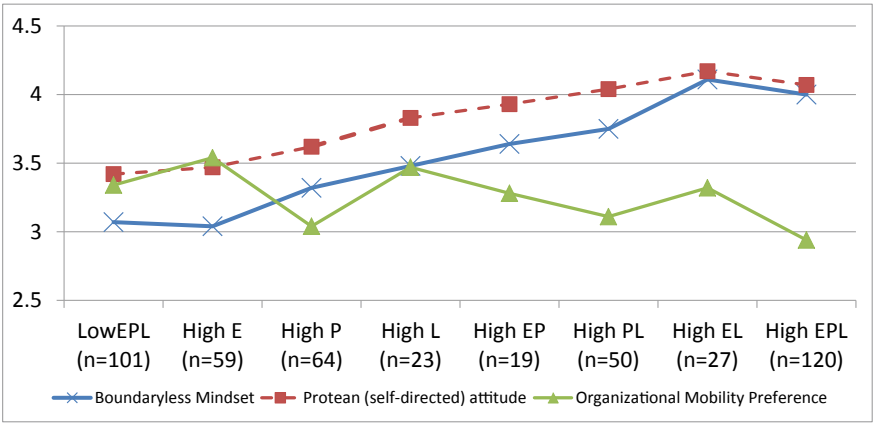

Fig. 4.2 Mean values of Boundaryless Mindset across eight EPL motivation profile groups plotted in bold-line from highest to lowest (with dotted/fine-lines representing the means for protean (self-directed) career attitude, and Organizational Mobility Preference) (Study 2)

boundaryless and self-directed attitudes (Briscoe et al., 2006). The enhanced EPL motivation scales for working adults demonstrated good psychometric properties similar to Study 1 and the university population (e.g., similar scale reliabilities), replicating a second-order factor structure with 9 first-order factors following Chan and Drasgow's (2001) framework of affective/identity, calculative/non-calculative, and social-normative motivations and 3 second-order factors of the E, P, and L motivations. The results also provided partial support for inter-scale validity within the EPL model with E, P, and L motivations positively predicting their corresponding E, P, and L career intent. Having established the factor structure of the EPL working adults scales and concurrent validity in their relations with other 21st century career concepts, we next attempted to cross-validate the EPL scale with western samples in Study 3.

Study 3

To further demonstrate the applicability of the EPL motivation scales for working adults, efforts were made to recruit participants from different age groups, job-types and job status (e.g. permanent vs. temporary) in New Zealand (NZ).

Table 4.6 Mean values of boundaryless mindset and Protean career attitudes and organizational mobility preference across high (above average) and low (average and below) EPL motivation groups (Study 2)

		1. Low EPL (n = 101)	2. High E (n = 59)	3. High P (n = 64)	4. High L (n = 23)	5. High EP (n = 19)	6. High PL (n = 50)	7. High EL (n = 27)	8. High EPL (n = 120)	One-way analysis of variance		
										F	LSD	η2
Boundaryless career mindset (5 items)	Mean	3.07	3.04	3.32	3.48	3.64	3.75	4.11	4.00	22.13*	3, 4, 5, 6, 7, 8 > 1, 2; 7, 8 > 3, 4, 5, 6; 6 > 3	0.25
	sd	(0.79)	(0.70)	(0.63)	(0.76)	(0.58)	(0.61)	(0.70)	(0.71)			
Protean (self-directed) attitude (6 items)	Mean	3.41	3.47	3.62	3.83	3.93	4.04	4.17	4.07	11.93*	6, 7, 8 > 1, 2, 3; 4, 5 > 1, 2	0.15
	sd	(0.73)	(0.74)	(0.67)	(0.59)	(0.64)	(0.56)	(0.56)	(0.71)			
Organizational Mobility Preference (4 items)	Mean	3.34	3.54	3.04	3.47	3.28	3.11	3.32	2.94	4.04*	1, 2, 4, 7 > 8; 1, 2,4 > 3;	0.06
	sd	(0.72)	(0.82)	(0.84)	(0.82)	(0.68)	(0.89)	(1.19)	(0.04)		2 > 6	

Note *$p \leq 0.001$ (two-tailed test). One participant did not provide full data and thus were not classified into an EPL group

Method

Sample and Procedure

A total of 231 working adult employees in New Zealand volunteered to participate in the research survey (47% males, 53% females; 17.3% were aged 30 and 39 years old, 38.5% were aged 40 and 49 years old, 19% were above 50 years old; 78.4% were employed in a permanent jobs; 30.3% in a managerial jobs and 46.3% in a professional/technical jobs; mean working experience was 8.5 years, SD of 8.4 years).[1] Participants voluntarily responded to an invitation email that was forwarded by their personnel department from the researchers. Informed consent was obtained from all participants at the start of the surveys. All participants completed the survey online and acknowledged the informed consent form before beginning the survey in accordance to procedures approved by the Institutional Review Board. Respondents answered the questionnaire anonymously; most took 15–20 min to complete it online.

Measures

EPL motivation scales for working adults. The 27-item EPL motivation scales for working adults used in Study 2 were administrated. Similar to the previous studies, participants responded to each item using a 5-point scale from "strongly disagree" to "strongly agree".

Results

Confirmatory Factor Analysis of EPL Motivation Scales for Working Adults

Table 4.7 summarizes the fit indices for the various measurement models that were fitted to the data collected on the EPL motivation scales from NZ samples. Confirmatory factor analysis was used to examine the fit of the EPL motivation measurement model. First, fitting a single common-factor to the 27 items of EPL motivation scales generated poor model fit (CFI = 0.57; RMSEA = 0.14), indicating that the three scales did not measure the same construct. Next, we compared this to the fit of the model with three first-order factors. The model with three first-order factors fitted the data better (CFI = 0.78; RMSEA = 0.10). Similar to the results found in Study

[1] We thank Dr. Jeffrey Kennedy and his research team in Massey university in collecting and sharing this dataset with us.

Table 4.7 Fit indices from confirmatory factor analyses of EPL motivation scales (Study 3)

Model	χ^2	df	χ^2/df	CFI	RMSEA
EPL Motivation 1 factor model (27 Items)	1714	324	5.29	0.57	0.14
EPL Motivation 3 factors model (27 Items)	1027	321	3.20	0.78	0.10
EPL Motivation 9 first-order factors, 3 second-order factors model (27 Items)	589	312	1.89	0.91	0.06

Note $N = 231$. WLSMV was used for estimation due to non-normality of the distribution of the item scores

2, the EPL motivation scale for working adults is best represented as a measurement model with three second-order factors (E, P, and L motivations), each with three first-order factors following Chan and Drasgow's (2001) framework of affective/identity, calculative/non-calculative, and social-normative motivations (CFI = 0.91; RMSEA = 0.06). Table 4.5 shows the descriptive statistics, scale reliabilities, and correlations among the EPL career motivation subscale scores, which are comparable to those obtained based on Singapore samples in Study 2.

General Discussion

This paper reports a pilot research effort to adapt and validate Chan et al. (2012) EPL career motivation scales for use in the working adult population both locally and overseas. The three studies provide initial support for the validity of the EPL motivation measures for the working adult population by showing that E, P, and L can be measured as three distinct dimensions—each with three factors following Chan and Drasgow's (2001) framework of affective/identity, calculative/non-calculative, and social-normative motivations—across 2 different national samples (Singapore and New Zealand). Scale reliabilities of the E, P, and L motivation dimensions across the three studies' working adult samples were similar to the university population (entrepreneurial motivation reliability ranging from 0.85 to 0.87 vs. university population's 0.82; professional motivation reliability ranging from 0.70 to 0.80 vs. university population's 0.75; and leadership motivation reliability ranging from 0.70 to 0.85 vs. university population's 0.72).

We also validated the scales by comparing the mean scale scores across various samples in Study 1. "High potentials" in healthcare nursing and allied health professionals had significantly higher professional motivation than regular, non-high potential staff from the public sector research institute and the university innovation centre, and the 6 entrepreneurs surveyed were highest in entrepreneurial motivation as expected. In contrast, "high potential" healthcare professionals (medical, nursing and allied health) and the university innovation centre's administrative/managerial staff were the least entrepreneurially motivated. As expected, leadership motivation was

significantly highest among the healthcare administrative/managerial high-potential staff, followed by the research institute managers.

Our working adults data also replicated Chan et al. (2012) finding that the more "multidimensional" an individual's E, P and L motivations, the higher their self-reported boundaryless mindset and protean/self-directed career attitudes. In Study 1, we explored the relationship between proactive career behaviours as conceptualised by Strauss, Griffin and Parker (2012) to include career planning, proactive skill development, career consultation, and network building; we found that individuals who were more "multidimensional" in their E, P and L motivations reported higher levels of proactive career behaviours. Consistent with Chan et al. (2012) finding with student data, this pattern was not observed with organizational mobility preference (see study 2) and this validates Briscoe, Hall & DeMuth's (2006) separation of organizational mobility preference from boundaryless mindset.

Contributions, Applications, Limitations and Further Research Possibilities

This paper marks an attempt at extending Chan et al. (2012) EPL framework and measures to the working adult population with both local and overseas samples. Having valid measures of EPL motivations for working adults will allow further longitudinal follow-up studies from university samples to examine how individuals' career aspirations change with exposure to working life, and to possibly link EPL career "growth" to measures of career success and employability. As Chan et al. (2012) suggested: "Future research can verify the applicability of the EPL framework to the workplace by analysing EPL dimensions of employees in particular organizations, and relating them to relevant workplace outcomes such as job satisfaction, organizational commitment, and turnover intention". Future studies should also consider including working adult samples from other countries to further examine the cross-cultural replicability of EPL framework and measures.

Study 1 and Study 2 sampled working adults from the innovation sector, especially research institute staff and the university incubation centre. We observed interesting differences between managerial/administrative staff versus scientists/researchers and entrepreneurs in these units. This opens up interesting research possibilities on the potential motivational differences between managers and scientific "professionals" and/or "entrepreneurs" in the innovation sector. Future research in organizational contexts can now examine the EPL composition of work teams as suggested by Chan et al. (2012) who asked: "do management teams with a certain mix of EPL characteristics perform better than others? Similarly, do teams with more entrepreneurial leaders perform better than those with more professional leaders?" (p. 83).

Vloeberghs, Pepermans and Thielemans (2005) argued that in an age of more non-linear, boundaryless careers, more attention is needed in the management of "high potentials" who have traditionally been treated as traditional careerists and assumed

"bound to the employing organization with limited marketability". By including a group of "high-potentials" in our survey, we demonstrate one potential application of the EPL framework, which is to allow employing organizations to appreciate the EPL profiles of their high-potential staff. On the whole, most of the high-potentials are in the high-P, high-EPL, high-PL categories. Such categorisation of high-potentials by their EPL motivational profile allows the possibility of more differentiated talent development and management in the organization. For example, the high EPL talents are likely to expect more opportunities for designing their own work and careers than the high-Ps or high-PLs who are likely to expect more organizational career planning. The high EPLs are also likely to be more open to starting new "ventures" both within and beyond the organization.

The present paper utilises self-reported data to validate the EPL measures. While common method bias can be introduced when all data are collected from the respondents (Chang, Van Witteloostujin, & Eden, 2010), we mitigated the risks by using different samples and thus enhanced the robustness of our findings. Nevertheless, future research should consider using other sources of data (e.g. peer responses) to further reduce the possibility of common method bias.

Conclusion

Chan et al. (2012) EPL motivation measure were administered to undergraduate students in a Singaporean public university where they were given feedback on their EPL career aspirations in terms of "T-shaped" metaphor (as introduced by Guest in 1991; and popularised by Brown, 2005). Providing students with feedback using the EPL framework is one way to better achieve a more holistic development of students to prepare them for a work context that will demand greater employability and life-long learning (more details on the T-shaped metaphor can be found in Chap. 7 and the student feedback system based on EPL framework can be found in Chap. 12). Similar feedback systems can be developed for working adults in the future.

We successfully adapted the EPL measures for use with working adults through Singapore and New Zealand samples over three studies, with good psychometric properties similar to Chan et al. (2012) version. We hope that this present paper encourages future research to extend efforts to establish generalizability of our findings and construct validity of Chan et al.'s EPL framework and measures for working adults in organizations and in career counselling contexts.

Appendix 1

EPL Career Aspiration Scale for Working Adults

Instructions: Please read each statement below carefully and indicate the extent you disagree or agree with the following statements, using the response scale below. Please circle the appropriate response besides each statement.

SD	D	N	A	SA
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

			SD	D	N	A	SA
Entrepreneurial motivation (E)	EAI#	1. Ever since I was a kid, I have dreamed about opening my own business	SD	D	N	A	SA
	EAI	2. I am the type of person that is best suited to be an entrepreneur	SD	D	N	A	SA
	EAI	3. I am the kind of person who constantly has ideas about new businesses	SD	D	N	A	SA
	ECL	4. I see working for myself as the best way to escape the rigidity and routines of organizations/companies	SD	D	N	A	SA
	ECL	5. Starting and running my own company will allow me to derive the full reward of my own efforts and ideas	SD	D	N	A	SA
	ECL	6. The rewards and satisfaction of starting and running a business far outweigh the risks and sacrifices needed	SD	D	N	A	SA
	ESN	7. This country needs more entrepreneurs and I feel obliged to "give it a go"	SD	D	N	A	SA
	ESN	8. I have always been taught in the value of starting a business (e.g. it provides jobs and helps the economy)	SD	D	N	A	SA

(continued)

(continued)

			SD	D	N	A	SA
	ESN	9. If my family or friends asked me to go into business, I would consider it favourably	SD	D	N	A	SA
Professional Motivation (P)	PAI	10. I enjoy reading articles and attending courses that deepen or update my professional expertise	SD	D	N	A	SA
	PAI	11. I am best suited for professional jobs where I can make use of the knowledge I have gained in the past	SD	D	N	A	SA
	PAI	12. I care deeply about advancing and creating knowledge in my area of expertise (specialization)	SD	D	N	A	SA
	PCL	13. Being a respected professional will assure me of a steady income, prestige, and status in society	SD	D	N	A	SA
	PCL	14. My chosen profession will give me a comfortable life with acceptable prestige or status in society	SD	D	N	A	SA
	PCL	15. If I stick to being a profession in my industry, I am guaranteed to make a good living	SD	D	N	A	SA
	PSN	16. The best way to increase my country's competitiveness is for people like me to become highly skilled professionals in my industry	SD	D	N	A	SA
	PSN	17. I feel that I have a responsibility to stay and excel in my current profession	SD	D	N	A	SA
	PSN	18. If asked to teach in an advanced course or program in my specialty area, I would be honored to do it	SD	D	N	A	SA

(continued)

(continued)

			SD	D	N	A	SA
Leadership Motivation (L)	LAI	19. I have always enjoyed leading others and would assume leadership roles whenever I could	SD	D	N	A	SA
	LAI	20. I am the kind of person who likes influencing and managing people more than doing anything else	SD	D	N	A	SA
	LAI	21. I am definitely more of a leader by nature, so I am happy to assume leadership responsibilities whenever I can	SD	D	N	A	SA
	LNCL	22. I don't expect to get any privileges if I agree to lead or be responsible for a project	SD	D	N	A	SA
	LNCL	23. I am interested in leading groups even if there are no clear advantages for me	SD	D	N	A	SA
	LNCL	24. When I agree to lead a group, I don't seek advantages or special benefits	SD	D	N	A	SA
	LSN	25. I would agree to be a project leader whenever asked by my coworkers	SD	D	N	A	SA
	LSN	26. If I am nominated to be in charge of a project or a group, I feel it is an honor and privilege to accept such a role	SD	D	N	A	SA
	LSN	27. I would accept a managerial position if nominated by peers or senior management	SD	D	N	A	SA

Note #Each of EPL scales can be further divided into 3 subscales following Chan & Drawgow's (2001) framework of affective/identity (AI), calculative(CL)/non-calculative (NCL) and social-normative (SN) motivations

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Chapter 5
Latent Difference Score Analysis—Stability and Change in Entrepreneurship-Professionalism-Leadership Aspirations

Jia Lin and Moon-Ho Ringo Ho

Abstract Chan et al. (2012) have proposed an innovative Entrepreneurship, Professionalism and Leadership (EPL) framework for understanding career growth and development in the 21st century. To date, there are no studies examining how EPL aspiration changes over time. This paper attempts to characterize the variation of EPL motivation across time from 1,748 university students using the Latent Difference Score (LDS) approach. Changes in EPL dimensions were found to be inter-related, and differences in the EPL development between Science, Technology, Engineering, and Mathematics (STEM) and non-STEM students were detected.

Keywords Entrepreneurship · Professionalism · Leadership · Motivation · Stability and change · Longitudinal modeling · STEM

Introduction

The workplace has evolved over the years as countries transition from industrial economies to knowledge-based economies, leading to more focused innovation-driven strategies (e.g., Singapore Government, 2017, 2018). This increased focus on innovation-driven strategies means that companies need employees equipped with skills which while they may not be entirely related to their professional specialization are needed to help formulate and carry out such innovative strategies. At the same time, the idea of "careers" gradually shifted from a long-term, fixed employment nature to one that is protean or boundaryless in nature (Arthur & Rousseau, 1996; Hall, 1976, 1996), allowing individuals greater flexibility in shaping their work

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experience over time. As the malleability of individuals' career aspirations (intention, motivation, and efficacy) is a key tenet of the EPL framework (Chan et al., 2012), this chapter explores the EPL motivation changes and how the changes in the 3 dimensions relate to each other and evolve over time.

The EPL Framework

In their seminal paper, Chan and colleagues (2012) proposed a person-centered framework for conceptualizing subjective careers space characterized by three dimensions, namely, entrepreneurship (E), professionalism (P), and leadership (L), suggesting that individual careers can be changed in any direction across one's lifespan. Based on over 10,000 university student samples, they demonstrated that the EPL career aspirations (including motivation, efficacy and intention) can be measured separately. Furthermore, those who reported high E, P and L motivation had highest boundaryless and protean (self-directed) career attitudes whereas those who are strongly motivated for professional careers prefer working in one organization, rather than in multiple organizations in advancing their careers. Similar results have been replicated with other university student samples (Chan et al., 2015a, 2015b) and working adult samples (Chernyshenko, Ho, Chan, Yu, & Uy, 2016), providing support for the generalizability of the EPL framework beyond university students. EPL motivation was also found to be related to specific personality traits (Chan et al., 2015b), universal and cultural values (Kennedy, Chan, & Ho, 2017), and other career measures such as Savickas and Porfeli's (2012) Career Adapt-abilities Scale (CAAS; Chan et al., 2015a). To date, all studies adopting the EPL framework were cross-sectional in nature. To enrich our understanding of how EPL career aspirations change over time within individual (intra-individual change) and how these changes differ across different individuals (inter-individual change), we adopt the Latent Difference Score (LDS) approach to examine these issues. We will first provide a short review on the background of LDS and how to use it for understanding the development of EPL career aspirations.

Latent Difference Score Analysis

Building on the principles of linear dynamic models, the LDS approach (LDS; see McArdle, 2001; McArdle & Hamagami, 2001) integrates features of latent growth curve models (Meredith & Triask, 1990) and autogressive cross-lagged regression models (Joreskog & Sorbom, 1979) within the framework of structural equation modeling for longitudinal data analysis. Autoregressive cross-lagged models capture the influence of current and past status on future status of the phenomenon of interest but does not provide information on the absolute trajectories of change over time. On the contrary, growth curve models capture trajectories of change over time but do not

allow for past status to influence current or future status (Clark, Nuttall, & Bowles, 2018). LDS combines the best of both approaches and opens an opportunity for research to effectively examine the autogressive cross-lagged processes and model trends (linear/nonlinear) over time. Generalization for modeling multiple change processes is relatively straightforward.

In LDS framework, an observed score, for example, professional motivation *P(t),* measured at time t from an individual n is decomposed into a true/latent score (*pmot(t)*), and measurement error (*e(t)*): $P(t)_n = pmot(t)_n + e(t)_n$. The difference in the latent score between successive time points (latent difference score) is then given by: $\Delta\ pmot(t)_n = P(t)_n - P(t-1)_n$. For data in which observations were collected at fixed time intervals (as in the current study), the time between successive pairs of observations can be set to a constant ($\Delta t = 1$ unit time). The latent difference score can then be interpreted as the rate of change of the true sore: $\Delta\ pmot(t)_n / \Delta t = \Delta\ pmot(t)_n$. McArdle and his co-authors proposed that the latent change score can be specified as the additive outcomes of two distinct developmental processes: a constant growth and an autoproportional growth. To illustrate their ideas, the latent change in professional motivation over time can then be expressed: as: $\Delta\ pmot(t)_n = \alpha_{\text{pmot}} \cdot s_{\text{pmot},n} + \beta_{pmot} \cdot pmot(t-1)_n$, where the first component α_{pmot} represents constant amount of change per unit time within an individual but such an amount can differ across individuals (s_{pmot} is analogous to the factor score in factor analysis) and the second component represents part of the latent change that is proportional to the previous latent change score level, $pmot(t-1)_n$. For model identification purpose, α_{pmot} is fixed to be 1. The proportionality coefficient, β_{pmot} can be extended to be time-varying ($\beta_{pmot}(t)$). The corresponding path diagram is shown in Fig. 5.1 and this univariate LDS model is referred to as the *dual change score* model.

Based on the empirical data, the dual change score model can be simplified to three special cases: (i) by setting $\beta_{pmot}(t)$ to be zero, we obtain the *constant change score* model where the latent change is constant within a subject over time: $\Delta\ pmot(t)_n = \alpha_{\text{pmot}} \cdot s_{\text{pmotn},n}$, $\beta_{pmot} = 0$, (ii) in the *proportional change score* model, latent change is only proportional to the latent score from the previous time point: $\Delta\ pmot(t)_n = \beta_{pmot} \cdot pmot(t-1)_n$, $\alpha_{\text{pmot}} = 0$, and (iii) in the *no change score* model, the latent scores do not change over time: $\Delta\ pmot(t)_n = 0$, $\alpha_{\text{pmot}} = \beta_{pmot} = 0$. However, the observed score can still differ over time due to the presence of measurement error.

The model above focuses on the analysis of change for a single process but can easily be generalized to a model with two or multiple processes simultaneously. We illustrate the idea of bivariate process next. Consider the change in a professional motivation score, *pmot(t)*, and entrepreneurial motivation score, *emot(t)*. The two processes may affect each other (this is referred to as "coupling"). In other words, the change in professional motivation is driven by the two components as shown in the dual change score model above and also by the entrepreneurial motivation from previous time points with the amount characterized by the magnitude of the cross lag coefficient, γ_{emot} expressed as:

$$\Delta pmot(t)_n = \alpha_{\text{pmot}} \cdot s_{\text{pmot},n} + \beta_{pmot} \cdot pmot(t-1)_n + \gamma_{EtoP} \cdot emot(t-1)_n.$$

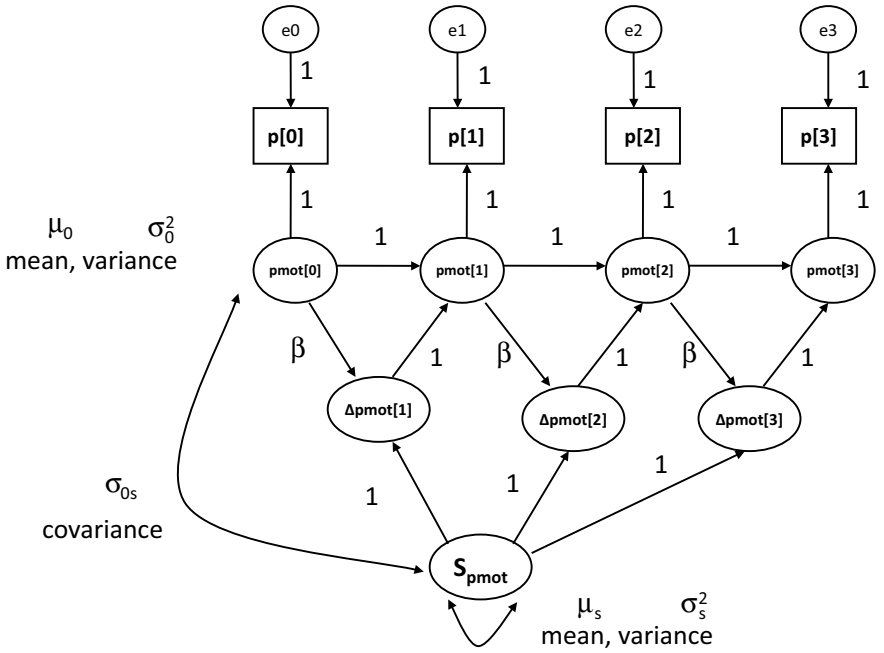

Fig. 5.1 Dual change score model

Similarly, the change in entrepreneurial motivation can be affected by the past professional motivation level expressed as:

$$\Delta emot(t)_n = \alpha_{\text{emot}} \cdot \text{s}_{\text{emot},n} + \beta_{emot} \cdot emot(t-1)_n + \gamma_{PtoE} \cdot pmot(t-1)_n.$$

The coefficients γ_{EtoP}, and γ_{PtoE}, represent the degree of coupling between two univariate series, which can also vary over time [$\gamma_{EtoP}\,(t)$ and $\gamma_{PtoE}\,(t)$]. If both of these coefficients are zero, it means that there is *no coupling relationship* between the two processes. If $\gamma_{EtoP} \neq 0$ but $\gamma_{PtoE} = 0$, it suggests a *unidirectional coupling*—latent change in professional motivation is affected by the past entrepreneurial motivation level but not the other way around. If $\gamma_{PtoE} \neq 0$ but $\gamma_{EtoP} = 0$, it suggests latent change in entrepreneurial motivation is affected by the past professional motivation level but not the other way around. If both $\gamma_{EtoP} \neq 0$ and $\gamma_{PtoE} \neq 0$, it suggests a *dynamic coupling* between the development of entrepreneurial and professional motivation, as shown in Fig. 5.2.

All the models described above can be fitted using standard structural equation modeling software and model comparisons can be performed using the goodness of fit indices to select the "best" model to characterize the change of a specific process. In this chapter, we will use the LDS approach to examine the change in the EPL motivations and whether the change in one career motivation dimension is coupled with other dimensions, based on university samples.

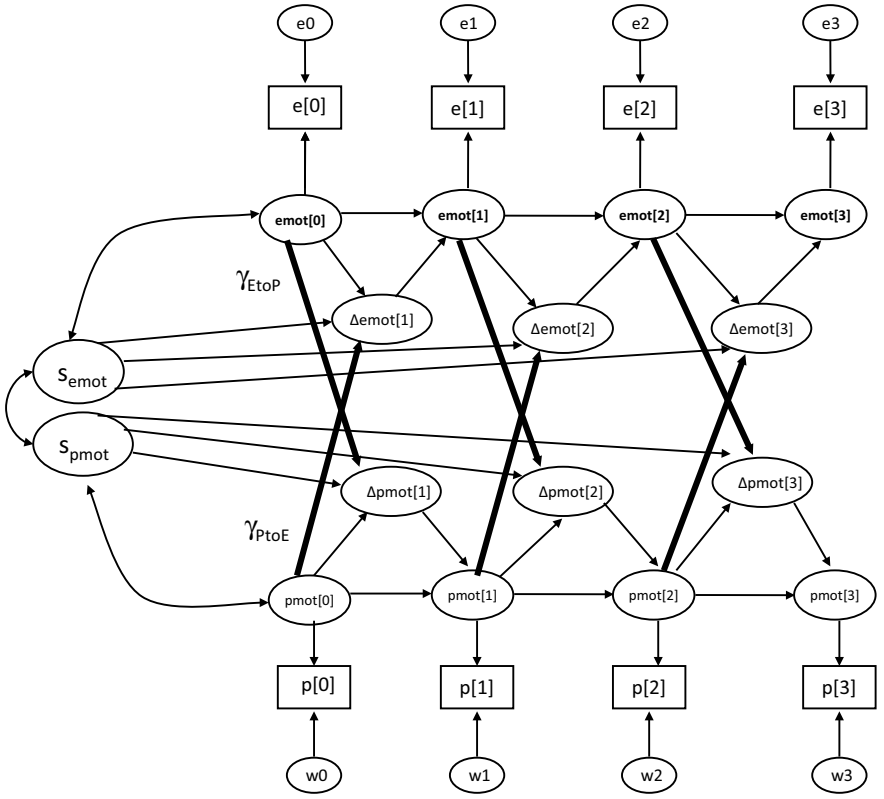

Fig. 5.2 Bivariate dual change score model

Aims of Study

The current paper aims to contribute to the EPL literature by examining the longitudinal changes of EPL motivation dimensions. Given that the EPL framework posits individuals' EPL dimensions to change over time (Chan et al., 2012), it is therefore important to understand the level of co-dependency between E, P, and L and how these dimensions influence each other over time. For the first time since the EPL framework was introduced, we have collected a sizable dataset of longitudinal responses from students over the course of their enrolment in the university. In addition, Chan et al. (2014, 2015c) reported that students from STEM (Science, Technology, Engineering, and Mathematics) disciplines have higher entrepreneurial motivation than students from non-STEM disciplines. Therefore, we explored for differences in EPL motivation development between students from the STEM disciplines and students from non-STEM disciplines.

Method

Our data was collected as part of the annual Career Aspiration Survey (CAS) conducted at a large public university in Singapore between 2010 and 2016. 1748 respondents (891 males, 857 females) who completed the EPL scale in at least three out of four consecutive years provided the data for our study. Hence, each respondent provided either 3 or 4 time point data for the EPL scale. The average age of respondents when they first completed the survey is 21.18 years ($SD = 2.57$). Approximately 64% of the respondents belong to the STEM disciplines. Respondents from the Science and Engineering courses were classified as belonging to STEM disciplines, while respondents from Business studies, Arts, Humanities, and Social Sciences were classified as belonging to non-STEM disciplines.

Measure

Entrepreneurship, *Professionalism, and Leadership (EPL) motivation scale*. The EPL motivation self-report measure (Chan et al., 2012) contains 18 items to assess individuals' expressed motivation to pursue entrepreneurial, professional, or leadership career and uses a 5-point Likert scale from 1 'Strongly Disagree' to 5 'Strongly Agree'. As reported in Chan et al. (2012), the EPL scale was best represented as a higher order factor analytic model with E, P, L motivation as the second order factor. In the current paper, an aggregate score was created for each EPL dimension by averaging responses to the items measuring the respective dimensions.

Analytic Strategy

The LDS analyses were conducted using MPLUS version 7.31 (Muthen & Muthen, 1998–2012). Parameters were estimated using the maximum-likelihood method, which compares the fit of a hypothesized structural model to the observed variance-covariance matrix. We used various measures to assess model fit. The chi-square index provides a measure of model fit, and we applied a heuristic whereby the ratio of chi-square to degrees of freedom (χ^2/df) ratio as low as 2 or as high as 5 to indicate a reasonable fit (Marsh & Hocevar, 1985). The root-mean-square error of approximation (RMSEA; Steiger & Lind, 1980) shows model discrepancy per degree of freedom and penalizes additional complexity to models without substantially improving model fit. Smaller RMSEA values indicate better model fit: RMSEA values smaller than 0.05 indicate a "close fit", while values greater than 0.10 suggest the model fits poorly (Browne & Cudeck, 1989). The comparative fit index (CFI; Bentler, 1990) shows reduction in model misfit when the target model is compared to a baseline model. Generally, CFI values greater than 0.90 indicate a good model fit to

the observed data. The Akaike information criterion (AIC; Akaike, 1973) considers the model complexity against the number of parameters. Generally, when comparing competing models, the model with a smaller AIC is preferred.

Results

Table 5.1 provides the means, standard deviations, and correlations among the EPL motivation variables. Within each EPL motivation dimension (E, P, and L), the inter-correlations between the scale scores from four time points were significant. Similar to Chan and colleagues' (2012) study, entrepreneurial motivation and leadership motivation scores were significantly positively correlated (r = 0.19–0.33) while entrepreneurial and professional motivation, and professional and leadership motivation were less strongly correlated ($r = -0.07$ to 0.08 and r = 0.08 to 0.25 respectively). However, most correlations between entrepreneurial and professional motivation are negative ($r = -0.07$ to -0.01).

In general, respondents in this sample showed an overall decreasing trend in both the entrepreneurial motivation scores (M_e = 2.89–2.70) and in the professional (M_p = 3.89–3.77), but an increasing trend in the leadership motivation scores (M_l = 3.53–3.58). Overall, this group of participants reported stronger professional motivation and leadership motivation than their entrepreneurial motivation. Even though the overall group means of EPL motivations do not change a lot over the 4 time points, individual differences exist in the pattern of change in EPL motivations over the same period. In Fig. 5.3a, mean scores of 6 randomly selected respondents were plotted for their EPL motivation levels to illustrate the varying patterns of change across their 4 years of study. Even respondents with similar initial motivation scores demonstrated different patterns of changes over time. For example, professional motivation levels were quite different in the first year of study among these participants but they all converged to similar level of professional motivation in their final year. Such pattern was not found in the development of E motivation. Figure 5.3b presents joint plots of E, P, and L motivation scores from 6 randomly selected participants—one for each individual. It illustrates how EPL motivation levels can change concurrently within an individual. Some participants demonstrated "convergent" pattern in all the EPL development while some showed convergent pattern in PL development but divergent pattern in E development.

For each of the EPL dimensions, four univariate LDS longitudinal models of EPL motivation were evaluated, namely, the no change model, the proportional change model, the additive constant change model and the dual change score model. Table 5.2 presents summary results for these four models. Change in entrepreneurial motivation was best represented by dual change LDS model, $\chi^2(7) = 11.74$, $p > 0.05$, AIC = 9461.76, CFI = 0.998, RMSEA = 0.02. The unstandardized parameter estimate of the proportional coefficient (β) is -0.25, the initial status mean (μ_0) is 2.89 and the average constant change ($E(\alpha) = \mu_s$) is 0.64. All parameter estimates are statistically significant (ps ranged from < 0.01 to < 0.05).

Table 5.1 Correlations, Means, and Standard Deviation of EPL motivation scale

Variable		Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12
1	Entrepreneurial Motivation TP1	2.89	0.71	–											
2	Entrepreneurial Motivation TP2	2.81	0.72	0.71**	–										
3	Entrepreneurial Motivation TP3	2.78	0.75	0.64**	0.72**	–									
4	Entrepreneurial Motivation TP4	2.70	0.77	0.61**	0.69**	0.77**	–								
5	Professional Motivation TP1	3.89	0.54	0.08**	0.06*	0.07**	−0.01	–							
6	Professional Motivation TP2	3.82	0.56	−0.03	−0.01	−0.02	−0.07	0.49**	–						
7	Professional Motivation TP3	3.78	0.59	−0.05	−0.02	0.00	−0.06	0.44**	0.57**	–					
8	Professional Motivation TP4	3.77	0.55	−0.07*	−0.00	−0.02	−0.05	0.34**	0.50**	0.63**	–				

(continued)

Table 5.1 (continued)

Variable		Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12
9	Leadership Motivation TP1	3.53	0.55	0.33**	0.24**	0.21**	0.19**	0.25**	0.14**	0.08**	0.08*	–			
10	Leadership Motivation TP2	3.55	0.56	0.25**	0.27**	0.22**	0.23**	0.15**	0.21**	0.10**	0.13**	0.61**	–		
11	Leadership Motivation TP3	3.55	0.59	0.23**	0.22**	0.30**	0.23**	0.14**	0.12**	0.17**	0.08	0.57**	0.64**	–	
12	Leadership Motivation TP4	3.58	0.55	0.23**	0.26**	0.29**	0.31**	0.10**	0.08*	0.02	0.16**	0.52**	0.58**	0.60**	–

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

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

Note TP1 = first measurement occasion (Year 1 of study); TP2 = second measurement occasion (Year 2 of study); TP3 = third measurement occasion (Year 3 of study); TP4 = fourth measurement occasion (Year 4 of study)

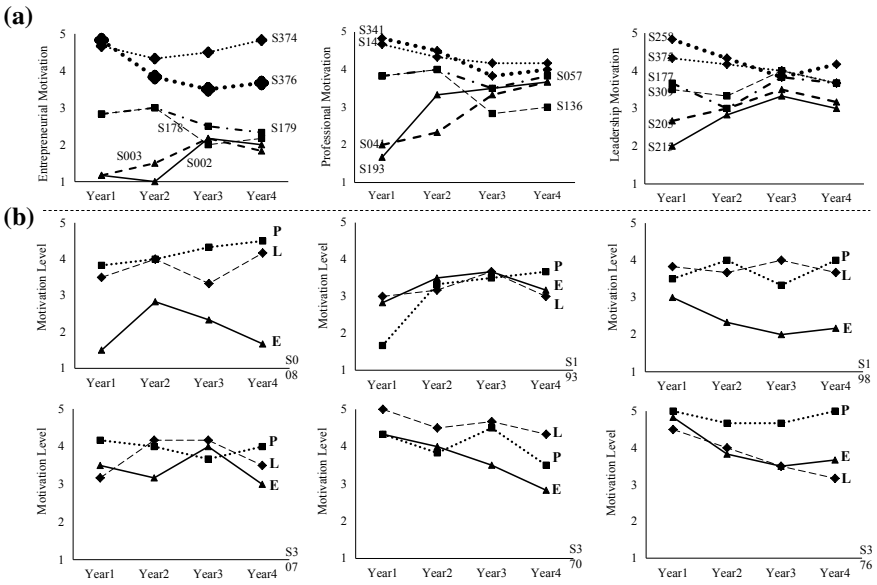

Fig. 5.3 Plot of EPL motivation trajectories from selected participants. Note. The 3 plots in **a** show the E, P and L motivation scores of 6 randomly selected participants across the four measurement occasions [from left to right]. In **b** each plot shows the the E, P, and L motivation scores from one randomly selected respondent across the four measurement occasions

Similarly, changes in professional motivation was best represented by dual change LDS model, $\chi^2(7) = 17.14$, $p < 0.05$, AIC = 8030.10, CFI = 0.993, RMSEA = 0.03. The unstandardized parameter estimate of the proportional coefficient (β) was -0.58, the initial status mean (μ_0) was 3.89 and the average constant change (μ_s) was 2.19. All parameter estimates were statistically significant ($p < 0.01$).

Changes in leadership motivation was also best represented by dual change LDS model, $\chi^2(7) = 18.88$, $p < 0.01$, AIC = 7458.14, CFI = 0.994, RMSEA = 0.03. The unstandardized parameter estimate of the proportional coefficient (β) was -0.42. The initial status mean (μ_0) is 3.53 and the average constant change mean (μ_s) was 1.50. All of these parameter estimates are statistically significant ($p < 0.01$).

Tri-variate Latent Difference Models

The next part of our analyses focus on using trivariate dual change LDS analyses to explore if there is any coupling relationships present in the change of entrepreneurial motivation, professional motivation and leadership motivation. Building on the univariate latent difference score results, the following equations describe changes in the E, P, and L motivation scores in the presence of coupling of the other two motivations:

Table 5.2 Fit statistics for traditional latent change score models

	Entrepreneurial motivation				Professional motivation			
	NC model	PC model	CC model	DC constrained	NC model	PC model	CC model	DC constrained
Goodness-of-fit								
CFI	0.887	0.958	0.997	0.998	0.888	0.928	0.971	0.993
TLI	0.998	0.975	0.998	0.999	0.939	0.957	0.978	0.994
SRMR	0.041	0.114	0.041	0.026	0.148	0.137	0.195	0.119
RMSEA	0.105	0.084	0.026	0.020	0.090	0.076	0.054	0.029
AIC	9465.841	9577.502	9465.841	9461.762	8173.212	8117.994	8059.439	8030.104
χ^2 (df)	222.863** (11)	133.475** (10)	17.815* (8)	11.736 (7)	168.243** (11)	111.025** (10)	48.469** (8)	17.135* (7)
$\Delta\chi^2$ (df)^	–	89.388** (1)	205.048** (3)	6.079* (1)		57.218** (1)	119.774** (3)	31.334** (1)
χ^2/df	20.26	13.35	2.23	1.68	15.29	11.10	6.06	2.48

Leadership motivation				
	NC model	PC model	CC model	DC (Constrained)
Goodness-of-fit				
CFI	0.982	0.985	0.993	0.994
TLI	0.990	0.991	0.995	0.995
SRMR	0.088	0.089	0.113	0.096
RMSEA	0.043	0.042	0.033	0.031
AIC	7478.319	7473.686	7460.108	7458.141
χ^2 (df)	47.065** (11)	40.432** (10)	22.853** (8)	18.887** (7)

(continued)

Table 5.2 (continued)

	Entrepreneurial motivation				Professional motivation			
	NC model	PC model	CC model	DC constrained	NC model	PC model	CC model	DC constrained
$\Delta\chi^2$ (df)^		6.633* (1)	24.212** (3)		3.966* (1)			
χ^2/df	4.28	4.04	2.86		2.70			

Note $^{**}p < 0.01$; $^{*}p < 0.05$

^model comparison index is computed between no change model (NC) and proportional change (PC) model, between no change (NC) model and constant change (CC) model, between constant change (CC) model and constrained dual change (DC) model, between constrained dual change (DC constrained) model and unconstrained dual change model (DC unconstrained)

$$\Delta emot(t)_n = \alpha_{\text{emot}} \cdot s_{\text{emot},n} + \beta_{emot} \cdot emot(t-1)_n + \gamma_{\text{PtoE}} \cdot pmot(t-1)_n + \gamma_{\text{LtoE}} \cdot lmot(t-1)_n.$$

$$\Delta pmot(t)_n = \alpha_{\text{pmot}} \cdot s_{\text{pmot},n} + \beta_{pmot} \cdot pmot(t-1)_n + \gamma_{\text{EtoP}} \cdot emot(t-1)_n + \gamma_{\text{LtoP}} \cdot lmot(t-1)_n.$$

$$\Delta lmot(t)_n = \alpha_{\text{lmot}} \cdot s_{\text{lmot},n} + \beta_{lmot} \cdot lmot(t-1)_n + \gamma_{\text{EtoL}} \cdot emot(t-1)_n + \gamma_{\text{PtoL}} \cdot pmot(t-1)_n.$$

For comparison purposes, we fitted no coupling model and a series of trivariate coupling models with various constraints on the coupling coefficients, from constraining all these coefficients to be the same over time (as stated in the equation above), to some and all of them to be allowed variation over time. Due to the large number of models involved and space limitation, we present only the "best" fit model in Table 5.3.

Based on the coupling coefficients, it is interesting to note that the relationship is not reciprocal among the EPL motivations. In fact, stronger level of professional motivation decreases the change in entrepreneurial motivation ($\gamma_{\text{PtoE}} = -0.291$, $p < 0.01$) and leadership motivation ($\gamma_{\text{PtoL}} = -0.425$, $p < 0.01$), but not the other way round ($\gamma_{\text{EtoP}} = 0.146$, $p > 0.05$; $\gamma_{\text{LtoP}} = 0.153$, $p > 0.05$). However, entrepreneurial and leadership motivation levels do not affect each other's change ($\gamma_{\text{LtoE}} = -0.201$, $p > 0.05$; $\gamma_{\text{EtoL}} = 0.161$, $p > 0.05$).

Comparison Between STEM and Non-STEM Students

The analysis above assumes that the coupling dynamics holds for all participants, which may not be appropriate. It is plausible that the proposed dynamics differ among known or unknown subgroups in both qualitative and quantitative ways. Chan et al. (2014, 2015c) reported that STEM students have stronger entrepreneurial motivations than non-STEM students. In our final analysis, we explored the differences in the coupling relationships discovered above between students from STEM (engineering and science majors) and non-STEM disciplines (arts, humanities, social sciences majors). We split the samples into these two subgroups and refitted the model in Table 5.3 separately for each subgroup.

Table 5.3 Fit statistics for "best" fit trivariate LDS dual change score model

	Trivariate coupling (unconstrained) model
Additive coefficients	
s_{emot}	2.047**
s_{pmot}	1.952**
s_{lmot}	2.315**
Proportional coefficients	
β_e	−0.097
β_p	−0.769**
β_l	−0.319
Coupling coefficients	
γ_{PtoE}	−0.291*
γ_{LtoE}	−0.201
γ_{EtoP}	0.146
γ_{LtoP}	0.153
γ_{PtoL}	−0.425**
γ_{EtoL}	0.161
Goodness-of-fit	
AIC	24474.543
CFI	0.976
TLI	0.969
SRMR	0.061
RMSEA	0.044
χ^2 (df)	222.241** (51)
$\Delta\chi^2$ (df)^	57.143** (10)
χ^2/df	4.36

Note $^{**}p < 0.01$; $^{*}p < 0.05$. s_{emot} = slope mean for entrepreneurial motivation (emot), s_{pmot} = slope mean for professional motivation (pmot), s_{lmot} = slope mean for leadership motivation (lmot), γ_{EtoP} = cross-lag effect of emot on the rate of change in pmot, γ_{PtoL} = cross-lag effect of pmot on the rate of change in lmot, γ_{EtoL} = cross-lag effect of emot on rate of change in lmot. γ_{PtoE} = cross-lag coefficient of pmot on the rate of change in emot. γ_{LtoE} = cross-lag coefficient of lmot on the rate of change in emot. γ_{LtoP} = cross-lag coefficient of lmot on the rate of change in pmot

For both groups, stronger professional motivation also significantly decreases the change in leadership motivation ($\gamma_{PtoL} = -0.555$, $p = 0.041$ for non-STEM group; $\gamma_{PtoL} = -0.374$, $p = 0.012$ for STEM group). Stronger leadership motivation significantly increases the change in entrepreneurial motivation for non-STEM majors ($\gamma_{LtoE} = 1.023$, $p = 0.027$) but decreases it for STEM majors ($\gamma_{LtoE} = -0.807$, $p = 0.018$). Stronger professional motivation

hinders the change in entrepreneurial motivation significantly for non-STEM students ($\gamma_{PtoE} = -0.579$, $p = 0.031$) but this relationship is not significant for STEM students ($\gamma_{PtoE} = -0.334$, $p = 0.096$). Stronger entrepreneurial motivation does not drive any change in professional and leadership motivation for both groups ($\gamma_{EtoP} = 0.152$, $p = 0.222$; $\gamma_{EtoL} = 0.071$, $p = 0.616$ for non-STEM majors; $\gamma_{EtoP} = 0.126$, $p = 0.455$, $\gamma_{EtoL} = 0.286$, $p = 0.088$ for STEM majors). In addition, stronger leadership motivation does not lead to any change in professional motivation for both groups ($\gamma_{LtoP} = 0.112$, $p = 0.735$ for non-STEM majors, $\gamma_{LtoP} = 0.220$, $p = 0.259$ for STEM majors).

Discussion

In the current paper, we sought to understand the change of the EPL motivation for a group of students over the course of their university education. Using latent difference score approach, we attempted to reveal the underlying dynamics on how the three types of motivation change over time and if the change in one motivation dimension drives the change in other dimensions. As this is the first study in understanding the change in EPL motivation over time, our results are mainly descriptive in nature.

Over the four years of study, the average scores of entrepreneurial motivation levels are generally low, compared to the averages of the professional and leadership motivation levels. This result is not surprising as, among university students, entrepreneurship as a career is not a mainstream choice, compared to professional and leadership/managerial careers (e.g. Chernyshenko, Chan, Ho, Uy, & Sam, 2017).

Through the trivariate latent difference analysis, we found that changes in EPL motivations are related to each other. Among the EPL motivations of the current university, we found that a student's professional motivation "slows" down the development in entrepreneurial and leadership motivations but not the other way around. On the other hand, there is no clear evidence that the development in entrepreneurial and leadership motivations are related to each other. To further understand to what extent these changes relate to the disciplines in terms of the type of courses that the students were enrolled in, we compared the STEM and non-STEM majors. There are some commonalities between the two groups: (i) entrepreneurial motivation does not affect change in professional and leadership motivation, (ii) leadership motivation does not affect change in professional motivation, but (iii) professional motivation negatively affects the change in leadership motivation for both groups.

On the other hand, (i) leadership motivation promotes change in entrepreneurial motivation for non-STEM students but hinders such change for STEM students; (ii) professional motivation affects negatively the change in entrepreneurial motivation for non-STEM students only. We note there has been increasing emphasis of entrepreneurial training in STEM curriculum at the university level (e.g. Nanyang Technopreneurship Center, 2001; NTUitive, 2014; NUS Entrepreneurship Centre,

1999), which could have inspired STEM students to pursue entrepreneurship in tandem with their professional training, This may explain why professional motivation may not hinder development in entrepreneurial motivation for STEM majors. With the Singapore Government's focus on cultivating entrepreneurship among students in STEM-related fields at a younger age (Ministry of Education, 2014, 2019; National Archives of Singapore, 2012), entrepreneurial aspirations among STEM students may grow stronger in the near future. We encourage future research to examine possible reasons (e.g., university curriculum emphasis on discipline-specific academic training versus general education, career guidance from each discipline etc.) that may further support our current findings.

Limitations and Future Directions

In a world where innovation and entrepreneurship are gaining prominence (e.g. Singapore Government, 2017, 2018), it is worrisome to learn that university students are less entrepreneurially motivated than they were professionally motivated. Future studies can consider cross-university/cross country samples to compare whether this trend is specific to one institution. A limitation in using university students is that they may have lesser work experience compared to an adult working population and hence their EPL motivation may differ from working adults. However, data on EPL based on student samples are useful in providing a fuller picture if respondents continue to provide data after they enter the workforce. Future studies could use a different sample pool and over a longer period of time to get a clearer view of EPL relationships.

To our knowledge, this was the first paper to apply a latent difference score (LDS) approach to the EPL framework. As LDS is a complex approach that enables us to examine longitudinal relationship between EPL motivation dimensions, future research should consider using other longitudinal analysis methods such as mixed effect regressions (Garcia & Marder, 2017) or latent profile analysis (Stanley, Kellermanns, & Zellweger, 2017) to understand the longitudinal change trajectories. In this paper, the cross-lagged/coupling coefficients are assumed to be the same for all participants (fixed effect). However, individual differences may be present. Future studies could expand the current LDS framework by incorporating random effects in the cross-lagged coefficients. Moreover, the current study examines the similarity and differences in the change in EPL motivation between STEM and non-STEM students (known membership). Future research could explore the heterogeneity in the dynamics through mixture analysis to discover unknown/hidden groupings among the participants.

In summary, we applied a longitudinal analysis method (LDS) to gain a preliminary understanding of the relationship between entrepreneurial (E), professional (P), and leadership (L) motivation. While a clear negative relationship between entrepreneurial motivation and professional motivation is observed, the full relationship between E, P, and L motivation is more intertwined and complex. We note

the limitation in using a university student sample and encourage future studies to use a wider sample across different periods to better understand how EPL changes over time.

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Chapter 6
Operationalizing Developmental Readiness via Entrepreneurship, Leadership, and Professionalism Career Dimensions

Oleksandr S. Chernyshenko, Moon-Ho Ringo Ho, Kim-Yin Chan and Kang Yang Trevor Yu

Abstract This chapter seeks to contribute to the emerging literature on developmental readiness (Avolio and Hannah, 2008). First, we propose to broaden the developmental readiness (DR) concept beyond leadership domain to include other viable career tracks (e.g., expert or entrepreneur). To that extent, we use Chan's et al. (2012) EPL model to represent DR constructs in a multidimensional career space defined by entrepreneurship, professional, and leadership vectors. We also describe and initiate the effort to develop and validate a suite of DR measures that can be readily used in research and practice.

Keywords Career development and management · Developmental readiness · Human capital development · Talent management · Motivation · Entrepreneurship · Motivation-to-develop

Introduction

Today, very few organizations can sustain themselves without continuous development of the workforce. For that reason, employee learning is often referred to as "the lifeblood of modern organizations" (Bartlett & Ghoshal 1998; Senge, 1990). Training opportunities have been found to have positive effect on talent recruitment (Barbeite & Maurer, 2002), commitment and satisfaction ((Mikkelsen, Saksvik, Eriksen, &

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Ursin, 1999), and retention (Kaye & Jordan-Evans, 2000; Lund & Borg, 1999). Being a "learning organization" also appears to be associated with an organization's financial performance (Ellinger, Ellinger, Yang, & Howton, 2002). To no surprise, organizations invest heavily in training (e.g., $12 billion on managerial development in U.S. (Industry Report, 2007)), and there is no shortage of research on the topic. Cseh (1998), for instance, identified 135 dissertations from 1980 to 1998 dedicated to a topic of informal learning alone.

One of the emerging and important concepts in the training and development literature is "developmental readiness." The term was coined by Avolio and Hannah (2008) to explain why some leadership development interventions did not lead to positive learning outcomes. The concept paralleled clinical psychology literature where being developmentally ready to accept the change has been linked to success of therapy interventions (Singer, 1997). Being developmentally ready is seen as a necessary prerequisite for getting the most out of training interventions.

Beyond learning outcomes, constructs associated with developmental readiness (DR) appear to be critical in predicting *intentions to participate* in formal development activities. (Mauer, Lippstreu, & Judge, 2008; Mauer, Weiss, & Barbeite, 2003). Cerasoli et al. (2014) also argued that some components of DR are key among other antecedents of participation in informal learning. Given that many of today's training solutions involve on-demand, self-directed configurations, the importance of DR construct for both research and practice should only increase in the foreseeable future.

While the precise definition of DR is yet to be agreed on, it is becoming clear that the concept is multi-dimensional and includes at least three core motivational constructs: career motivation (e.g., motivation to lead), perceived competence/efficacy (e.g., leadership efficacy), and motivation-to-develop (Keating, Rosch, & Burgoon, 2014; Rosch & Villanueva, 2016; Lippstreu, 2010). Moreover, some researchers suggest that the three constructs have structural relations with leadership motivation and efficacy having independent effects on motivation-to-develop (Rosch & Villanueva, 2016). In simple terms, a high level of development readiness means that the individual (a) has a clear goal/motivation to pursue a certain career path, (b) perceives to already have skills necessary to be successful in a particular domain, and (c) desires to develop those skills to even higher levels.

Figure 6.1 summarizes the extant research and presents a simplified conceptual model for the developmental readiness constructs. This model combines ideas from Mauer et al. (2003, 2008), Avolio and Hannah (2008), and Rosch and Villanueva (2016), and formally specifies the three DR constructs as a proximal antecedent of participation in learning and other forms of proactive career behaviors. However, unlike Avolio and Hannah's (2008) view of DR as a moderator, our model conceptualizes DR as a key mediator of relationships between more distal dispositional/situational factors (e.g., individual differences and experience) and the outcomes.

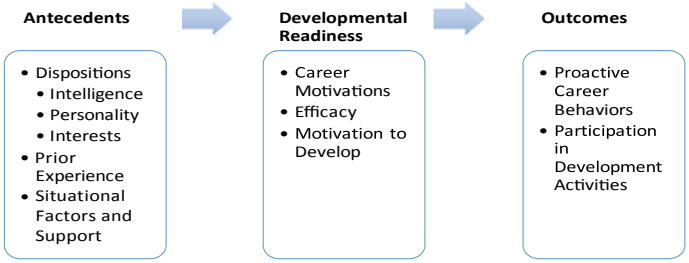

Fig. 6.1 Conceptual model of antecedents and consequences of developmental readiness

Goals of This Chapter

This chapter seeks to contribute to the emerging literature on developmental readiness. First, we propose to broaden the DR concept beyond the leadership domain to include other viable career tracks (e.g., professional or entrepreneurial). To that extent, we use Chan's et al. (2012) person-centered career framework to represent DR constructs in a multidimensional career space defined by entrepreneurship (E), professional (P), and leadership (L) vectors. Specifying DR in this way allows for the inclusion of a wider variety of developmental activities and, thus, broadens the scope of the DR construct. Second, we propose to develop a suite of DR measures that can be readily used in research and practice. Our aim here is to design short, reliable scales with an empirically justifiable factor structure. Finally, we conducted a small, exploratory cross-sectional validity study to show how the three DR constructs relate to each other as well as to self-reported proactive career behaviors.

Operationalizing Developmental Readiness via EPL Career Framework

Although past DR research almost exclusively focused on leadership development, we believe that the concept is applicable to other career paths and training interventions. Building on organizational career models by Schein (1978), Kanter (1989), and Chan et al. (2012), we propose to look at DR in reference to three fundamental career vectors: entrepreneurship (E), professionalism (P), and leadership (L). Individual's development can then be seen as a journey in this multi-dimensional EPL career space, where pursuit of expert knowledge and skills, for example, would be seen as a movement along the professionalism vector. Development interventions can also be located in this space and seen as ways to help individuals move in that particular

direction. In our view, broadening DR beyond leadership career vector would allow it to be more readily used by HR professionals, because training and development interventions are rarely limited to just the development of managerial skills and often include technical and business development skills that are more consistent with P and E career vectors.

For each EPL dimension, we developed scales assessing the three main motivational DR constructs: career motivation, efficacy, and motivation-to-develop. For career motivation and efficacy constructs, we simply adapted measures previously developed for university student populations (see Chan et al., 2012). To develop motivation-to-develop scales, we used Lippstreu's (2010) approach in which he asked respondents to indicate the degree to which they are motivated to improve specific EPL behaviors.

We then conducted a small, exploratory cross-sectional validity study involving 181 adults from medical, R&D, and start-up sectors to see how the three DR constructs relate to each other as well as to proactive career behaviors. Taking into considerations past research findings by Rosch and Villanueva (2016), we expected EPL motivations and efficacies having independent effects on EPL motivations to develop. We also expected all DR EPL constructs to positively associate with proactive career behaviors.

Methodology

Sample and Procedure

A total of 181 working adults (41% male; 59% female) participated in the study. 81% were aged between 21 and 40 years old, with the remaining 19% above 40 years old. The average working experience was 9.9 years. Participants were recruited from medical, public R&D, and start-up sectors in Singapore. 93% of participants were administered the paper and pencil surveys; the rest completed the surveys online. Informed consent was obtained from all participants at the start of the surveys. The survey procedures were approved by the Institutional Review Board.

Measures

EPL career motivation scales for working adults. An 18-item working adult version of Chan et al. (2012) measure was administered. Examples of the items include, "I am the kind of person who constantly has ideas about new businesses" (E career motivation), "I have always enjoyed leading others and would assume leadership roles whenever I could" (L career motivation), and "I care deeply about advancing

and creating knowledge in my area of expertise" (P motivation). Participants indicated their response to each item using a 5-point scale from "strongly disagree" to "strongly agree". Cronbach alphas for the three scales were 0.84 for entrepreneurship motivation, 0.68 for professional motivation, and 0.68 for leadership motivation. Confirmatory factor analysis showed evidence for a measurement model with three second-order factors (E, P, and L motivations), each with three first-order factors solution following Chan and Drasgow's (2001) framework of affective/identity, calculative/non-calculative, and social normative motivations (CFI = 0.88; SRMR = 0.08; RMSEA = 0.06).

EPL efficacy scales for working adults. 12-item version of Chan et al.'s (2012) EPL efficacy measure was administered. Participants were given a list of 12 EPL behaviors (see Table 6.1) and asked to indicate how confident they were to perform them successfully. A 5-point response scale was used with 1 = Not at all confident, 2 = A little bit confident, 3 = Moderately confident, 4 = Fairly confident, and 5 = Extremely confident. Confirmatory factory analysis showed good fit for a three-factor solution (CFI = 0.97; SRMR = 0.04; RMSEA = 0.05). Cronbach alphas were 0.88 for E efficacy, 0.86 for P efficacy, and 0.91 for L efficacy.

EPL motivation to develop scales for working adults. Scales were developed following the approach proposed by Lippstreu (2010). Participants were given a list of 12 EPL behaviors (see Table 6.1) and asked to indicate how motivated they were to improve each behavior. A 5-point response scale was used with 1 = Not at all motivated, 2 = A little bit motivated, 3 = Moderately motivated, 4 = Fairly motivated, and 5 = Extremely motivated. Item content, means, standard deviations and corrected item-total correlations (CITC) for the three motivation-to-develop scales are presented in Table 6.1. Confirmatory factory analysis showed good fit for a three-factor solution (CFI = 0.95; SRMR = 0.05; RMSEA = 0.07, see Table 6.2 for more details). Cronbach alphas were 0.90 for E motivation-to-develop, 0.86 for P motivation-to-develop, and 0.91 for L motivation-to-develop.

Proactive career behaviour scale. To measure participants' overall proactivity in career development, we took 5 out of 13 items from Strauss, Griffin and Parker's (2012). Confirmatory factory analysis showed a single common-factor underlying these 5 items (CFI = 0.93; SRMR = 0.05; RMSEA = 0.15). Cronbach alpha for this 5-item scale was 0.75.

Results

Table 6.3 shows correlations and reliability estimates for the nine EPL developmental readiness scales (i.e., EPL career motivations, efficacies, and motivations-to-develop) and proactive career behaviors. Consistent with past research by Chan et al. (2012), entrepreneurship and professional career motivations were uncorrelated ($r = 0.04$, n.s.), while professional and leadership career motivations had high positive correlations ($r = 0.49$, $p < 0.01$). As expected, all nine EPL DR scales had significant

Table 6.1 Item Statistics for EPL Motivation to Develop Scales

Item code		Item content	Mean	S.D.	CITC
Entrepreneurship motivation to develop					
EFF2_Ent	1	Plan a business (including market analysis, pricing, financing/costs, marketing/sales)	2.61	1.13	0.78
EFF3_Ent	2	Build a network of contacts or partners who will support a new business	2.87	1.15	0.82
EFF6_Ent	3	Identify opportunities to start-up viable business ventures	2.83	1.16	0.82
EFF7_Ent	4	Design an effective campaign for marketing a new product or service	2.89	1.10	0.69
Professionalism motivation to develop					
EFF21_Prof	1	Teach or share with others my knowledge, experience, and expertise in my chosen area of work specialization	3.71	0.95	0.68
EFF22_Prof	2	Conduct research to further advance knowledge in my area of expertise, specialization or profession	3.59	1.02	0.76
EFF23_Prof	3	Write articles/books and present at professional meetings	2.73	1.25	0.70
EFF20_Prof	4	Keep up with the advancing knowledge and skills in my area of expertise, specialization or profession	3.61	0.91	0.71
Leadership motivation to develop					
EFF13_LMgt	1	Align and rally people around a common goal	3.27	0.95	0.78
EFF14_LMgt	2	Motivate others working with me to do more than they dreamed they could do	3.28	0.97	0.84
EFF15_LMgt	3	Take charge of decisions needed for a group or organization	3.28	1.02	0.78
EFF16_LMgt	4	Plan, direct, organize and prepare others as to what they need to do.	3.43	0.92	0.81

positive correlations with proactive career behaviors. The highest correlations were observed for EPL motivation-to-develop scales, while the lowest correlations were observed for EPL career motivation scales. The latter may have been attenuated due to the scales' unreliability.

Table 6.2 3-Factor CFA solution for the EPL motivation to develop Scales

Model	χ^2	df	χ^2/df	CFI	SRMR	RMSEA	AIC	BIC	ABIC
3 first-order factors model (12 items)	90.043	51	1.766	0.947	0.049	0.065	5086.53	5211.06	5087.55

Note N = 181. All items were included in the analyses. Mplus version 7.31 was used to run CFA with MLMV estimation

Table 6.3 Scale reliabilities and inter-scale correlations

	Scale	1	2	3	4	5	6	7	8	9	10
1	Entrepreneurship MTD	**0.90**									
2	Professionalism MTD	0.36**	**0.86**								
3	Leadership MTD	0.56**	0.49**	**0.91**							
4	Entrepreneurship Efficacy	0.64**	0.25**	0.37**	**0.88**						
5	Professional Efficacy	0.38**	0.73**	0.49**	0.38**	**0.86**					
6	Leadership Efficacy	0.47**	0.34**	0.64**	0.59**	0.55**	**0.91**				
7	Entrepreneurship Motivation	0.59**	0.00	0.25**	0.47**	0.09	0.37**	**0.84**			
8	Professional Motivation	0.04	0.45**	0.22**	0.13	0.45**	0.32**	0.04	**0.68**		
9	Leadership Motivation	0.26**	0.29**	0.39**	0.31**	0.32**	0.41**	0.23**	0.49**	**0.68**	
10	Proactive Career Behaviors	0.50**	0.40**	0.42**	0.40**	0.40**	0.39**	0.31**	0.33**	0.32**	**0.75**

Notes MTD = Motivation to Develop. $N = 181$. $^{**}p \leq 0.001$ (2-tailed)

Table 6.4 Multiple Regression Results for Predicting EPL Motivation to Develop

Dependent variable	Predictors	Unstandardized coefficients		Standardized coefficients	t	sig	R^2
		B	SE	Beta			
Entrepreneurship Motivation to Develop	Intercept	0.52	0.23		2.22	0.03	
	Entrepreneurship Efficacy	0.47	0.07	0.45	6.82	0.00	
	Entrepreneurship Motivation	0.44	0.09	0.34	5.11	0.00	0.48
Professional Motivation to Develop	Intercept	0.23	0.35		0.68	0.50	
	Professional Efficacy	0.67	0.06	0.66	11.67	0.00	
	Professional Motivation	0.27	1.00	0.15	2.67	0.01	0.55
Leadership Motivation to Develop	Intercept	0.78	0.32		2.41	0.02	
	Leadership Efficacy	0.59	0.06	0.58	9.24	0.00	
	Leadership Motivation	0.24	0.10	0.15	2.45	0.02	0.43

Note $N = 181$

To see if EPL career motivations and efficacies have positive and independent effects on the respective motivations-to-develop, we conducted multiple-regression analyses for each EPL domain, respectively. As can be seen in Table 6.4, significant standardized regression coefficients were observed for Entrepreneurship efficacy ($\beta = 0.45$, $p < 0.01$) and Entrepreneurship career motivation ($\beta = 0.34$, $p < 0.01$) when predicting Entrepreneurship motivation-to-develop. Coefficients for the Leadership and Professional domains were also significant, but were considerably higher for efficacy than for career motivation. These results support assertions by Rosch and Villanueva (2016) that, within DR construct space, motivations and efficacies could be seen as predictors of motivations-to-develop.

Altogether, our results showed construct validity evidence for the 12 scales that we proposed to assess employee's developmental readiness. CFA analyses showed factorial structures consistent with theoretical expectations. Despite being short (4–6 items), scale reliabilities were also fairly high (ranged from 0.68 to 0.91). Observed correlations and regression coefficients were consistent with past research and in the expected directions.

General Discussion

This chapter makes several important contributions towards a better understanding of the developmental readiness concept and expands the reach of the Chan's et al. (2012) EPL framework beyond university student populations. First, this chapter

has formally operationalized DR as a confluence of three motivational constructs, namely, career motivation, efficacy, and motivation to develop. Second, it expanded DR concept beyond leadership domain to include professional and entrepreneurship career tracks. This three-dimensional view of DR allows for studying career progressions of employees in a wider variety of organizations including start-ups, professional services firms, and R&D companies. Third, this chapter offered a suite of measures that can be readily used by HR professionals for training and development applications. The suite of measures includes 12 four to six-item scales (EPL motivation, EPL efficacy, and motivation-to-develop EPL skills) with an established factorial structure and acceptable levels of reliability. A pilot study involving 181 employees provided initial validation evidence.

The limitations of the study includes: (1) a cross-sectional study design, (2) a relatively small sample size (N = 181), (3) a somewhat low diversity of industries represented (medical, R&D, and start-ups), and (4) a limited number of relevant constructs studied. Hence, our plan for future research is to study antecedents and consequences of DR constructs across different industry sectors and across time, along the conceptual model presented in Fig. 6.1. It will be particularly beneficial to follow employees over time, as they grow in their career paths, and to understand the relative importance of dispositions, past experiences, and DR constructs in predicting the engagement in training and development activities. We anticipate fitting a number of structural equation models to strengthen validity evidence along the lines of the employee development framework presented in Fig. 6.1.

Finally, we believe that our EPL-based operationalization of the developmental readiness has important implications for practice. It offers a practical solution that enables organizations to identify employees who may be ready to take on additional responsibilities and training. Hence, the assessment suite allows for more targeted, person-centered training and development interventions, and, ultimately, for better returns on investment. Moreover, because the Chan et al.'s (2012) EPL model encompasses the majority of career paths of today's organizations (e.g., specialists, managers, business developers), the EPL DR model could be useful for organizations seeking a comprehensive Human Capital model for all HR processes. The key advantage of the EPL DR model is that it is simple to communicate, and would, therefore, be readily accepted, which in turn would lead to successful HR process implementation in organizations.

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Part II
Empirical Studies

Part 2 includes various empirical research studies that employ the EPL measures from Chan et al. (2012). In the twenty-first century, tertiary educational institutions are increasingly concerned with the work-readiness and employability of their graduates beyond mere education for education's sake. More than academic results, university graduates are expected to possess transferable skills, life-long learning and self-managing career skills and mindsets beyond their technical, vocational, or professional knowledge, and skills to navigate highly dynamic job/labor markets. Chapter 7 presents empirical evidence to show how E, P, and L efficacies contribute to the prediction of self-perceived employability in a sample of 5874 university students, as a way to justify how individuals can think of developing their E, P, and L skills to ensure employability in the future. It also suggests how the EPL framework can relate to the popular "T-shaped" metaphor in the popular human resources literature, where "T-shaped" is used to describe the need for both breadth (transferable) and depth (specialized/technical) skills needed for various reasons from collaboration to employability. The chapter discusses how universities can provide future graduates with more T-shaped EPL development professionals for greater employability and career adaptability.

Chapter 8 reports the development of a new self-report measure of individual differences in Preferences for Non-Standard Work (PNSW), and an effort to explore relationships between PNSW and EPL motivations and efficacies, alongside measures of perceived employability and career adaptabilities. Using data collected from a sample of 225 undergraduate students, confirmatory factor analysis showed that individuals can discriminate between five forms of non-standard work as follows: independent contracting, outsourced work, temporary or part-time work, working in a "start-up," and external deployment. Correlation and regression analyses revealed that while the preference for outsourced, temporary/part-time work and external deployments was not predicted by EPL motivations, efficacies, or career adaptability factors, entrepreneurial motivation and efficacy were significantly predictive of preferences for independent contracting and start-up work, as one would expect. The preference for start-up work was also weakly but significantly correlated with all

four career adaptability factors, with overall career adaptability correlating significantly with start-up preference at $r = 0.26$. The findings are discussed in relation to understanding individual differences in PNSW, and the use of such measures in career counseling.

Till now, Chan et al.'s (2012, 2015) published research has focused on personality traits and vocational interests as possible "antecedents" of EPL motivations. While there has been much research into the relationship between values and leadership style, we know little about how values contribute to entrepreneurial, professional, and leadership motivations. Chapter 9 attempts to address this gap by examining correlations from a study of 272 undergraduate students; the findings suggest that universal and cultural values can distinguish between these motivations. Leadership and entrepreneurial motivation share a basis in achievement and stimulation values, while entrepreneurial motivation is distinguished by low emphasis on values of conformity and security. Professional motivation shares little in common with the other two types; it is characterized by hedonism and uncertainty avoidance.

Taken together, we hope that these three chapters provide readers with a good appreciation of the wide range of empirical research than can emanate from Chan et al.'s (2012) EPL framework and measures. We also hope that papers would stimulate further research by using these measures in different settings and to address new research questions.

Chapter 7
A "T-shaped" Metaphor for Holistic Development: Entrepreneurial, Professional and Leadership (EPL) Efficacies Predict Self-perceived Employability

Kim-Yin Chan, Moon-Ho Ringo Ho and Regena Ramaya

Abstract Today, tertiary educational institutions are especially concerned with the work-readiness and employability of their graduates beyond mere education for education's sake. More than academic results, university graduates are expected to possess transferable skills, life-long learning and self-managing career skills and mindsets beyond their technical, vocational or professional knowledge and skills to navigate highly dynamic job/labor markets. Chan et al. (2012) first introduced the Entrepreneurial, Professional and Leadership or EPL framework using the "dimensions of boundaryless career space" as a heuristic to help individuals visualize how they can advance their careers simultaneously in E, P and L dimensions. This chapter suggests how the EPL framework can relate to the popular "T-shaped" metaphor in the popular human resources literature, where "T-shaped" is used to describe the need for both breadth (transferable) and depth (specialized/technical) skills needed for various reasons from collaboration to employability. We present empirical evidence to show how E, P and L efficacies contribute to the prediction of self-perceived employability in a sample of 5,874 university students, as a way to justify how individuals can think of developing their E, P and L skills to ensure employability in the future. We discuss how universities can provide future graduates with more holistic T-shaped EPL development for greater employability and career adaptability.

Keywords Employability · Graduates · T-shaped · Metaphor · Entrepreneurial · Professional · Leadership · Skills · Transferable · Efficacy · Development · Innovation

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Introduction

Metaphors are ubiquitous in everyday life and also in the social sciences (Lakoff & Johnson, 1980; Grant & Oswick, 1996; Inkson, 2002, 2004; Morgan, 1983, 1986; Tsoukas, 1993). They are mental tools that help us communicate and understand complex phenomena in simpler, illustrative ways through analogies. Chan et al. (2012) introduced Entrepreneurship, Professionalism, Leadership (EPL) as a metaphor for the "three key dimensions of subjective career space" in which careers could be seen as vectors navigating at different rates, directions, and intensities (see Fig. 7.1). This served as a heuristic to help individuals to visualize how they can advance their careers simultaneously in E, P and L dimensions in a boundaryless career space. In this chapter, we introduce another heuristic to help people think about their EPL development, namely, the popular metaphor of the "T-shaped professional".

The T-shaped metaphor was first mentioned by Professor David Guest of Kings College London in 1991. Commenting on a British Computer Society Report and a survey of computing jobs in the U.K. and in *The Independent*, Guest (1991) suggested that firms were looking for T-shaped, "hybrid" IT professionals who could "combine business expertise with IT skills"; that they were distinguished by their "ability to relate to 'the broad picture' and to people". Around the turn of the millennium, IBM also started to emphasize the need for higher education systems to generate more T-shaped graduates to meet the future needs of the service economy. It did so by advocating a new educational curriculum concept called "Service Science, Management, and Engineering" or SSME (see Maglio et al., 2006; Spohrer et al.,

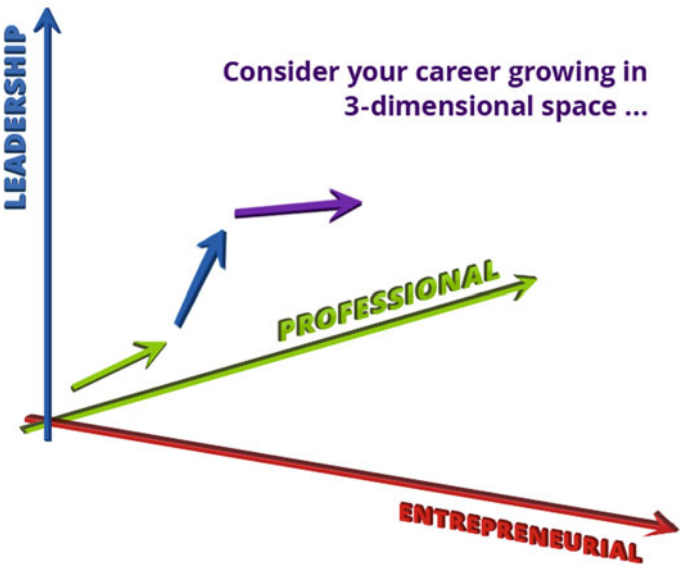


Fig. 7.1 Chan et al. (2012) metaphor of EPL as "dimensions of boundaryless career space"

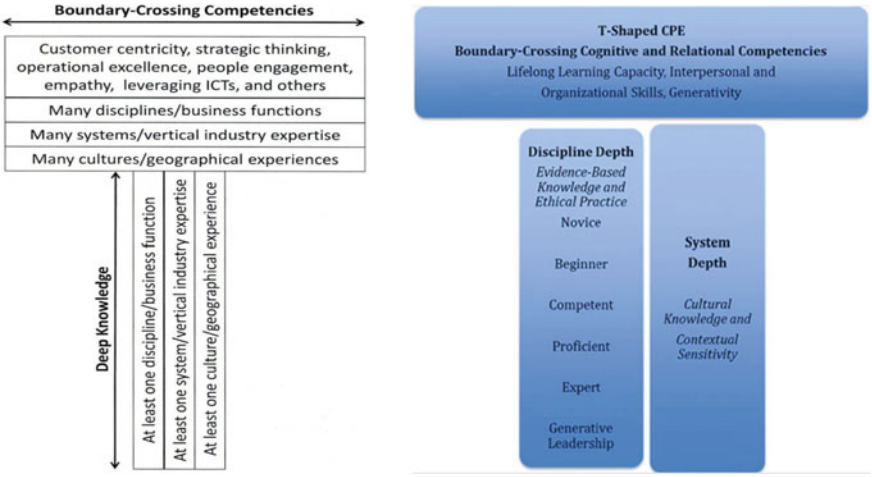
2007). At a London conference in 2001, Dave Roberts of IBM mentioned to the audience that the IT consulting company was looking to recruit T-shaped people (Usability News, 2001): "The 'T' that IBM desires is a combination of breadth of knowledge and depth of understanding".

In 2005, Tim Brown, the CEO of the design consultancy IDEO, also popularized the "T-shaped" metaphor when he wrote in *Fast Company*: "We look for people who are so inquisitive about the world that they're willing to try to do what you do. We call them 'T-shaped people.' They have a principal skill that describes the vertical leg of the T—they're mechanical engineers or industrial designers. But they are so empathetic that they can branch out into other skills, such as anthropology, and do them as well. They are able to explore insights from many different perspectives and recognize patterns of behavior that point to a universal human need. That's what you're after at this point—patterns that yield ideas". In 2010, Brown (see Hansen, 2010) further added that recruiting T-shaped professionals was the key to building interdisciplinary work teams and a collaborative culture in the workplace.

Today, the idea of a "T-shaped" person or professional is commonly used in the popular human resource literature to refer to the need for both deep specialization and broad knowledge and skills (e.g., Bierema, 2016; Cotter, 2015; Harris, 2009). Beyond the fields of computing and design, references to the "T-shaped" metaphor can also be found in the practice literatures of law (e.g., Smathers, 2014), public health (e.g., Frenk, Hunter, & Lapp, 2015), medical education (e.g., Donofrio, Spohrer, & Zadeh, 2010), water management (e.g., McIntosh & Taylor, 2013) and knowledge management (e.g., Hansen & Von Oetinger, 2001). The metaphor of the T-shaped professional is also associated with innovation and enterprise: "T-shaped professionals are lifelong learners with open minds who collaborate easily across their local and global networks. They are broad, empathic communicators and challenge-seekers as well as deeply engaged, critical thinkers. And they are entrepreneurially minded opportunity finders with imagination who learn quickly from failure" (p. 13, Demirkan & Spohrer, 2015). In studies of research scientists at 3M, Boh, Evaristo and Ouderkirk (2014) found through qualitative interviews that "at the individual level, one can consider breadth and depth of inventor expertise as two separate dimensions, rather than two ends of the same dimension". They termed such T-shaped individuals "polymath inventors" and qualified that they are not "jack of all trades and master of all trades" but rather people with "skills that are both deep (represented by the vertical part of the 'T') and broad (represented by the horizontal part of the 'T')". Their quantitative research showed that having both the breadth and depth of expertise affected their innovative capacities and their career success: "Depth of inventor expertise enables individuals to generate technically influential inventions, as measured by patents granted. However, both breadth and depth of expertise are required for innovators to be deemed highly valuable, based on their records of effectively converting inventions into commercially successful products" (p. 349).

As a heuristic, the T-shaped metaphor visually depicts the importance of having both breadth and depth of knowledge and skills needed to operate in a more complex environment that requires more collaboration and innovation. However, there are many variations in terms of what goes into the "breadth" and "depth" depending

on the application of the metaphor—some are illustrated in Fig. 7.2. To the extent that any metaphor is but a tool to represent a phenomenon in a simpler way, we suggest in this chapter that Chan et al. (2012) EPL framework can also be used to represent the T-shaped metaphor (Fig. 7.3) given that Professionalism is intuitively associated with technical "depth" and disciplinary specialization (i.e., the vertical bar of "T"), while Entrepreneurialism and Leadership can be intuitively associated with a spectrum of more transferable or "broadening" skills (i.e., the horizontal bar



(a) T-shaped professional by Demirkan & Spohrer (2015)

(b) T-shaped Continuing Professional Education by Bierema (2016)

Fig. 7.2 Variants of the "T-shaped" metaphor. *Source* **a** Permission from Taylor and Francis. **b** Permission from Wiley

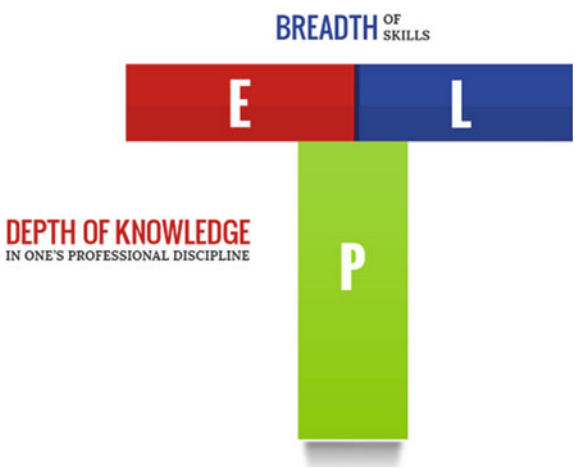


Fig. 7.3 EPL skills and the T-shaped metaphor

of "T"). This metaphor of having "T-shaped" skills can serve not only the work/task related needs for collaboration in an innovation context, but also as a heuristic for individuals to think more holistically about their career development for life-long employability.

Transferable Skills as "Breadth", Vocational as "Depth", and, Employability

As can be seen in Fig. 7.2, the vertical bar of the T-shaped metaphor is usually associated with disciplinary or vocational/technical professional knowledge and skills. Such knowledge can also include knowledge of the socio-cultural-technical context in which the professional or worker operates. On the other hand, the horizontal bar of the T-shaped metaphor is most commonly associated with collaborative, or cross-boundary (or boundary-spanning), cross-functional or cross-disciplinary skills. In our view, another way to use the T-shaped metaphor is to contrast subject- or discipline-specific (technical) skills versus portable, generic or transferable skills as is commonly used in discussions on the role of higher education in preparing the workforce for employability, or graduate employability.

Early interest in the concept of employability emerged in the 1950 s with a concern and focus on helping vulnerable or disadvantaged members of the population (e.g., youngsters, the long-term unemployed, or the disabled vulnerable groups) to find employment. By the 1990s, national level concerns for employability in many post-industrial societies extended to the total working population to address the problem of securing (rather than finding) employment—driven by increased feelings of job insecurity among the workers due to increased delayering and downsizing, mergers, outsourcing of work, elimination of traditional long-term careers, and tighter labor markets (see Forrier & Sels, 2003; Cuyper et al., 2008). Today, many governments are also demanding that tertiary educational institutions not only provide education for education's sake but also provide "employability" or "transferable skills" for the continuous, future-oriented "work-readiness" or employability of their graduates.

Put simply, transferable skills are those "essential work skills which are not subject-specific and which, once learned, may be transferred to and applied in many different contexts" (Gash & Reardon, 1988). Or, as Mansfield (2004) put it: "transferable skills are all the competencies which are not technical, specific, or occupational". Tien et al. (2004) observed that other terms are often used synonymously with "transferable skills": The U.S. National Skills Standard Board, U.K. and Canada refer to them as "employability skills", the United Nations "core skills", Australia "core skills/key skills", Taiwan "basic competencies". In some academic literature, transferable skills are also seen as generic in the sense that "they are not restricted to a particular task or work environment and… having been learnt/practised in one situation, they are flexible and can be applied to another task in another situation, albeit with some modification (p. 6; Denicolo & Reeves, 2013).

What is included in any list of transferable skills? Focusing on highly specialized scientific researchers, Denicolo and Reeves (2013) included "communication, problem-solving, team-working and networking, and business and management know-how" because these were deemed "relevant for a broad job market". Assiter (1995) included basic literacy and numeracy, and personal skills like the "ability to work well with others, communication, self-motivation, and the ability to organize one's own work and to use information technology" as the key (or core or generic) skills needed for different jobs. Harvey et al. (1997) suggested that there were two kinds of transferable skills: (1) personal attributes (e.g., knowledge, continuous learning, flexibility and adaptability, self-regulation, self-motivation, and self-confidence); and, (2) social-interaction skills (e.g., communication, relationships, group work, and the ability to influence). In a literature review conducted for the Australian Training Academy, Kearns (2001) distinguished four kinds of transferable skills as follows:

- preparation for employment and acquiring good work habits
- interpersonal skills supported by personal attributes and values, including for example emotional intelligence and self-understanding/awareness
- entrepreneurship, innovation, and creativity
- skills related to learning, thinking, and adaptability.

Separately in an attempt to standardize the outcomes of higher education across Europe, the "Tuning project" (González & Wagenaar, 2003) also distinguished three types of generic/transferable skills, namely:

- instrumental skills, including cognitive, methodological, technological, and linguistic abilities;
- interpersonal skills, including social interaction and cooperation, and critical and ethical consciousness; and,
- systemic skills, including the ability to analyze the whole and understand how the parts work together, as well as how to combine and apply skills and knowledge to different situations.

Empirical Study of EPL Efficacies and Self-perceived Employability

In a chapter entitled "Careers and the wealth of nations", Kanter (1989) proposed that to understand the link between individual-level careers and macro-level economic, social, and political issues, it was useful to appreciate that there were three principal career forms, each with its own "logic". These were: the bureaucratic (or leader/managerial), professional, and entrepreneurial types of careers. Chan et al. (2012) built on this theoretical foundation to propose that E, P and L could be treated as three dimensions (rather than types) of careers; that in a more boundaryless career context (Arthur, 1994), it was useful for people to advance their careers in E, P and

L dimensions simultaneously. They provided evidence to show that E, P and L motivations and efficacies could be measured independently, and that EPL motivations were not highly correlated with each other. Their empirical research (see also Chan et al. 2015) also showed that high-EPL individuals were also highest in boundaryless and self-directed or Protean (cf. Hall, 1996) career attitudes and career adaptability, followed by those high in only two of the three dimensions (i.e., high-EPs, high-ELs, high-PLs), who were higher than those high in only one dimension (i.e., high-Es, high-Ps, high-Ls). Low-EPL individuals were had the lowest mean scores on boundaryless, self-directed or Protean career attitudes and career adaptability. To the extent that Professionalism is intuitively associated with technical "depth" and disciplinary specialization, while Entrepreneurialism and Leadership (which for us includes "Management") can be intuitively associated with a spectrum of more transferable or "broadening" skills, the T-shaped metaphor could be used to represent the E, P and L skills development needed for employability in a more dynamic and boundaryless career context.

Employability has been operationalized in many different ways varying in terms of objectivity versus subjectivity of the measures and in terms of the extent to which personal or contextual factors are considered. Cuyper et al. (2008) adopt a highly person-centered approach when they state: "All employability definitions refer to the individual's ability to make labor market transitions… This ability results from the individual's know-how, skills, knowledge of the labor market, and adaptability" (p. 490). Such an approach would include self-perceived employability, which Berntson and colleagues (Berntson & Marklund, 2007; Berntson, Sverke, & Marklund, 2006) define as "the individual's perception of his or her possibilities to achieve a new job". Research has shown that self-perceived employability is positively related to employees' well-being, mediated by job insecurity.

In this study, we sought to explore empirically the relationship between E, P and L efficacies and employability, specifically looking at whether E, P and L efficacies each added to the prediction of self-perceived employability in a large sample of tertiary students.

Sample and measures. In September 2015, we included Berntson and Marklund's (2007) 6-item measure (also used in Berntson, Näswall & Sverke, 2008) of self-perceived employability alongside our measures of E, P and L motivations and efficacies, which were administered as part of a university-wide annual survey of students' EPL career aspirations. A total of 5,874 students (or 19% of total university population; mean age = 22.9 years. *sd* = 3.6; 50.1% male; 49.8% female; 76% Singaporean, 24% non-Singaporean; 82.7% undergraduate; 17.3% postgraduate) participated in the survey voluntarily and with informed consent. The study was approved by the university's IRB. The EPL scales were as reported in Chan et al. (2012). Respondents were asked to agree or disagree with each statement on a 5-point Likert scale from 1 ("strongly disagree") to 5 ("strongly agree"). A sample self-perceived employability item was "I could without problems get an equivalent job in another company/organization".

Correlations and Confirmatory Factor analysis. Table 7.1 indicates the scale means, standard deviations, Cronbach alpha reliability coefficients, and inter-scale

Table 7.1 Scale descriptive statistics and inter-scale correlations (EPL efficacies and Self-perceived employability)

Scale (no. of items)	M	sd	1	2	3	4	5	6
Demographics								
1. Age	22.9	3.6	n.a.					
2. Gender (coded: 0 = Male, 1 = Female)	n.a.	n.a.	−0.29	n.a.				
EPL efficacies								
3. Entrepreneurial (7)	2.54	0.91	0.16	−0.21	(0.92)			
4. Professional (5)	3.18	0.87	0.22	−0.22	0.59	(0.88)		
5. Leadership (7)	2.96	0.86	0.16	−0.20	0.79	0.70	(0.91)	
Employability								
6. Self-perceived employability (6)	3.34	0.64	0.14	−0.14	0.40	0.43	0.46	(0.83)

Note Main diagonals provide Cronbach alpha reliabilities in brackets
$N = 5784$. All correlations were significant at the 0.001 level (2-tailed)

correlations for all measures in the current analysis. Reliability coefficients for all four scales were good. However, the E, P and L efficacy scores were highly correlated. We therefore used confirmatory factor analysis to establish that construct validity of the four scales. Table 7.2 shows the fit indices for the four-factor model (with E, P L efficacy and self-perceived employability), compared to a single-factor model. From the CFI and RMSEA statistics, we observed that the four-factor model provided good fit to the data.

Table 7.2 Confirmatory factor analysis of EPL efficacy and self-perceived employability scales

Model	χ^2	*df*	χ^2/df	CFI	RMSEA	SRMR
1 factor model (4 scales; 25 items)	18021.459	275	65.3	0.747	0.105	0.087
4 factor model (4 scales; 25 items)	5413.231	269	20.1	0.927	0.057	0.038
MLMV estimation was used						
N = 5825						
For 4 factors model, factors correlation						

E_Eff	P_Eff	L_eff	PE
P_eff	0.635		
L_eff	0.846	0.783	
PE	0.446	0.495	0.525

Table 7.3 Hierarchical regression of self-perceived employability on E, P L efficacies

Predictor	Step 1	Step 2
Demographic variables		
Age	0.10***	0.03***
Gender	−0.11***	−0.02
EPL efficacy		
Entrepreneurial		0.07***
Professional		0.19***
Leadership		0.26***
Adjusted R^2	0.03***	0.24***
Change in Adj R^2		0.21***

$N = 5867$. ***Significant at 0.001 level

Regression analyses. Table 7.3 summarizes the findings of the hierarchical regression analyses conducted, with step 1 controlling for age and gender, and step 2 including E, P and L efficacy as predictors of self-perceived employability. Together, the demographic (control) variables and E, P and L efficacies accounted for 24% of the variance in self-perceived employability with each type of efficacy significantly adding to the prediction of the dependent variable. This was reasonably high given that there should exist non-personal or contextual factors (e.g., perception of the overall and specific job market for one's field) that could separately explain variance in self-perceived employability.

Our analysis indicates that students believe that having efficacy in E, P and L skills all add to their sense of employability in the future. These findings are limited to self-perceptions of one's skills and employability, and further research is needed to explore whether the relationships still hold with objective measures of E, P and L skills and employability. Still, the findings allow us to employ the T-shaped metaphor to represent the EPL model as part of feedback to individuals, to encourage them to nurture their E, P and L skills for greater sense of employability.

Discussion: Towards More "T-shaped" EPL Development for Professionals

Today, professionals in many traditional vocations like medicine, law, accounting, engineering, education, the military, are facing tremendous challenges in the 21st century as they operate in increasingly entrepreneurial and bureaucratic contexts (Friedson, 2001; Kanter, 1989). Some have even debated the "end of professions" (Broadbent, Dietrich & Roberts, 1997). Looking ahead, professionals will need to pay more attention to develop the breadth of transferable skills not only for the purpose of collaborating with other vocational specialists, but also to ensure greater employability.

In a paper calling for more "T-shaped" Continuing Professional Education, Bierema (2016) observed: "Professionals train for years to become experts. Yet, gaps between their education and the practice realities widen with globalization, technological advances, market competition, and knowledge development (p. 53)… The ambiguous, fluid, fragmented nature of life and work requires professionals to act nimbly, swiftly, and collectively." There is thus an urgent need for professions and individual professionals to reinvent themselves to stay relevant and employable in a rapidly changing work context.

This paper suggests that the T-shaped metaphor can also be used to represent Chan et al. (2012) EPL framework to the extent that Professionalism is intuitively associated with technical "depth" and disciplinary specialization, while Entrepreneurialism and Leadership can be intuitively associated with a spectrum of more transferable or "broadening" skills. We have also provided some empirical evidence for why it may be useful for individuals to develop their E, P and L skills in order to raise their self-perceived employability for a more dynamic and boundaryless career in the future. To the extent that Chan et al. (2012, 2015) have also shown that their EPL framework is related to career adaptability, boundaryless and Protean career attitudes, efforts to develop professionals in E, P and L dimensions will also better arm them with a career mindsets needed in the 21st century. "T-shaped" EPL development will also enable professionals to better operate in innovation and service economies—ensuring that they possess both enterprise/innovation skills and mindsets alongside people-oriented organizational leadership skills and orientations alongside deep/technical or vertical (disciplinary, vocational or professional) knowledge and skills.

Application: How Universities Can Develop More T-shaped Students for Employability

Traditionally, universities have focused on providing discipline-specific education and skills to their students, and, university students themselves may focus on achieving depth in academic excellence at the expense of developing more transferable skills. How can universities develop more T-shaped professionals? How can graduates take charge of their continuous T-shaped development beyond university? Our findings from the EPL research gives universities a good reason to formally embed broad/transferable skills in their curriculum and a chance to design (or redesign) university education to not only raise the self-perceived employability of graduates but also the value of university degrees to meet the demands of the rapidly changing economies of the future.

In a post-industrial climate with increased uncertainty in labor markets, many advanced economies are increasingly concerned with the issue of graduate employability. Today, tertiary educational institutions are especially concerned with the work-readiness of their graduates beyond mere education for education's sake, and, "Policymakers continue to emphasize the importance of 'employability skills' in

order for graduates to be fully equipped in meeting the challenges of an increasingly flexible labor market" (see Tomlinson, 2012).

Alongside calls for more transferable skills and attention towards graduate employability, international organizations like the OECD (2005) and Europe (European Commission, 2006) have also called for more infusion of enterprise or entrepreneurial skills and mindsets into general education systems. Lackéus (2015) in a recent literature review published by the OECD noted that while the broader term "enterprise education" is primarily used in United Kingdom to refer broadly to the personal development of mindsets, skills and abilities like creativity, self-reliance, initiative taking, action orientation, while the narrower term "entrepreneurship education" (commonly used in the U.S.) refers to the "specific context of setting up a venture and becoming self-employed".

For the purpose of providing more "T-shaped" EPL development to students, we recommend focusing on the broader concept of developing "entrepreneurial skills" rather than only the narrow approach of preparing individuals for entrepreneurship in start-up ventures. The concepts of leadership and entrepreneurship have conceptual overlaps and yet, are different (cf. Cogliser & Brigham, 2004; Vecchio, 2003). For our purpose, the "L" in EPL refers to the broad idea of bureaucratic/administrative skills and mindsets which includes both leadership and management. If leadership/management education and training focus on ways of influencing and organizing people to achieve goals, enterprise education (cf. Thursby, Fuller, & Thursby, 2009) would address the application of creative ideas and innovations to practical situations with entrepreneurial education aiming to produce individuals with the mindset and skills to respond to opportunities, needs and shortfalls, with key skills including "taking the initiative", "decision making", "problem solving", "networking", "identifying opportunities" and "personal effectiveness". Figure 7.4 suggests what a T-shaped (high EPL) individual might look like.

We have mapped the various broad/transferable skills in the E and L dimensions in Table 7.4 that universities could consider in their planning and structuring of students' learning of these skills. The skills are organized into 3 categories (E, L and those that are shared by both E and L dimensions). For the E dimension, universities could further differentiate the enterprise/entrepreneurship skills (for students interested in start-ups and business ventures) from the more generic entrepreneurial skills. Students could, not only strive towards achieving as many of these skills but also continue to acquire these skills when they graduate and build their careers over their lifetime. Universities could also adopt a more systematic and structured approach to their students' acquisition of these skills by supporting and guiding students to document their learning, and building their portfolios of the broad/transferable skills over the course of their degree programs. Such practices will not only develop students who are more confident in the broad/transferable skills but also increase students' self-perceived employability.

The following are some ideas that universities could consider in attempting to develop more T-shaped graduates:

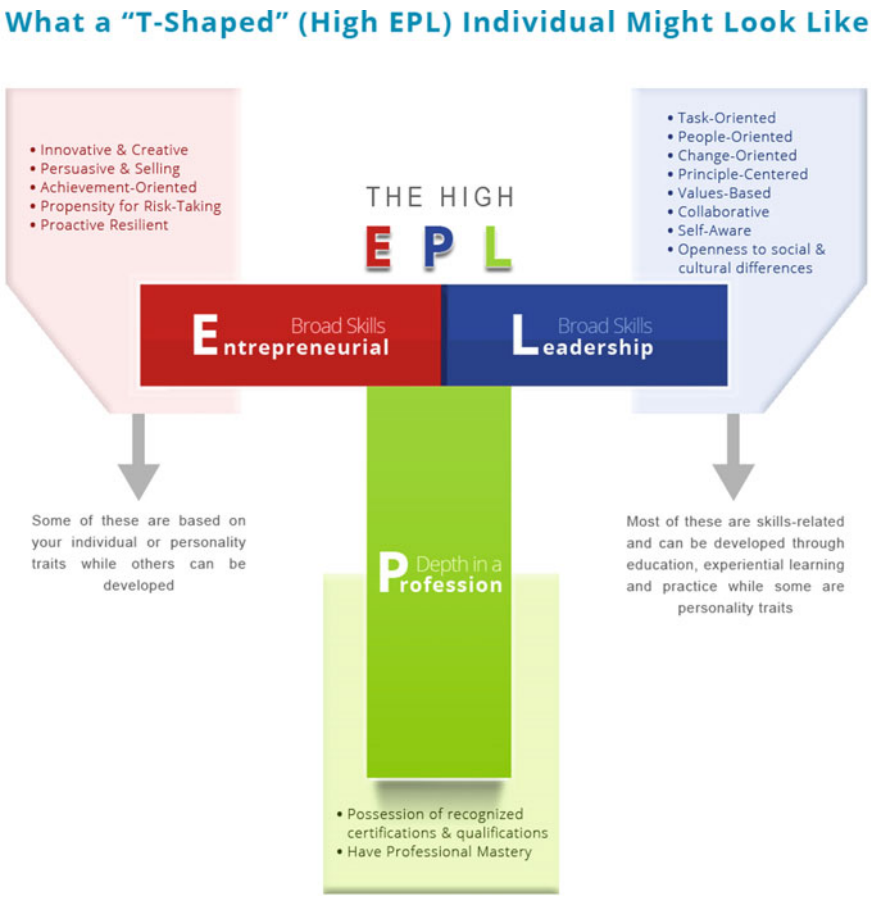


Fig. 7.4 What a T-shaped (high EPL) individual might look like

a. **Recruitment Assessment of Broad/Transferable Skills**. Organizations typically look for T-shaped individuals with leadership and innovation or creativity potential over and above the professional qualifications that job applicants come with. For this reason, assessment centers are designed to evaluate a candidate's leadership or management potential as well as his/her creativity. Universities will need to identify a set of core leadership/management and entrepreneurial skills that all graduates must have by the time they graduate. These skills should be formally introduced to students in their first year to create awareness and expectations in students to learn these skills. Universities could consult or engage expertise in the assessment of such skills. To motivate students to learn such skills, universities could implement systems/programs to recognize and reward students who have acquired such skills on a consistent basis.

Table 7.4 Transferable skills for Holistic student development

Enterprise/entrepreneurship development	For both entrepreneurship and leadership development	Leadership/management development
Entrepreneurial • Opportunity recognition • Exploiting opportunities • Design thinking • Risk assessment and risk management *Enterprise or entrepreneurship* • Business start-up • Business operations • Sales and marketing • Finance management • Knowledge of the economy (spotting trends etc.)	• Creative thinking • Problem-solving • Systemic thinking (strategy, goal-setting) • Ethical reasoning • Critical thinking • Decision-making • Communications (oral and written) • Presentation (persuasive influence and selling) • Negotiation • Networking • Cultural awareness and cultural competence • Digital savviness • Information-processing	• Principle-centered, or values-based or ethical leadership • Self-awareness; self-management/self-regulation • Effective leadership competencies (task, relations and change-focused behaviours) • Effective leadership styles (transactional and transformational) • Team leadership (building a shared vision to inspire followers, building team identity, trust and collaboration among members; team development) • Facilitation skills (facilitating discussions, team conversations and leading change) • Effective feedback, coaching and development

b. **Career Skills for the Future Workplace**. In dynamic and rapidly changing economies of the future, graduates need to master career skills and have career adaptable mindsets. University career offices will need to do more than just fit graduates into their first job. Graduates need to be equipped with the new career mindsets and skills (i.e., boundaryless mindset, career adaptability, proactive career behaviours and self-directedness) beyond preparing their resumes and equipping them with networking and job interview skills. These skills are highly recommended with our EPL approach to career development that encourages graduates to think of alternative careers paths (E and L) and to avoid the problems and lay-offs faced by many professionals, managers, executives and technicians (PMETs) in transforming economies. Students need to learn how to take charge of and design their own careers and the EPL feedback provides a good starting point for students' thinking about careers and career development.
c. **Capitalizing on Internship Programs**. Internship programs that have primarily focused on providing exposure to the professional/technical aspects of jobs in the various industries should include the learning of the broad/transferable skills in a more systematic and structured way. Although students could take the initiative in this area, both employers and the university could maximize the learning of leadership/management and entrepreneurial skills in real workplaces. Leadership and management coaching or entrepreneurial mentoring by workplace

supervisors could be of great value to interns who need some form of feedback and coaching support by experienced leaders, managers and entrepreneurs (or intrapreneurs).

d. **The University as an Ecosystem for Developing Broad/Transferable Skills**. Using Chan et al.'s (2012) EPL framework, students could receive feedback on their career motivations and learn about leadership/management and entrepreneurialism. With the EPL feedback, students could gain greater awareness of the importance of such skills beyond their professional degrees while gaining greater clarity of their career motivations and efficacies. Universities could design specific supporting programs and organise the university resources to develop their E, P and L potential of their students. The EPL feedback could also provide tips to help students build their portfolios in the E, P and L areas while they are still enrolled in the university programs. While infusing/embedding the transferable skills into the formal curriculum is ideal and universities could embark on such programs, broad/transferable skills could be learnt outside of the university curriculum during extra-curricular programs, events and activities organized or initiated by either the university or students themselves. These experiential opportunities provide real-life contexts where leadership/management and entrepreneurial skills may be learned and applied.

e. **Pedagogies for Learning Broad/Transferable Skills**. For the learning of leadership/management and entrepreneurial skills, an effective approach would be the Kolb's experiential learning cycle where students can have "hands-on" experiences and learn through reflective practices. Abstract or conceptual knowledge may be weaved into existing formal curriculum wherever possible or appropriate but knowledge acquisition of such skills with classroom or lecture-based approaches should ideally be followed-through and supported by the experiential learning approach. Universities could also implement collaborative programs to bring together students from across the many disciplines to jointly solve problems and learn through the lenses of other disciplines (e.g., students from the social sciences and psychology or information technology, communications and media could collaborate with students from the engineering sciences, medicine or other faculties, and learn through peer-coaching and apply relevant broad/transferable skills to solve technical or practical problems facing various industries).

Conclusion: T-shaped EPL Development for Employability and Career Adaptability

Chan et al. (2012) provided evidence to show that individuals high in EPL motivations also tended to hold more boundaryless and protean career attitudes. From a person-centered perspective, individuals growing up in more globalized, technologically advanced, knowledge-based economies are also likely to need and to adopt more contemporary career orientations: "Boundaryless career orientation and protean career

orientation are … becoming increasingly prevalent … The undergraduate student is likely to be technologically savvy, or at least more technologically aware than the previous generation, having grown up surrounded by technology in both a learning and recreational capacity" (p. 140, Donald et al. 2017). Using the "T-shaped" metaphor to guide skills development not only contributes to the self-perceived employability of graduates but also ensures that they acquire more entrepreneurial skills and mindsets alongside leadership/managerial skills that together, can represent a range of transferable skills complementing the deep, specialized vocational skills and knowledge gained from disciplinary education and training.

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Chapter 8
Measuring Preference for Non-standard Work: Relationships with EPL Motivations, Efficacies, Perceived Employability, and Career Adaptability

Kang Yang Trevor Yu, Kim-Yin Chan and Jia Lin

Abstract We report the development of a new self-report measure of individual differences in Preferences for Non-Standard Work (PNSW), and an effort to explore relationships between PNSW and Entrepreneurial-Professional-Professional motivations and efficacies, alongside measures of perceived employability and career adaptabilities. Using data collected from a sample of 225 undergraduate students, confirmatory factor analysis showed that individuals can discriminate between five forms of nonstandard work as follows: independent contracting, outsourced work, temporary or part-time work, working in a "start-up", and external deployment. Correlation and regression analyses revealed that while the preference for outsourced, temporary/part-time work and external deployments were not predicted by EPL motivations, efficacies, or career adaptability factors, entrepreneurial motivation and efficacy were significantly predictive of preferences for independent contracting and start-up work, as one would expect. The preference for start-up work was also weakly but significantly correlated with all four career adaptability factors, with overall career adaptability correlating significantly with start-up preference at $r = 0.26$. The findings are discussed in relation to understanding individual differences in Preferences for Non-Standard Work (PNSW), and the use of such measures in career counselling.

Keywords Nonstandard work · Work preferences · Employment relationship · Job search · Independent contracting

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Introduction

The impact of globalization and the accompanying uncertainty and volatility have been especially significant on job seekers and their careers. Traditional understandings of job search and career planning as directed toward full-time, long-lasting, and relatively stable relationships with a single employer are now becoming obsolete. Instead, the labor market is now characterized by a proliferation of short-term employment relationships under an increasingly flexible set of work arrangements (Ashford, George, & Blatt, 2007; Barley & Kunda, 2004; Cappelli & Keller, 2013). Recent estimates that 20–30% of the working-age population in the US and EU-15 (i.e., exceeding 160 million individuals) engage in such independent work suggest that this phenomenon is already quite widespread (Manyika et al., 2016). Nonstandard work arrangements are thus clearly growing in prevalence and being made available to a wider range of workers. Consequently, employment under different forms of nonstandard work arrangements is becoming commonplace at various stages of one's career.

Nonstandard work arrangements refer to work that is performed under one or more of the following conditions: (a) not on a fixed schedule, (b) under the administrative control of multiple organizations, (c) not at a fixed location, and (d) without the shared expectation of continued employment (Ashford et al., 2007; Kalleberg, Reskin, & Hudson, 2000; Pfeffer & Baron, 1988). In fact, these employment relationships are likely to continue growing in popularity due to the need for manpower flexibility and cost control in a volatile and uncertain global economy (Davis-Blake & Broschak 2009). It is thus not surprising to have some writers predict that much of future global economic growth will take place within the context of nonstandard work arrangements, occupied by workers from increasingly diverse demographics like previous retirees (Fox, 2016; Rau & Adams, 2005; Taylor, 2016).

Owing to its increasing importance for both employers and individual workers, it is crucial that we have a good understanding of the way nonstandard work impacts how individuals experience and think about such work and its impact on their jobs and careers (Feldman, Doerpinghaus, & Turnley, 1994). Unfortunately, much of today's knowledge is based on assumptions operating within the confines of standard work, which assumes that individuals work a fixed number of daily hours while holding the expectation of long-term employment with the same company (Ashford et al., 2007).

This chapter seeks to explore how Chan et al.'s (2012) EPL's operationalization of career aspirations is related to preferences for different forms of nonstandard work. Such understanding is central to demonstrating the efficacy of the EPL framework as a tool to shed light on the job and employment choices that people make as a result of their respective developments along EPL dimensions. This chapter thus starts with an introduction to the concept of individual preferences for nonstandard work (PNSW), followed by arguing how such preferences may be related to EPL as well as other key career constructs like career adaptabilities and perceived employability. As PNSW is still a novel construct under development, the ideas and initial analyses presented

in this chapter take on an exploratory approach in order to allow data to inform our thinking of the potential of both PNSW and EPL as key constructs in the experience of jobs and careers.

Individual Differences in Preferences for Nonstandard Work (PNSW)

Preferences for nonstandard work (PNSW) are defined as *individual liking for unique forms of work that varies along the dimensions of administrative control, length of employment, and physical location where work is performed*. According to Pfeffer and Baron (1988), non-traditional jobs can vary based on the amount of administrative control that employers or other parties (e.g., agents, professional service firms) exert over the employee, length of the employment relationship, and the physical environment in which the work is performed (Ashford et al., 2007; Cappelli, 1999; Cappelli & Keller, 2013). It follows that individuals should hold varying attitudes and preferences toward different job arrangements because they hold different preferences associated with these forms of employment. Employment arrangements can thus shape these preferences through extrinsic rewards like pay and benefits, as well as intrinsic rewards like job challenge and autonomy (Cable & Judge, 1994; Trank, Rynes, & Bretz, 2002).

Next, we outline the dimensionality of PNSW and the specific ways that such preferences can be distinguished from one another. We draw mainly from the frameworks developed by Ashford et al. (2007), and Cappelli and Keller (2013) to identify different types of nonstandard work. These frameworks highlight the rise of employment relationships that are increasingly short-term, as in the case of part-time work or other short-term projects (Gascoigne & Kelliher, 2018). Furthermore, they also highlight the prominent role of staffing and professional service firms who act as employment intermediaries who essentially take care of legal and administrative responsibilities of the individual worker while leasing their labor to clients (Bonet, Cappelli, & Hamori, 2013). The growth of such firms has in turn also driven the increasing importance of proactive career self-management as seen in independent contracting arrangements where individuals essentially perform services on specified projects for an employer (Sullivan & Baruch, 2009; Verbruggen & De Vos, 2019).

Our approach not only takes into account the availability of different types of nonstandard work that the above phenomena have precipitated, but also the rise of entrepreneurial jobs as a viable job and career alternative (Chan et al., 2012; Liñán & Chen, 2009). In all, this process led us to identify the following types of nonstandard work: (1) independent contracting; (2) outsourced projects from an agency or staffing firm; (3) temporary or part-time scheduled; (4) entrepreneurial start-ups; and (5) external deployment from a lead firm.

EPL and PNSW

As development along the three Entrepreneurship (E), Professionalism (P), and Leadership (L) dimensions of career space is one of the key tenets of the EPL framework featured in this book, it is important to explore whether and how EPL is related to individual preferences for different types of work arrangements. Whereas EPL represents both short- and long-term aspirations that may be formed during one's formative years in school, chances are that PNSW inclinations should only be activated when one is gathering information on job alternatives and has to choose between different employment arrangements. This makes us believe that it makes sense to view EPL motivations and efficacies as precursors to PNSW, and to ask how PNSW fits into the overall nomological network of constructs that EPL can influence. Developing such understanding is important for both EPL and career research for several reasons.

First, PNSW illuminates a possible mechanism by which EPL manifests itself in actual job choice and long-term career planning. Job choice is a key way for one to express and achieve EPL aspirations. For instance, someone with entrepreneurial intent and motivation should prefer nonstandard arrangements in a start-up type of environment. Similarly, one who aspires to develop along the professional dimension may desire to work on an independent contract basis to gain broad expertise working simultaneously with different clients. Understanding the various patterns of relationships linking EPL aspirations to the different types of work arrangements covered in PNSW can thus highlight how EPL results in certain job choices throughout the course of one's career.

Second, PNSW can also act as an accompanying diagnostic tool to EPL that can be used to conceptualize and assess the readiness of a workforce for the implementation of nonstandard work arrangements. As more twenty-first century organizations diversify their workforce through offering nonstandard work arrangements, it pays to diagnose the human resource capabilities to drive development in entrepreneurial innovation, professional expertise, and leadership capabilities using the EPL framework (Chan et al., 2012). Similarly, such efforts should be accompanied by a focus on PNSW to gauge whether such nonstandard offerings are a good match for the wants and desires of the existing talent pool. Such insight may highlight the challenges to be faced especially in the switching of employment arrangements for current personnel or the attraction of new talent when different forms of nonstandard employment are offered.

Third, PNSW can also help facilitate the EPL framework's attempt to integrate the previously disparate fields of entrepreneurship research, professionalism, and leadership development. By showing how EPL-based aspirations influence the use of nonstandard work experiences as key steps toward individual development across one's career and lifetime, PNSW contributes toward an understanding of how different forms of nonstandard work may be used to pursue changing EPL motivations across entire careers. This facilitates the building of knowledge about the challenges of developing boundaryless mindsets that are flexible enough to navigate through a volatile employment landscape (Arthur, 1994; Briscoe, Henagan, Burton, & Murphy,

2012). For example, PNSW can help illustrate how taking on nonstandard work can act as a bridge to facilitate shifting from one particular dimension of EPL to another as one approaches the more mature stages of one's career. Such knowledge can be useful in further elucidating the psychological process and manifestations of career transitions and development from an individual worker's point of view (Savickas, 2002).

An Exploratory Investigation

As previous empirical investigations of PNSW do not exist, we now describe an exploratory investigation conducted to examine possible relationships between EPL and PNSW. Our investigation consists of two phases. First, we develop and investigate the validity of a measure of PNSW. Second, we test how EPL is related to PNSW using this set of empirical data. In an attempt to further develop the nomological network of PNSW, we also analyze how it is related to other career-related constructs like career adaptabilities and perceived employability. Owing to the novel nature of PNSW, we refrain from making specific hypotheses and instead focus on reporting the associations between the variables of interest.

Career adaptability represents a psychological construct describing individual resources for coping with current and future tasks, transitions, and setbacks in jobs and career-related roles (Savickas, 1997; Savickas & Porfeli, 2012). They represent strengths and abilities to employ self-regulatory resources to deal with uncertain, complex, and ambiguous challenges posed by the experience of job tasks, transitions, and obstacles. Further expounding on this idea of career adaptability as a psychological form of human capital that is developed through education and experience, Savickas and Porfeli (2012) identify four dimensions of adaptability: (1) concern about career planning for the future; (2) controlling one's actions and beliefs; (3) curiosity in exploring new possibilities and opportunities; and (4) confidence to attempt and succeed at challenging tasks like learning and solving problems. They also apply career construction theory to argue that adaptability helps individuals strategize and direct career behavior, which manifest in differing affinities and PNSW for different forms of employment in order to self-regulate and achieve their long-term career goals. Therefore, career adaptabilities should also be related to PNSW.

The concept of perceived employability refers to the self-perceived ability to attain sustainable employment that matches one's qualifications (Rothwell, Herbert & Rothwell, 2008; Rothwell, Jewell & Hardie, 2009). Representing another type of psychological resource, these perceptions influence individuals' ability to be future orientated and deal with work transitions and other challenges of the labor market (Fugate, Kinicki, & Ashforth, 2004; Rothwell & Arnold, 2007). Given that PNSW and the respective desires for alternative forms of employment essentially represent avenues to enact change and career transition based on self-evaluations of employability, it is worth exploring whether and how this construct can also shape PNSW.

Methodology

The first part of our study focused on the development and validation of a psychometric measure of PNSW. In this respect, we followed previously recommended scale development approaches by first using a domain sampling approach to generate a pool of items. (DeVellis 1991, 1991; Hinkin, 1998). We deductively generated items describing different forms of nonstandard work based on current frameworks such as those developed by Ashford et al. (2007), and Cappelli and Keller (2013). In order to incorporate work arrangements associated with entrepreneurialism, we also considered the literature on entrepreneurial jobs and work performed within start-up contexts (Chan et al., 2012; Liñán & Chen, 2009).

We then proceeded to consult with our institution's career services office professionals as well as undergraduate job seekers to generate an initial pool of 13 items to describe these five different forms of nonstandard work: (1) independent contracting (e.g., "Working as a self-employed independent contractor on long-term assignments for one or more clients."); (2) outsourced projects from an agency or staffing firm (e.g., "Employed by a staffing or outsourcing firm or agency and sent on long-term assignments at other firms."); (3) temporary or part-time scheduled (e.g., "Working as a temporary employee—i.e., no expectation for long-term employment—for one employer, filling in for employees who are on leave or helping out during peak times."); (4) entrepreneurial start-ups (e.g., "Working full-time in your own start-up company."); and (5) external deployment from a lead firm (e.g., "Working for a firm that will deploy you out to work for other firms."). Responses in terms of preferences were assessed using a 5-point scale where respondents were asked to rate the extent to which they would consider each particular type of work arrangement in a future job that was described (1 = "definitely not for me"; 2 = "unlikely to consider"; 3 = "may consider in some circumstances"; 4 = "likely to consider"; 5 = "definitely will consider").

Part 1: Construct Validation

We administered our measure among undergraduate students from a large public university in Singapore. These students were taking a semester-long class titled, "Working in the 21st Century", and the questionnaire was administered towards the end of their 13-week semester. We advertised the study as part of an investigation into career mindsets of undergraduate students and offered an incentive of S$15 (approximately US$10) for voluntary participation. Out of the 297 students who received the questionnaire, 225 (75.8%) completed the survey.

Measures

In addition to the PNSW measure described above we also incorporated the following measures of EPL, career adaptabilities, and perceived employability.

Entrepreneurship, Professionalism, Leadership (EPL). Chan and colleagues' (2012) measure of EPL intent, motivation, and efficacy was used. EPL conceptualized career aspirations in terms of a person's expressed intent, motivation, and efficacy for careers along the respective dimensions of entrepreneurship, professionalism, and leadership. The self-report measure contains: (1) an 13-item measure of EPL intent to pursue an entrepreneurial, a professional, or a leadership career upon graduation, using a 5-point Likert scale; (2) a 18-item measure of EPL motivation assessing individual desire to be an entrepreneur, a professional, or a leader again, using a 5-point Likert scale; and (3) a 19-item measure of efficacy assessing individual confidence at performing skills and actions related to each of the EPL dimensions, using a 5-point scale ranging from "not at all confident" to "extremely confident".

Career adaptability. Savickas and Porfeli's (2012) 24-item career adaptabilities scale was used. Respondents rated how strongly they had developed a list of abilities described in each item using a 5-point scale (5 = Strongest; 4 = Very Strong, 3 = Strong; 2 = Somewhat strong; and 1 = Not strong). The list of abilities was based on the four dimensions of career adaptability identified by the researchers: (1) Concern (e.g., "Thinking about what my future will be like"); (2) Control (e.g., "Making decisions by myself"); (3) Curiosity (e.g., "Looking for opportunities to grow as a person"); and (4) Confidence (e.g., "Performing tasks efficiently").

Perceived employability. Perceived employability was assessed using Berntson and Marklund's (2007 self-assessment measure using a 5-point agreement-based Likert scale. This scale was developed to represent four primary influences of employability perceptions: (1) Self-belief (e.g., "I am generally confident of success in job interviews and selection events."); (2) University (e.g., "Employers are eager to employ graduates from my University."); (3) Field of study (e.g., "My chosen subject(s) rank(s) highly in terms of social status."); and (4) State of the labor market (e.g., "There is generally a strong demand for graduates at the present time.").

CFA Results

We investigated the underlying factor structure of our PNSW measure using confirmatory factor analysis. Our CFA analyses were conducted using MPLUS version 7.31. As reported in Table 8.1, we tested the overall fit of our proposed five-factor model (model 2) representing the underlying constructs of preferences for independent contracting, outsourced projects from a firm, temporary or part-time work, entrepreneurial start-ups, and external deployment from a lead firm, against alternative models including those with: (1) A single overall factor (model 1); (2) four factors with outsourced and deployed work loading on the same factor (model 3); (3)

Table 8.1 Overall model fit statistics from CFA of PNSW models

No.	Model description	χ^2	df	CFI	TLI	RMSEA	AIC
1	Single overall factor	664.63	65	0.53	0.44	0.20	7492.57
2	Five factors representing: (i) Independent Contracting; (ii) Outsourced; (iii) Temporary; (iv) Startup; and (v) External Deployment	214.70	55	0.88	0.82	0.11	7065.13
3	Four factors representing: (i) Independent Contracting; (ii) Outsourced; & External Deployment; (iii) Temporary; (iv) Startup	276.97	59	0.83	0.78	0.13	7107.29
4	Four factors representing: (i) Independent Contracting & Startup; (ii) Outsourced; (iii) Temporary; (iv) External Deployment	297.52	59	0.81	0.76	0.13	7138.95
5	Three factors representing: (i) Independent Contracting & Startup; (ii) Outsourced & External Deployment; (iii) Temporary	341.94	62	0.78	0.73	0.14	7176.63

Note n = 225

three factors following the previous four factor model with independent contract and start-up work also loading on the same factor (model 5); and (4) four factors following the five factor model but with independent contract and start-up work loading on the same factor (model 4).

The hypothesized five factor model displayed decent overall fit (CFI = 0.88; RMSEA = 0.11). Chi-squared difference tests also suggested that compared to the other alternative models, this model fitted the data significantly better. AIC statistics further suggested that the quality of the five-factor solution was superior relative to the other alternative model for this given set of data (Table 8.1). In all, these results suggested that individuals were able to differentiate their preferences between different forms of nonstandard work arrangements that included independent contracting, outsourced, temporary-part-time, start-up, and external deployed work.

Part 2: Correlates of PNSW

Having established the existence of different dimensions of PNSW, we next investigated how these preferences were related to EPL and two other career-related constructs. To do this, we first examined correlations between these constructs. We then followed our correlational analysis with a supplemental analysis using a series of

regression models to specifically investigate the possibility that PNSW toward different types of work would be associated with different dimensions of EPL, career adaptabilities, and perceived employability.

Correlational Analysis Results

Table 8.2 reports the descriptive statistics and intercorrelations between our variables of interest. Means and standard deviations suggest that PNSW across all five dimensions were at a moderate level at around the midpoint of the 5-point scale, which indicated that on average, respondents may consider these types of work in some circumstances. Relatively, preferences for start-up and external deployment forms of work exceeded the other three, whereas respondents seemed to have the least desire for temporary or part-time work. With the EPL scales, intent and motivation for entrepreneurship were distinctly lower than their counterparts for the other two dimensions, indicating that undergraduate students' career aspirations were still mostly geared towards developing in terms of either professional expertise or leadership ability. The means for career adaptability ranged from 3.36 (concern) to 3.60 (control) on a 5-point scale, indicating that respondents on average rated that they were strongly developed in this area. Lastly, perceived employability also displayed slightly positive agreement based on the self-assessment ($M = 3.64$ on a 5-point scale). Hence, respondents were slightly optimistic about their ability to attain sustainable employment that matched their qualifications.

Correlations in Table 8.2 suggest that independent contracting is positively linked to entrepreneurial intent, motivation, and efficacy with correlation coefficients (r) ranging from 0.49 to 0.32. This suggests that there may be a strong entrepreneurial basis for people to explore independent contracting as a form of work. Weaker but still positive relationships were also observed for career adaptability with relationships ranging from $r = 0.15$ for the control dimension to $r = 0.22$ for the curiosity dimension of career adaptability. Interestingly, a significant negative correlation was observed for professional intent ($r = -0.19$), suggesting that for those intending to pursue professional careers, independent contracting may actually be seen as a type of work to be avoided.

Working for agencies that facilitate outsourced work was generally unrelated to entrepreneurial (E), professional (P), and leadership (L) career attitudes. The only significant relationship was observed with efficacy for professional careers ($r = 0.20$). Weak positive correlations were obtained for career adaptability with control ($r = 0.15$) and curiosity ($r = 0.19$).

Preferences for temporary and part-time work also showed weak relationships with EPL career attitudes, with the only significant positive relationship seen for entrepreneurial intent ($r = 0.19$). This may indicate an inclination for short-term temporary or part-time work for those with strong entrepreneurial intent, perhaps to free up time to work on one's individual business endeavors. No other relationships were observed for career adaptability.

Table 8.2 Means, standard deviations, and intercorrelations of variables under study

		M	SD	1	2	3	4	5	6	7	8	9	10
Preference for nonstandard work (PNSW)													
1	ICT	3.17	0.92	(0.72)									
2	OTS	3.35	0.71	0.42**	(0.73)								
3	TPT	2.71	0.80	0.42**	0.42**	(0.78)							
4	STP	3.65	1.00	0.47**	0.13*	0.19**	(0.79)						
5	EDM	3.53	0.78	0.30**	0.65**	0.36**	0.22**	(0.89)					
EPL intent													
6	INT_ENT	3.01	0.83	0.49**	0.05	0.19**	0.64**	0.07	(0.91)				
7	INT_PROF	3.92	0.64	−0.19**	0.09	−0.04	−0.17**	0.14*	−0.33**	(0.76)			
8	INT_LDR	3.83	0.66	−0.02	0.08	−0.15*	0.05	0.08	0.02	0.21**	(0.63)		
EPL motivation													
9	MOT_ENT	2.90	0.74	0.34**	0.02	0.12	0.52**	0.04	0.79**	−0.36**	0.01	(0.79)	
10	MOT_PROF	3.89	0.55	−0.11	0.09	0.05	−0.12	0.09	−0.16*	0.68**	0.24**	−0.14*	(0.80)
11	MOT_LDR	3.70	0.55	0.15*	0.11	0.02	0.16*	0.09	0.21**	−0.04	0.44**	0.15*	0.12
EPL efficacy													
12	EFF_ENT	2.86	0.87	0.32**	0.06	0.04	0.49**	0.10	0.56**	−0.13	0.17*	0.56**	−0.03
13	EEF_PROF	3.37	0.78	0.12	0.20**	0.03	0.10	0.16*	0.15*	0.43**	0.32**	0.06	0.40**
14	EEF_LDR	3.29	0.74	0.13	0.12	−0.06	0.23**	0.08	0.26**	0.02	0.38**	0.23**	0.16*
Career adaptability													
15	Concern	3.36	0.72	0.16*	,09	-−0.08	0.25**	0.09	0.25**	0.23**	0.27**	0.14*	0.30**

(continued)

Table 8.2 (continued)

		M	SD	1	2	3	4	5	6	7	8	9	10
16	Control	3.60	0.62	0.15*	0.15*	0.02	0.17*	0.10	0.16*	0.15*	0.22**	0.07	0.20**
17	Curiosity	3.47	0.73	0.22**	0.19**	0.05	0.27**	0.22**	0.27**	0.14*	0.21**	0.22**	0.13*
18	Confidence	3.47	0.73	0.07	0.09	−0.07	0.19**	0.08	0.17*	0.16*	0.30**	0.11	0.22**
Career adaptability (overall)													
19	Career Adaptability	3.48	0.60	0.18**	0.15*	−0.03	0.26**	0.15*	0.25**	0.20**	0.29**	0.16*	0.25**
Perceived employability													
20	Perceived Employability	3.64	0.53	−0.03	0.03	0.01	0.05	0.05	0.22**	0.18**	0.30**	0.19**	0.23**

		M	SD	11	12	13	14	15	16	17	18	19	20
Preference for nonstandard work (PNSW)													
1	ICT	3.17	0.92										
2	OTS	3.35	0.71										
3	TPT	2.71	0.80										
4	STP	3.65	1.00										
5	EDM	3.53	0.78										
EPL intent													
6	INT_ENT	3.01	0.83										
7	INT_PROF	3.92	0.64										
8	INT_LDR	3.83	0.66										
EPL motivation													
9	MOT_ENT	2.90	0.74										

(continued)

Table 8.2 (continued)

		M	SD	11	12	13	14	15	16	17	18	19	20
10	MOT_PROF	3.89	0.55										
11	MOT_LDR	3.70	0.55	(0.71)									
EPL efficacy													
12	EFF_ENT	2.86	0.87	0.23**	(0.89)								
13	EEF_PROF	3.37	0.78	0.20**	0.51**	(0.85)							
14	EEF_LDR	3.29	0.74	0.48**	0.68**	0.62**	(0.88)						
Career adaptability													
15	Concern	3.36	0.72	0.26**	0.45**	0.47**	0.50**	(0.86)					
16	Control	3.60	0.62	0.33**	0.31**	0.41**	0.47**	0.69**	(0.81)				
17	Curiosity	3.47	0.73	0.20**	0.48**	0.44**	0.50**	0.66**	0.63**	(0.87)			
18	Confidence	3.47	0.73	0.36**	0.47**	0.49**	0.56**	0.62**	0.67**	0.65**	(0.89)		
Career adaptability (overall)													
19	Career Adaptability	3,48	0.60	0.34**	0.50**	0.53**	0.59**	0.86**	0.86**	0.86**	0.86**	(0.94)	
Perceived employability													
20	Perceived Employability	3.64	0.53	0.22**	0.32**	0.43**	0.44**	0.43**	0.41**	0.42**	0.42**	0.49**	(0.77)

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

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

Note N = 225. ICT = PNSW - Independent Contract; OTS = PNSW—Outsourced; TPT = PNSW—Temporary; STP = PNSW—Start-up; INT_ENT = EPL—Entrepreneurial Intent; INT_PROF = EPL—Professional Intent; INT_LDR = EPL—Leadership Intent; MOT_ENT = EPL—Entrepreneurial Motivation; MOT_PROF = EPL—Professional Motivation; MOT_LDR = EPL—Leadership Motivation; EFF_ENT = EPL—Entrepreneurial Efficacy; ENT_PROF = EPL—Professional Efficacy; EFF_LDR = EPL—Leadership Efficacy

Preferences for start-up employment arrangements were unsurprisingly strongly and positively related to entrepreneurial intent ($r = 0.64$), motivation ($r = 0.52$), and efficacy ($r = 0.49$). There was also a weaker positive relationship with leadership efficacy ($r = 0.23$) which may be based on the belief that one needs to demonstrate some aspects of leadership in order to succeed in start-up related work. Start-up preferences were also positively linked to all facets of career adaptability, though correlations which ranged from 0.17 to 0.27 were not as high as those observed for the above entrepreneurial career attitudes.

The last nonstandard work dimension of external deployment saw only positive relationships with career aspirations in the areas of professional intent ($r = 0.14$) and efficacy ($r = 0.16$). This finding is consistent with the fact that this form of work is exemplified in jobs offered by professional service firms who deploy their employees out to work for client firms (Cappelli & Keller, 2013). In terms of career adaptability, we find a significant positive relationship with curiosity ($r = 0.22$), which is in line with the ability of external deployments to provide more exposure to a variety of different job contexts. Lastly, it should also be noted that self-perceived employability was unrelated to the PNSW factors.

Overall, these unique patterns of relationships across different types of PNSW with different dimensions of EPL and career adaptability suggest that these preferences are distinct from the established constructs related to EPL and career adaptability. Different types of career aspirations manifest in preferences for different types of nonstandard work. Career adaptability attitudes also displayed differing patterns of correlations across these preferences, with start-up based preferences strongly associated with such attitudes whereas preferences for temporary and part-time work were not related to adaptability. We now expand on this correlational analysis using regression techniques to explore more complex relationships between these constructs.

Supplemental Regression Analysis

The purpose of these exploratory analyses is to delve deeper into the possible unique relationships that EPL career aspirations and other career attitudes can have with the different dimensions of PNSW. It should first be noted that although our regression analysis models PNSW dimensions as dependent variables, we recognize that our current cross-sectional field survey design is unable to provide any strong causal inference. However, the current analysis does allow us to compare the unique relationships involving different facets of EPL and PNSW in the presence of attitudes like career adaptability and perceived employability, which still provide valuable initial insight to the unique variance in PNSW that can be attributed to similarly multi-dimensional constructs like EPL.

Table 8.3 Results from regression analyses linking PNSW to career adaptability, perceived employability, and EPL motivations and efficacies

	PNSW dimensions				
	Independent contracting	Outsourced	Temporary and Part-time	Startup	External Deployment
Intercept	–	–	–	–	–
EPL motivation					
Entrepreneurship	0.26**	0.07	0.13	0.33**	0.04
Professionalism	−0.11	−0.01	0.06	−0.05	0.03
Leadership	0.14	0.07	0.08	0.08	0.08
EPL efficacy					
Entrepreneurship	0.19	−0.15	0.07	0.35**	0.02
Professionalism	0.15	0.24*	0.11	−0.05	0.16
Leadership	−0.21	0.01	−0.22	−0.13	−0.12
Career adaptability					
Career adaptability	0.17*	0.11	−0.05	0.19*	0.11
Perceived employability					
Employability	−0.20**	−0.12	0.01	−0.14*	−0.05
Model R^2	0.21**	0.06	0.04	0.37**	0.04

Note $*p < .05$. $**p < .01$. $N = 225$. Standardized estimates are reported here

Table 8.3 displays the results from regression analyses that estimated five models using each of the PNSW dimensions as dependent variables. To avoid multicollinearity problems, we decided to only include EPL motivation and efficacies and to drop EPL intent as predictors (due to the high correlations between respective E, P and L motivation and intentions). We also decided to collapse the career adaptability factors into a single general factor due to the high correlations between the four career adaptability factors.

We first entered E, P and L motivations and efficacies as predictors, followed by career adaptability and self-perceived employability. From the five regression models, we observed that out of all the EPL-related variables, only entrepreneurial motivation was predictive of the preference for independent contracting ($B = 0.26$; $p < 0.01$). Interestingly, though no significant correlations involving employability were detected, perceived employability was now negatively related to this preference ($B = -0.20$; $p < 0.01$). The entire model containing EPL, career adaptabilities, and perceived employability explained 21% of the variance in the preference for this form of work ($F = 7.02$, $df = 8$; $p < 0.01$).

Second, the variance explained by this model for outsourced work was much lower and not significant ($R^2 = 0.06$; $p > 0.05$), where this preference was only very weakly related to efficacy for professionalism ($B = 0.24$; $p < 0.05$). Similarly, the

preferences for temporary or part-time work were not significantly related to the EPL, career adaptability or perceived employability predictors.

Fourth, our model explained up to 37% of the variance in start-up work preferences ($F = 15.52$, $df = 8$; $p < 0.8$). As expected, entrepreneurial motivation ($B = 0.33$; $p < 0.01$) and efficacy ($B = 0.35$; $p < 0.01$) were both positively related to this type of work arrangement. In addition, perceived employability was also weakly but negatively ($B = -0.14$; $p < 0.05$) and career adaptability was weakly but positively ($B = 0.19$; $p < 0.05$) related to this preference. Lastly, preferences for external deployed work were not significantly predicted by the predictors in our model ($F = 1.19$, $df = 8$; $p > 0.05$). Overall, these supplemental analyses indicate that in line with the previous correlational analysis, entrepreneurial career aspirations and career adaptability attitudes were strongly related to preferences for two types of nonstandard work: independent contracting and working in start-up environments. However, in addition to correlational analysis, they also highlight the unique variance in independent contracting specifically explained by entrepreneurial motivation. Moreover, perceived employability now displayed a unique negative relationship with these same two types of PNSW when analyzed in the presence of career aspirations and adaptability.

Discussion

In summary, EPL based motivation and efficacies, especially those that have to do with entrepreneurship were positively linked to preferences for independent contracting and start-ups. Various distinct reasons could underlie each of these relationships. For instance, people could view independent contracting as a means for obtaining valuable experience in a particular role or skill that is needed before setting up their own business venture. The link between entrepreneurship intentions and start-up work preferences may seem obvious, but it is still worth noting that almost a third the entire amount of variance in such preferences was accounted for in our regression model. The weaker but consistent relations between career adaptabilities with preferences for these types of nonstandard work point towards the key role of individual adaptability when it comes to building an important understanding of PNSW.

Although the regression analyses only included overall career adaptability as a predictor, a consistent pattern observed in the correlation matrix in Table 8.1 was the high correlation of the curiosity dimension of career adaptabilities for all featured types of nonstandard except for start-up work. This highlights the fundamental attributes of exploration and looking for new opportunities to learn and grow as a person in order for one to even consider different forms of employment under nonstandard work. It is quite surprising that such curiosity was not related to preferences for start-up work. Perhaps desires for start-up work experiences are the result of a more carefully constructed plan and a single-mindedness to start and own one's own business instead of a more exploratory mindset.

Finally, we also note that perceived employability was weakly and negatively related to independent contracting and start-up work in our regression models. This is inherently interesting because it suggests that the self-perceived ability to obtain and sustain a fair job given one's own qualifications actually discourages the consideration of alternative forms of employment. Perhaps nonstandard work still suffers from the sort of stigma that is attached to unglamorous, low paying jobs that people only take when they cannot obtain normal full-time standard work. These underlying cognitions and their implications should be addressed in future research.

General Discussion

We conducted an exploratory study to pursue an original way of operationalizing individual preferences for nonstandard work (PNSW) and investigated their links with the EPL framework and other career-related constructs. Our research thus developed and began the validation of a psychometric method of assessing PNSW and proceeded to examine empirical links between this novel concept and EPL.

Implications

Our results indicate that distinct preferences for different forms of nonstandard work do exist and that they also share interesting relationships with certain EPL dimensions. Namely, entrepreneurial motivation (which is highly correlated with intent) and efficacy were related to preferences for several types of nonstandard work including independent contracting, temporary and part-time, and start-up work. PNSW thus helps uncover a possible way by which EPL motivations influence career development through the alternative employment arrangements that they may be willing to explore in order to facilitate personal growth along certain EPL dimensions.

There is also initial promise for the use of PNSW as a diagnostic tool to accompany the EPL framework as a way to gauge individuals' readiness to develop along the dimensions of entrepreneurialism, professionalism, and even leadership through the exploration of nonstandard work experiences. As individuals start to assume more control and responsibility for managing their own careers (Feldman & Bolino, 2000; Briscoe et al., 2012), taking on nonstandard forms of work is likely to constitute an increasingly important way in which learning and development takes place in all dimensions of the EPL. PNSW can thus serve as a reasonable indicator of one's awareness and aptitude to use these work experiences for one's career development.

Our findings for career adaptabilities and perceived employability also emphasize the importance of curiosity and exploration-related mindsets, as well as prevailing perceptions of what it means to remain employed when understanding PNSW. Adaptability through the consideration of non-traditional forms of employment requires the

ability to constantly survey one's surrounding employment landscape for opportunities to learn and develop. Furthermore, most people's current conceptions of being gainfully employed may also need to be broadened to incorporate work arrangements outside of the usual notions of full-time jobs (Cappelli, 1999). These are perhaps some areas for post-secondary and tertiary education planners as well as career counsellors and learning and development professionals to pay attention to as we seek to prepare current and future generations of workers to navigate an increasingly complex labor market consisting of diverse forms of employment (Chan et al., 2012).

Limitations

We now highlight several important limitations of this research. As reported above and in Table 8.1, the overall fit of our measurement model though superior to other competing models, was still less than ideal. Depending on the fit index used, the data does indicate that model fit can still be significantly improved.

It should also be emphasized that the data was gathered via a cross-sectional design which essentially makes all interpretations of significant relationships correlational instead of causal in nature. Future research should employ more rigorous field methods to not only strengthen causal inference, but also track how PNSW changes throughout the various stages of one's career.

Lastly, our insights were garnered through data sampled from a population of undergraduate students. It could be argued that some individuals in this group lack experiences and knowledge when it comes to understanding the implications of various forms of nonstandard work (Boswell, Zimmerman, & Swider, 2012). In particular, PNSW dimensions like flexible part-time and temporary arrangements may be more strongly considered for more mature workers at later stages of their lives when they have more of a need to balance work and family commitments (Gascoigne & Kelliher, 2017). Moreover, independent contracting and entrepreneurial start-up options can also become more applicable later in one's career when sufficient experience, skills, and expertise are accrued (Bidwell & Briscoe, 2009). Thus, future research should explore the possible varying patterns of PNSW for different groups of job seekers at different stages of their careers.

Conclusion

Research on preferences for different forms of nonstandard work is still in its infancy. However, the pace of change that is likely to dictate rapid transformations in the employment context means that such research is not only timely but may be a key requirement in the overall research agenda of academics in this and related fields. Developing a sound understanding of PNSW and how it varies according to the

EPL dimensions thus holds significant value in our continued efforts to deepen our understanding of career development in the twenty-first century.

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Chapter 9
The Influence of Values on Entrepreneurial, Professional, and Career Motivations

Jeffrey C. Kennedy and Moon-Ho Ringo Ho

Abstract Organizations increasingly expect people to move between roles which involve varying combinations of professional (vocational), leadership, and entrepreneurial responsibilities. While there has been considerable research into the relationship between values and leadership style, we know little about how values contribute to entrepreneurial, professional and leadership motivations. This study of 272 undergraduate students from a Singapore public university suggests that both universal and cultural values can distinguish between these motivations. Leadership and entrepreneurial motivation share a basis in personal achievement and stimulation values, while entrepreneurial motivation is distinguished by low emphasis on values of conformity and security. Entrepreneurial motivation also appeared grounded in collectivist values, while leadership motivation seems to be underpinned by a desire to benefit others. Professional motivation shares little in common with the other two types; it is characterized by hedonism and uncertainty avoidance, raising questions about the extent to which students pursuing vocational or professional careers may be willing to explore entrepreneurial and leadership options.

Keywords Career development and management · Entrepreneurship · Leadership · Professionalism values

Introduction

The careers field has always had a strong focus on the question of which jobs are most suited to which individuals. Vocational guidance has relied on tools for measuring various aptitudes, experiences, skills, values, personality traits and interests, with a view to matching these up against job attributes. Improving the fit between the

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person (typically assessed on a subset of these characteristics) and the job can lead to positive outcomes for the person and for job performance.

While the vocational fit approach has proved useful, it is less helpful when it comes to broader questions related to career choice. For example, within a specific vocation, many career avenues are possible. People who share a similar vocational fit with, for example, medicine, will nevertheless vary in their career aspirations. Some may seek to innovate, or to follow an entrepreneurial path; others will seek to assume greater leadership or managerial responsibility; and others might focus on developing greater skill levels in more specialized and demanding medical fields. Understanding what motivates people to follow these different career directions will provide a useful complement to the vocational fit approach. In this paper, we examine the extent to which individual values guide such career motivations.

Chan and Drasgow (2001) presented an influential model of motivation to lead (MTL). They demonstrated that people are motivated to lead for three broad reasons—they like leading and see it as part of their identity (affective/identity); they believe it is their duty, or is expected of them (socio-normative); and they are prepared to accept the responsibilities and costs of leading (non-calculative). This framework formed the basis for a subsequent extension into careers motivation, considering entrepreneurial and professional careers motivation, in addition to leadership (Chan et al., 2012).

Chan et al. (2012) suggest that entrepreneurial, professional, and leadership (EPL) career motivations can be understood as three dimensions of career space. Rather than being constrained to a single career track, individuals can alternate movement along different dimensions, or even combine dimensions. A nurse combines clinical work with unit leadership responsibilities, while an architect creates a new business around a design innovation. This conceptualization of careers is more aligned with the view of careers as taking place across multiple boundaries (Arthur & Rousseau, 1996). It is also a more accurate representation of the workplace, where managers are encouraged to combine leadership with entrepreneurship (e.g., Teece, 2016). Professions such as engineering (e.g., Rottmann, Sacks, & Reeve, 2014) and healthcare (e.g., Dickinson, Ham, Snelling, & Spurgeon, 2014; Mascia, Dello Russo, & Morandi, 2015) grapple with how to develop leadership among their professionals, while entrepreneurship is also becoming a core competency for professionals (Reihlen & Werr, 2012).

While research has identified differential links between personality traits and motivation for entrepreneurial, professional, and leadership careers (Chan, Uy, Chernyshenko, Ho, & Sam, 2015), the role of values has not yet been studied. Values are important motivational constructs which could be expected to influence career preferences in EPL "career space".

Study Aim and Hypotheses

This study seeks to clarify the relationship between individual values and the EPL career motivations of university students as they prepare to transit into the workforce. We focus on two complementary conceptualizations of values—universal values and cultural values. The universal values are those developed by Schwartz (1992), designed to capture values present to a greater or lesser extent in all cultures. While the Schwartz framework has been used to compare groups and societies across cultures, it is also used at the individual level, to understand the broad goals governing people's evaluations and behavior (e.g., Knafo, Roccas, & Sagiv, 2011). The second framework used in this study stems from research into values developed at the societal level, as popularized by Hofstede's (1980) pioneering cross-cultural work since the 1960s.

Universal Values

The Schwartz Values Survey (SVS) is one of the most widely used frameworks for understanding values at both individual and national levels in international business studies (Knafo et al., 2011). Building on prior work, Schwartz conceived of values as being grounded in universal requirements of human existence—biological needs, group survival and welfare needs, and social coordination (Schwartz, 2012). These needs are relevant to all individuals and cultures, although their relative importance will vary. Schwartz (pp. 5–7) groups his individual-level values into ten sub-dimensions, and summarises the defining goal of each as follows:

1. Self-Direction—independent thought and action; choosing, creating, exploring.
2. Stimulation—excitement, novelty, and challenge in life.
3. Hedonism—pleasure or sensuous gratification for oneself.
4. Achievement—personal success through demonstrating competence according to social standards.
5. Power—social status and prestige, control or dominance of people and resources.
6. Security—safety, harmony, and stability of society, or relationships, and of self.
7. Conformity—restraint of actions, inclinations, and impulses likely to upset or harm others and violate social expectations or norms.
8. Tradition—respect, commitment, and acceptance of the customs and ideas that one's culture or religion provides.
9. Benevolence—preserving and enhancing the welfare of those with whom one is in frequent personal contact (the 'in-group').
10. Universalism—understanding, appreciation, tolerance, and protection for the welfare of all people and for nature.

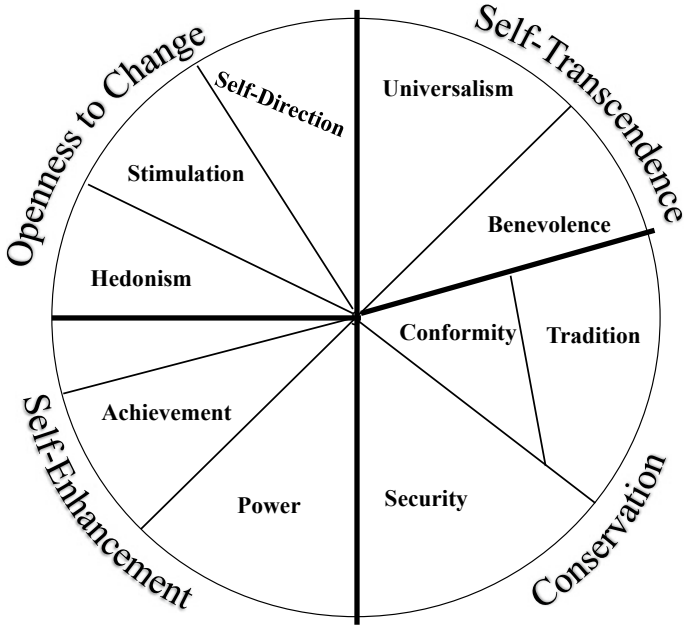

Fig. 9.1 Theoretical model of relations among Schwartz's ten value sub-dimensions (from Schwartz & Sagie, 2000, p. 470)

Behaviors consistent with one value may be consistent with, or in conflict with other values. For example, pursuit of personal success (achievement) may support attainment of status (power) while potentially going against the welfare of others (benevolence). Displaying the values in a circular pattern (Fig. 9.1) allows these relationships to be made explicit, with values close to each other in the circle having greater congruence, and conflicting values appearing on the opposite side of the circle. Two higher-order dimensions are also shown in the circular diagram. One dimension moves from 'openness to change' (stimulation and self-direction) to 'conservation' (conformity, tradition, and security). The second dimension is from self-transcendence (universalism and benevolence) to self-enhancement (power, achievement, and hedonism).

The risk and uncertainty of entrepreneurial activities suggests that values associated with openness to change (rather than conservation) are likely to underpin entrepreneurial motivation. A number of studies support this view. Fagenson (1993), for example, used Rokeach's (1973) values framework to compare values of male and female managers and entrepreneurs. While she found no gender differences, entrepreneurs placed significantly more value than managers on self-respect, freedom, a sense of accomplishment, and an exciting life.

Voss (2001) compared values of administrators (managers in business organizations) with entrepreneurs (using the Schwartz framework). He found entrepreneurs to be higher on achievement and self-direction (though not stimulation). While he

hypothesized that administrators would be higher on conformity, tradition, and hedonism than entrepreneurs, no significant differences were found. As with the study by Fagenson (1993), Voss sought to differentiate the values of people currently in managerial and entrepreneurial roles. Neither study included professionals, nor did they consider motivation to become an entrepreneur versus other roles.

Jaén, Moriano, & Liñán (2013) studied the influence of values on entrepreneurial intentions of Spanish university alumni. Using the four Schwartz higher-order factors (with ten sub-dimensions as indicators), they found that both openness to change (stimulation, hedonism, and self-direction) and self-enhancement (achievement and power) were positively associated with entrepreneurial intentions. Kirkley (2016) also used the Schwartz values framework, but he asked his sample of entrepreneurs to identify the values which they believed were most strongly associated with entrepreneurial behavior. Three of the top five ranked values belonged to the self-direction sub-dimension, while the remaining two tapped stimulation and achievement.

Based on these studies, we hypothesize the following:

Hypothesis 1 Achievement, stimulation, and self-direction will be positively associated with entrepreneurial motivation.

Chan and Drasgow (2001) were the first to systematically explore motivation to engage in leadership roles, and identified values as a distal antecedent. While they used a different measure of values (Singelis, Triandis, Bhawuk, & Gelfand, 1995), they concluded that affective motivation to lead was associated with values of competition and achievement (consistent with Schwartz's self-enhancement dimension). Socio-normative motivation was associated with a sense of social duty and obligation, consistent with the self-transcendence dimension in Schwartz's framework. These two Schwartz dimensions capture a tension between "values that emphasize concern for the welfare and interests of others … and values that emphasize pursuit of one's own interests and relative success and dominance over others" (Schwartz, 2012, p. 8).

Further evidence for the importance of self-enhancement and self-transcendence comes from Clemmons and Fields (2011). While adopting Schwartz's conceptualization of these two dimensions, they used different scales to measure them. They found that both dimensions were positively associated with motivation to lead, and explained incremental variance over and above that explained by personality. We therefore hypothesize the following:

Hypothesis 2 Self-enhancement (comprising power, achievement, and hedonism) will be positively associated with leadership motivation.

Hypothesis 3 Self-transcendence (comprising universalism and benevolence) will be positively associated with leadership motivation.

Values are an integral part of being a professional, with values such as autonomy, public service, self-regulation being seen as definitional (Hinings, 2001). However,

we are not aware of any research which has explored the extent to which values contribute to professional motivation. We therefore do not hypothesize any relationships between values and professional motivation.

Cultural Values

Commonly used measures of cultural values, such as those developed by Hofstede (1980) or the GLOBE project (House et al., 2004) operate at the societal level. While they serve to distinguish average levels of values across cultures, the scales do not exhibit acceptable psychometric properties when used to assess individual differences (Hanges & Dickson, 2004). In order to assess the influence of individual differences in values on career motivations, it is necessary to use measures designed for use at the individual level. Dorfman and Howell (1988) developed individual versions for four of the Hofstede dimensions—individualism/collectivism, power distance, uncertainty avoidance, and masculinity/femininity. In this study, we use the first three values; we excluded masculinity/femininity because findings from the GLOBE project suggest it confounds several different values, including assertiveness, gender egalitarianism, and humane orientation (Emrich, Denmark, & den Hartog, 2004).

Dorfman and Howell (1988, p. 129) define the three societal dimensions on which they based their scales as follows:

1. Power distance—defines the extent to which a society accepts unequal distribution of power in institutions and organizations.
2. Individualism/collectivism—individualism implies a loosely knit social framework in which people are supposed to take care of themselves; as opposed to collectivist cultures characterized by 'in-groups' which are expected to take care of their members.
3. Uncertainty avoidance—defines the extent to which people in a culture feel threatened by uncertainty and ambiguous situations and try to avoid such situations.

There is little research to guide development of hypotheses regarding relationships between motivation to take up entrepreneurial, professional, or leadership roles, and the cultural values of power distance and individualism/collectivism. In the leadership context, for example, cultural values have been shown to influence the choice of leadership styles and their relative effectiveness in different cultures (see, for example, Brodbeck et al., 2000; den Hartog et al., 1999). While power distance influences use of directive versus participative styles, this knowledge provides little guidance as to whether this value influences the motivation to take on leadership roles in the first place. Similarly, collectivism has been shown to correlate positively with team-integrating and collaborative leader behaviors (Gelfand, Bhawuk, Nishii, & Bechtold, 2004), but it is unclear whether a person with higher collectivistic (or individualistic) values will be more or less likely to seek leadership roles.

With respect to entrepreneurship, the role of individualism and collectivism is unclear. Hayton & Cacciotti (2013) summarized a number of studies, some of which showed a negative relationship between collectivism and entrepreneurship while others showed no relationship. Pinillos & Reyes (2011) suggested the possibility of a non-linear relationship, with collectivism contributing to entrepreneurial activity in developing countries, and individualism in developed countries.

Uncertainty avoidance, however, has been shown to be relevant to engagement in entrepreneurial activities. Hofstede (2001, p. 164) notes that low uncertainty avoidance "implies a greater willingness to enter into unknown ventures". Risk aversion, which is consistent with high levels of uncertainty avoidance, has been shown to relate positively to professional motivation, and negatively to both leadership and entrepreneurial motivation (Chan et al., 2015). Greater risk associated with leadership and entrepreneurial outcomes compared with more certain returns from application of professional skills suggests the following hypothesis:

Hypothesis 4 Uncertainty avoidance is positively associated with professional motivation and negatively associated with both leadership and entrepreneurial motivation.

Method

Participants

Data were collected from students attending a large Singaporean university, enrolled in diverse disciplines including science, engineering, humanities, and business. The sample had 272 students; 53% were male, and the average age was 21.9 years ($sd = 2.6$). Students were invited to participate by email, and received S$10 compensation.

Measures of Cultural Values

Universal values were measured using Schwartz's (1992) 57 item SVS scale. Respondents used a 9-point scale (ranging from −1 (opposed to my values) through 0 (not important) to 7 (of supreme importance) to rate the importance of each item as a guiding principle in their life. Following the approach outlined in Schwartz, each individual's mean score on all items was subtracted from individual item scores so as to eliminate the effect of differing response styles, and accurately reflect the relative importance of each value for each respondent. These adjusted item scores were used to calculate the ten sub-dimensions by averaging the relevant items. Cronbach alpha reliability coefficients (calculated on raw scores) ranged from 0.62 (tradition)

to 0.80 (universalism and benevolence). These were generally in line with those obtained in studies across many countries; see, for example, Ralston et al. (2011).

Cultural values were measured using Dorfman and Howell's (1988) scales for individualism/collectivism (6 items), uncertainty avoidance (5 items), and power distance (5 items), each measured on a 5-point scale (*strongly disagree* to *strongly agree*). Reliabilities (Cronbach alpha) were lower than desirable, ranging from 0.56 (uncertainty avoidance) to 0.62 (individualism/collectivism). High scores on the individualism/collectivism scale indicate stronger emphasis on collectivistic values.

EPL motivations were measured using the 27-item scale from Chan et al. (2012). Participants used a 5-point scale (*strongly disagree* to *strongly agree*) to indicate their motivation towards entrepreneurial, professional, or leadership careers. Sample items included: "I am the kind of person who likes influencing and managing people more than doing anything else" (leadership motivation); "I like to be highly specialized and experienced in a specific area of expertise" (professional motivation); and "I like thinking about ways to create new products and services for the market" (entrepreneurial motivation). Cronbach alpha reliabilities ranged from 0.71 (leadership) to 0.81 (entrepreneurial).

Results

Scale descriptive statistics, inter-scale correlations, and reliabilities are summarized in Table 9.1 (EPL and universal values scales) and Table 9.2 (EPL and cultural values). The mix of negative, positive, and non-significant correlations suggest that common method bias was not a significant concern (Spector, 2006). The EPL scales showed a significant positive correlation ($r = 0.24$, $p < 0.01$) between leadership and entrepreneurial motivation, while there was no correlation between either of these scales and professional motivation. This pattern of correlations was generally consistent with that reported in Chan et al. (2012). The positive correlations between gender and both entrepreneurial and leadership motivation indicated that males were more likely to express higher motivations for these roles.

Patterns of correlations within the Schwartz value dimensions were also consistent with past studies. Dimensions near each other on the circumplex (Fig. 9.1) tended to correlate positively with each other (e.g., power, achievement, hedonism), while dimensions on opposite sides of the circle were negatively correlated (e.g., stimulation, self-direction with tradition, conformity and security).

The correlations in Table 9.1 show that achievement ($r = 0.14$, $p < 0.01$), stimulation ($r = 0.21$, $p < 0.01$) and self-direction ($r = 0.16$, $p < 0.01$) are all significantly related to entrepreneurial motivation, thus supporting Hypothesis 1.

Hypothesis 2 and 3 stated that self-enhancement values (power, achievement, hedonism) and self-transcendence values (universalism, benevolence) would relate positively to leadership motivation. From Table 9.2 we see that achievement is positively related to leadership motivation ($r = 0.20$, $p < 0.01$) thereby partially supporting Hypothesis 2. However, the correlation between power and leadership motivation is

Table 9.1 Scale descriptive statistics and inter-scale correlations (EPL motivations and Schwartz values)

Scale (No. items)	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Demographics																	
1. Gender	–	–	–														
2. Age	21.93	2.56															
EPL motivations																	
3. Entrepreneurial (9)	3.10	0.66	**0.23**	0.01	(0.81)												
4. Professional (9)	3.86	0.53	0.00	0.03	0.01	(0.76)											
5. Leadership (9)	3.65	0.49	**0.21**	−0.01	**0.24**	−0.04	(0.71)										
Schwartz Values																	
6. Power (4)	−1.26	1.19	0.03	0.04	0.06	0.04	−0.08	(0.65)									
7. Achievement (4)	0.38	0.84	0.04	**−0.14**	**0.14**	−0.11	**0.20**	**0.29**	(0.64)								
8. Hedonism (3)	−0.12	1.34	−0.01	−0.03	−0.05	**0.16**	**−0.15**	**0.29**	−0.03	(0.69)							
9. Stimulation (3)	−0.55	1.35	0.11	−0.08	**0.21**	−0.09	**0.12**	0.00	**0.22**	0.04	(0.75)						
10. Self-direction (5)	0.32	0.80	**0.12**	−0.08	**0.16**	−0.01	0.08	**−0.17**	**0.14**	0.02	**0.45**	(0.68)					
11. Universalism (8)	−0.16	0.72	0.01	0.09	−0.01	0.01	0.02	**−0.45**	**−0.31**	**−0.33**	−0.05	0.12	(0.80)				

(continued)

Table 9.1 (continued)

Scale (No. items)	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
12. Benevolence (5)	0.41	0.79	0.08	0.04	−0.05	−0.05	**0.17**	**−0.35**	**−0.12**	**−0.31**	**−0.27**	**−0.24**	−0.03	(0.80)			
13. Tradition (5)	−0.97	1.01	−0.02	0.09	0.01	0.03	−0.07	**−0.19**	**−0.43**	**−0.30**	**−0.37**	**−0.36**	0.02	**0.19**	(0.62)		
14. Conformity (4)	0.26	0.84	−0.01	−0.07	**−0.14**	−0.02	−0.04	**−0.24**	**−0.15**	**−0.22**	**−0.41**	**−0.39**	−0.08	**0.37**	**0.26**	(0.67)	
15. Security (5)	−0.01	0.69	−0.04	0.07	**−0.14**	0.08	0.02	−0.01	**−0.19**	0.01	**−0.30**	**−0.34**	0.01	−0.03	−0.02	**0.15**	(0.66)

Note Main diagonal provides scale Cronbach alpha reliability coefficients in parentheses
Correlations greater than ± .12 are significant at $p < .05$ (2-tailed) and are shown as bold in the table; correlations ± .15 are significant at $p < .01$ (2-tailed)
Gender: 0 = Female, 1 = Male
$N = 272$

Table 9.2 Scale descriptive statistics and inter-scale correlations (EPL motivations and Cultural values)

Scale (No. items)	M	SD	1	2	3	4	5	6	7	8
Demographics										
1. Gender	–	–	–							
2. Age	21.93	2.56								
EPL motivations										
3. Entrepreneurial (9)	3.10	0.66	**0.23**	0.01	(0.81)					
4. Professional (9)	3.86	0.53	0.00	0.03	0.01	(0.76)				
5. Leadership (9)	3.65	0.49	**0.21**	−0.01	**0.24**	−0.04	(0.71)			
Cultural values										
6. Individualism/Collectivism (6)	3.57	0.49	**0.18**	0.08	**0.22**	0.08	0.07	(0.62)		
7. Uncertainty avoidance (5)	3.83	0.41	0.02	−0.01	−0.03	**0.22**	0.09	0.03	(0.56)	
8. Power distance (5)	2.08	0.52	−0.02	0.02	0.02	0.06	**−0.16**	0.09	**0.19**	(0.59)

Note Main diagonal provides scale Cronbach alpha reliability coefficients in parentheses. Correlations greater than ± 0.12 are significant at $p < 0.05$ (2-tailed) and are shown as bold in the table; correlations ± 0.15 are significant at $p < 0.01$ (2-tailed). Gender: 0 = Female, 1 = Male. $N = 272$

non-significant, while hedonism is significantly negatively correlated ($r = -0.15$, $p < 0.01$) which is inconsistent with the hypothesized relationship. Benevolence is positively correlated with leadership motivation ($r = 0.17$, $p < 0.01$), partially supporting Hypothesis 3, but universalism is non-significant.

Turning to cultural values, uncertainty avoidance is positively correlated with professional motivation ($r = 0.22$, $p < 0.01$) thereby giving partial support to Hypothesis 4. However, the hypothesized negative correlation with both leadership and entrepreneurial motivation was non-significant.

Given that EPL motivation is a new construct, and there is little prior research into the influence of values on motivation to enter entrepreneurial, professional, and leadership careers, it was not possible to set out hypotheses regarding all three motivations. Non-hypothesized significant relationships should be interpreted with caution, but suggest further avenues for exploration. Considering universal values, there is a strong significant negative relationship between both conformity and security values and entrepreneurial motivation (both $r = -0.14$, $p < 0.01$). This is consistent with the identity of an entrepreneur as a risk taker who seeks new directions and challenges existing ideas. Hedonism is positively correlated with professional motivation ($r = 0.16$, $p < 0.01$), suggesting that enjoyment or intrinsic interest is a core driver of motivation to pursue specialization in careers.

Only one hypothesis was made regarding cultural values. The positive correlation between uncertainty avoidance and professional motivation ($r = 0.22$, $p < 0.01$) supports Hypothesis 4, but the hypothesized negative relationship with entrepreneurial and leadership motivation was non-significant.

Two significant non-hypothesized correlations are also present in Table 9.2. Individualism/Collectivism is positively correlated with entrepreneurial motivation ($r = 0.22$, $p < 0.01$) suggesting that students with stronger collectivist values are more highly motivated to become entrepreneurs. Power distance is negatively correlated with leadership motivation ($r = -0.16$, $p < 0.01$). These two results will be explored more in the discussion section.

Dominance Analysis

So far we have considered Schwartz's universal values and the individual-level cultural values separately, in terms of their correlations with E, P, and L motivation. However, a more detailed understanding can be gained by using dominance analysis and multiple regression analysis to explore which of these types of values has the most impact on EPL motivation.

Dominance analysis seeks to overcome an inherent problem with the multiple regression method. The aim of regression is to select weights for independent variables such that the error of prediction of the dependent variable is minimized (Nunnally & Bernstein, 1994). However, when predictors are correlated, regression coefficients are not a reliable indicator of the relative importance of predictors. For example, variance which a weak predictor shares with a stronger predictor will be accounted

for by the strong predictor; the resulting weight assigned to the weak predictor will underestimate its relationship with the dependent variable. Even relatively minor shifts in correlations between predictors can result in large differences in the magnitudes and the relative order of predictors (Johnson, 2000). Dominance analysis helps to clarify the relative importance of each predictor; i.e., "The proportionate contribution each predictor makes to R^2, considering both its direct effect (i.e., its correlation with the criterion) and its effect when combined with the other variables in the regression equation" (Johnson & LeBreton, 2004, p. 240).

We reduced the total pool of predictors by regressing each of the three EPL motivations separately on all of the Schwartz and Dorfman values measures, using stepwise regression with an inclusion criterion of $p < 0.05$ and a removal criterion of $p < 0.1$. These generous criteria ensured we would be including all relevant predictors in the subsequent dominance analysis. Tables 9.3, 9.4 and 9.5 present the resulting regression summaries for E, P, and L motivations respectively.

Dominance analysis was carried out using the R package 'yhat' (Nimon & Oswald, 2013; Nimon & Roberts, 2012). In terms of relative importance, predictors can demonstrate complete dominance (where they contribute more R^2 to prediction than any other predictor, in all predictor subsets), but this is relatively unusual. Conditional dominance is less strict, and represents cases where the average R^2 contribution of a predictor across all models with the same number of predictors is higher than that

Table 9.3 Regression results using entrepreneurial (E) motivation as the criterion

Predictor	*b*	*b* 95% CI [LL, UL]	*beta*	*beta* 95% CI [LL, UL]	Fit
(Intercept)	1.77**	[1.21, 2.32]			
Stimulation	0.09**	[0.03, 0.15]	0.19	[0.06, 0.31]	
Self-direction	0.13*	[0.02, 0.23]	0.16	[0.03, 0.28]	
Power	0.08*	[0.02, 0.15]	0.15	[0.03, 0.27]	
Individualism/Collectivism	0.40**	[0.25, 0.56]	0.30	[0.18, 0.42]	
					R^2= 0.140**
					95% CI[0.06, 0.21]

Note A significant *b*-weight indicates the beta-weight is also significant. *b* represents unstandardized regression weights. *beta* indicates the standardized regression weights. LL and UL indicate the lower and upper limits of a confidence interval, respectively. *indicates $p < 0.05$. **indicates $p < 0.01$

Table 9.4 Regression results using professional (P) motivation as the criterion

Predictor	*b*	*b* 95% CI [LL, UL]	*beta*	*beta* 95% CI [LL, UL]	Fit
(Intercept)	2.84**	[2.26, 3.41]			
Hedonism	0.06*	[0.01, 0.10]	0.14	[0.03, 0.26]	
Achievement	−0.07	[−0.14, 0.01]	−0.10	[−0.22, 0.01]	
Uncertainty avoidance	0.28**	[0.13, 0.43]	0.21	[0.10, 0.33]	
					$R^2 = 0.081$**
					95% CI[0.02, 0.14]

Note A significant *b*-weight indicates the beta-weight is also significant. *b* represents unstandardized regression weights. *beta* indicates the standardized regression weights. LL and UL indicate the lower and upper limits of a confidence interval, respectively. *indicates $p < 0.05$. **indicates $p < 0.01$

Table 9.5 Regression results using leadership/management (L) motivation as the criterion

Predictor	*b*	*b* 95% CI [LL, UL]	*beta*	*beta* 95% CI [LL, UL]	Fit
(Intercept)	3.05**	[2.51, 3.59]			
Benevolence	0.16**	[0.09, 0.24]	0.26	[0.14, 0.38]	
Stimulation	0.08**	[0.03, 0.12]	0.21	[0.08, 0.34]	
Achievement	0.14**	[0.07, 0.21]	0.24	[0.12, 0.36]	
Security	0.09*	[0.00, 0.17]	0.12	[0.00, 0.24]	
Universalism	0.08	[−0.00, 0.16]	0.11	[−0.01, 0.23]	
Uncertainty avoidance	0.14	[−0.00, 0.28]	0.11	[−0.00, 0.23]	
					$R^2 = 0.131$**
					95% CI[0.05, 0.19]

Note A significant *b*-weight indicates the beta-weight is also significant. *b* represents unstandardized regression weights. *beta* indicates the standardized regression weights. LL and UL indicate the lower and upper limits of a confidence interval, respectively. *indicates $p < 0.05$. **indicates $p < 0.01$

of other predictors. Finally, general dominance is where one predictor has higher average contribution across all possible models (Azen & Budescu, 2003).

For entrepreneurial motivation, the set of predictors selected by stepwise regression comprised stimulation, self-direction, power, and individualism-collectivism. Complete dominance was established among these predictors, with individualism-collectivism contributing more to R^2 than any other predictor, in all possible regression subsets formed from these predictors. The second most dominant predictor was stimulation. Self-direction exhibited only general dominance over power, with little to separate the contribution made by these two predictors. Average R^2 contributed

by individualism-collectivism across all models was 0.066, followed by 0.039 for stimulation. Total model R^2 was 0.140 (Table 9.3).

For professional motivation, the set of predictors selected by stepwise regression comprised hedonism, achievement, and uncertainty avoidance. Uncertainty avoidance demonstrated complete dominance over both other predictors, while hedonism was relatively more important than achievement. Average R^2 contributed by uncertainty avoidance across all models was 0.047, followed by 0.023 for hedonism. Total model R^2 was 0.081 (Table 9.4).

For leadership/managerial motivation, the set of predictors selected by stepwise regression comprised benevolence, stimulation, achievement, security, universalism, and uncertainty avoidance. The two most important predictors were benevolence (which showed complete dominance in all subsets of predictors except when achievement was included), and achievement (which showed complete dominance in all subsets except when benevolence was included). Achievement and benevolence contributed an average of 0.044 and 0.043 to R^2 respectively, across all predictor subset models. Stimulation was the next most important predictor (0.024) while there was little to distinguish security, universalism, and uncertainty avoidance with respect to dominance or average R^2 contribution. Total model R^2 was 0.131 (Table 9.5).

Discussion

Although somewhat exploratory in nature, this study confirms the importance of considering the role of values in career motivations. Most of the hypothesized relationships received at least partial support, and a number of unexpected correlations between values and each of the career motivations were observed. This study suggests that efforts to examine individual differences antecedents to career motivations should go beyond personality traits (e.g., Chan et al., 2015) to also include individual differences in universal and social values.

It appears that in this sample of Singapore undergraduates, values of achievement, stimulation, and self-direction are strongly associated with entrepreneurial motivation. The non-hypothesized negative correlations between the values of conformity and security with entrepreneurial motivation are consistent with the role of entrepreneurs as risk-taking innovators. Interestingly, Jaén et al. (2013) hypothesized a negative relationship between conservation (encompassing tradition, conformity and security) and entrepreneurial intention, but found a non-significant result in their study of Spanish entrepreneurs. They suggest that different values may underlie different forms of motivation—some people "will see entrepreneurship as a way of gaining freedom (self- direction value), … others may see it as the possibility to continue the family business (tradition value)" (p. 26). Thus, while values associated with self enhancement and openness to change seem to have a fairly robust and consistent relationship with entrepreneurial intention, values associated with conservation (tradition, conformity, security) may have a more nuanced relationship, shaping motivation towards different "flavours" of entrepreneurship.

Turning to a consideration of cultural values, our findings suggest further lines of exploration regarding the ways in which cultural settings influence EPL motivations. The significant positive relationship between collectivism and entrepreneurial motivation suggests that our Singaporean student sample is motivated by a desire to contribute to the collective rather than just pursue individual success as entrepreneurs. Pinillos & Reyes (2011) concluded that collectivism contributes more to entrepreneurship in developing countries, but as Singapore is a developed country, our findings suggest there may be additional factors influencing the role of collectivism in entrepreneurship. For example, entrepreneurial motivation may be shaped by national discourse, on ways in which society frames entrepreneurship as a path to nation-building versus a path to individual success. Of the various values identified, dominance analysis suggests that the two with most impact on entrepreneurial motivation are collectivism and stimulation.

Leadership motivation is also characterized by values of achievement and stimulation (though not self-direction). The motivating goal of self-direction is "independent thought and action—choosing, creating, exploring" (Schwartz, 2012, p. 5). At first glance it might be expected that leadership (especially transformational leadership) would be predicted by the motivation for "independent thought and action". The lack of a significant correlation suggests that the students in our sample may have a different conception of leadership—for example, as being focused on furthering the goals of their organization in ways which conform to organizational structures and norms.

The significant negative correlation between power distance and leadership motivation is noteworthy. Several interpretations are possible, and will need additional research to explicate. One possibility is that this reflects commitment to a more participative, less autocratic style of leadership, the kind of leadership more consistent with low power distance cultures. Alternatively, it may be the case that respondents with lower power distance values feel less constrained by societal hierarchical relationships, and thereby sense a greater possibility of becoming leaders, believing more in the possibility of upward mobility.

Contrary to the hypothesized relationship, hedonism is negatively correlated with leadership motivation. It is possible that this is a sample-specific finding. Singapore is a collectivist society, placing emphasis on the importance of individuals contributing to the community and society; leadership may therefore be seen more as a social obligation, using leadership as a way to benefit others rather than satisfy one's personal desires. The significant correlation with benevolence (a value focused on enhancing the welfare of others) supports this interpretation. This perspective is captured by Chan & Drasgow's (2001) social-normative component of the motivation to lead. Future research could usefully seek to clarify whether certain societal cultures are more conducive to different types of leadership, thereby moderating the relationship between individual values and leadership motivation.

Our dominance analysis indicates that in this Singaporean sample, benevolence and achievement are the most important predictors of leadership motivation, followed by stimulation. There is quite a high level of commonality between leadership and entrepreneurship (Vecchio, 2003), and past studies of the EPL framework have

noted that E and L correlate more highly with each other than either do with P motivation (Chan et al., 2012). Our findings suggest that values can contribute to distinguishing these related motivations. While they share the value of stimulation, the entrepreneurial motivation of Singaporean students appears to be grounded in collectivism (and a willingness to forego security), whereas leadership stems more from a desire to achieve personal success while doing good for others.

Dominance analysis indicated that (in our sample) uncertainty avoidance was the most powerful predictor of professional/vocational motivation, followed by hedonism. Given that vocational specialists are often expected to take on leadership or innovation roles, the lack of overlap between values which motivate professionalism and those which motivate leadership and entrepreneurship is concerning. The strong influence of uncertainty avoidance is in contradiction to the need for entrepreneurs to accept risk and forego security.

Hedonism is a motivational goal oriented towards attaining pleasure and sensual gratification (Schwartz, 2012), suggesting that vocational/professional motivation is strongly motivated by intrinsic enjoyment of the work. Enjoyment of one's current specialist role can inhibit a person from taking on leadership roles, if it means leaving the specialist tasks behind. For example, in commenting on the discomfort and insecurity often felt by new managers, Freedman (1998, p. 134) suggests many experience "addictive cravings" for their "familiar technical specialty responsibilities". Gaining similar satisfaction from leadership roles would require both skills and leadership self-efficacy (Chan & Drasgow, 2001; Maurer & London, 2018), but attaining these will require more than a minimal level of motivation to lead.

The relationship between hedonism and motivation towards professional careers may also follow a less direct path. Schwartz et al. (2012) found hedonism to be one of the values positively associated with the belief: "It is hard to get ahead in life without lots of money." They note that money "makes it easier to pursue a hedonistic life" (p. 680). Future research could usefully seek to disentangle the instrumental role of professional or specialist career choices (in providing money for an enjoyable life) from the direct intrinsic enjoyment of such work. The instrumental role may be more prominent in societies which place higher emphasis on materialistic values. Singapore is arguably such a country, with leaders periodically expressing concern at the religion of "moneytheism" (Kwok & Low, 2002), popularly captured by the '5Cs' life goals of cash, car, condo, club, and credit card (Chew, 2007).

Limitations and Future Directions

It is important to highlight that the overall amounts of variance in EPL motivations accounted for by values in our study were relatively small, suggesting that values are likely to act in combination with other antecedent factors to predict career motivations. For example, Chan et al. (2015) have identified relationships between personality traits and EPL motivation. Combining personality and values in a single study would help clarify the relative importance and degree of independence of these

determinants of motivation. Such a study would also permit the use of dominance analysis across a wider range of predictors than possible in the current study.

Finally, values and implicit meanings of leadership, entrepreneurship and professional work differ across cultures. Thus, the correlations observed between values and the career motivations in this study may be specific to our sample of undergraduate students from a Singaporean university. There is also the question of whether the students' values and understanding of entrepreneurship, professionalism and leadership were sufficiently stable. In this study, we evaluated the undergraduate students' values and career motivations at a critical period of formation regarding future career paths. However, we did not explore how the students' values had developed. For example, to what extent were values (and perhaps career motivations) shaped by family experiences, including the vocational choices (and career satisfaction) of parents? Similarly, to what extent are these students' values (and perhaps the relationship between values and motivation) malleable in response to early career experiences? A longitudinal study across high school, university and early career experiences would provide rich insights into the process of EPL motivation development, and the determinants of such motivation over time.

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Part III
Applications in Innovation and Enterprise

The chapters in Part 3 share in common the goal of advancing the application of EPL framework in different contexts. Today, many developed countries around the world are embracing science, technology, and innovation as an important engine for economic growth. Innovation is fundamentally a human activity and a social one that involves more than any single individual's efforts. It is thus important not only to study core innovation processes but also the approach to nurturing and managing the people in the innovation system. Chapter 10 begins by highlighting four unique challenges of innovation featuring the unique management and development needs of highly specialized scientific/engineering workers for innovation, given the motivational complexity and diversity of this workforce. It proposes that EPL can serve as a broad framework to specify the dimensions of talent needed for innovation to succeed at different levels of analysis from individuals to teams, units, organizations, and even the national innovation ecosystem. The chapter concludes by discussing the potential applications of EPL framework for innovation workforce development and human resource management, and calls for more research using this framework to better understand and thereby enhance the nurturing and management of R&D personnel for the innovation economy.

Chapter 11 illustrates the application of the EPL framework in the specific context of innovation human capital development in Singapore. Since the turn of the millennium, the Singapore government has attempted to transform the economy by focusing on innovation. Such a focus requires a better understanding of the career preferences and career development among Science, Technology, Engineering, and Mathematics (STEM) doctoral-level graduates. This chapter reports a survey of the preferences of 310 STEM doctoral students and post-doc researchers for academic teaching versus R&D careers in various settings including university, government, industry, and start-up contexts. Interesting patterns in how their self-report career preferences may have changed since the start of their doctoral education are observed. Faculty culture was also found to relate to and possibly shape the doctoral student/post-doc researchers' career preferences. Meaningful relationships are also observed between entrepreneurial, professional, and leadership (EPL) efficacy and motivations with the doctoral student/post-doc reseachers' career preferences. The findings are discussed

in relation to enhancing the career development aspect of STEM doctoral education as part of broader innovation workforce development.

Moving away from the specific context of innovation, Chap. 12 describes a 3-year project to develop a university-wide IT-based System that aims to provide students with career development and feedback based on the EPL framework. The chapter begins by documenting the early origins of Chan et al.'s (2012) early EPL research, which started with an annual university-wide survey of students' entrepreneurial motivation, framed in terms of a holistic assessment of students' EPL career aspirations. This Career Aspiration Survey was then transformed into a system for more holistic EPL career development and feedback. The chapter describes career development content developed for the system that aimed to help the university students to better understand the increasingly "boundaryless" and Protean nature of careers in the twenty-first century as part of supplementing the more conventional vocational guidance and job matching services already provided by the university. The chapter concludes by sharing a vision of how universities can better support the life-long career education and development of its students for greater employability in a more complex and changing world of work.

Extending Chan et al.'s early research that focused on university students' career aspirations to pre-university/secondary school students, Chap. 13 incorporated the EPL framework into social cognitive theory in an attempt to better understand adolescent career aspirations. Data from 252 students indicated that parental encouragement played a positive role in increasing the youth's career self-efficacy, motivation, and intent, with self-efficacy mediating some of the relationships. Findings suggest that encouragement from parents is critical in shaping career development of adolescents particularly in the Singapore context. Chapter 14 reports a different context in which the EPL framework was included in a national-level survey of nascent entrepreneurial activity. Specifically, items measuring individual-level E, P, and L orientations were included in the 2012–2014 Singapore Global Entrepreneurship Monitor Adult Population Survey ($N = 6002$). The findings showed that entrepreneurship career aspirations to have positive relationships with early entrepreneurship activities, while professional career aspirations to have negative relationships. Moreover, both E and P career aspirations exhibit incremental validities even after demographics and entrepreneurial attitudes were included in the regression model. These findings are similar to those obtained with student samples, so it appears that Chan et al.'s (2012) EPL career aspirations model may generalize beyond university settings.

Chapter 15 takes a closer look at the Social Cognitive Career Theory and some of its constructs in relation to the shaping of entrepreneurial career choices. Using structural equation modeling, the chapter examines the influence of individual, social cognitive, and environmental factors on the development of 396 university students' entrepreneurial intentions and the process of career choice-making. Consistent with earlier findings, the results provide support for hypotheses concerning core SCCT variables (self-efficacy, outcome expectations, goals, and interests) while suggesting a need to examine additional constructs (such as individual and contextual factors). Implications and suggestions for future research on the SCCT choice model and its application to an Asian population in the entrepreneurial domain are discussed.

Taken together, the six chapters in Part 3 provide readers with an appreciation of how Chan et al.'s (2012) EPL framework may be applied in relation to the wider economy of work and careers and to individual-level career development.

Chapter 10
Entrepreneurship-Professionalism-Leadership: A Framework for Nurturing and Managing the R&D Workforce for a National Innovation Ecosystem

Kim-Yin Chan, Kwee Hoon Lim and Marilyn A. Uy

Abstract Today, many developed countries around the world are embracing science, technology and innovation as an important engine for economic growth. Innovation is fundamentally a human activity and a social one that involves more than any single individual's efforts. It is thus important not only to study core innovation processes but also the approach to nurturing and managing the people in the innovation system. In this chapter, we highlight four unique challenges of innovation arising from the unique management and development needs of highly specialized scientific/engineering workers for innovation, given the motivational complexity and diversity of this workforce. We propose that Entrepreneurship, Professionalism and Leadership (EPL) can serve as a broad framework to specify the dimensions of talent needed for innovation to succeed at different levels of analysis from individuals to teams, units, organizations and even the national innovation ecosystem. We discuss potential applications of EPL framework for innovation workforce development and human resource management and call for more research using this framework to better understand and thereby enhance the nurturing and management of R&D personnel for the innovation economy.

Keywords Innovation · Workforce development · Careers · Human resource management · Organization · Entrepreneurship · Leadership · Professionalism · R&D workers · Scientists

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Introduction

In the early half of the last century, the Austrian-born American economist Schumpeter (1911/1934, 1950) advocated innovation and entrepreneurship as the vital engine for economic and social change. Recognized today as a "Prophet of Innovation" (McCraw, 2009), Schumpeter's ideas were indeed ahead of his time. Today, a well-accepted definition of innovation is "the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations" (p. 46; OECD "Oslo Manual", 2005). Innovation experts like van de Ven et al. (2008) distinguish *invention* which is simply the creation of a new idea from *innovation* which is an encompassing process of developing and implementing a new idea: "As long as an idea is perceived as new to the people involved, it is an 'innovative idea', even though it may appear to others to be an 'imitation' of something that exists elsewhere" (p. 9).

As an economic system-level activity, innovation goes beyond individuals' ideas, discoveries, creativity or inventions. The Spanish Secretary-General for Science, Technology and Innovation, Marisa Poncela-Garcia (2016) described: "Innovation is essentially the result of a complex and usually lengthy process that may start with basic research and ends up with the introduction of new technologies, processes, products or services into the market. Many actors are involved in this procedure: researchers, technologists and business people, as well as a wide range of entities such as public, private or mixed R&D centres; innovative companies and public and private funding agencies" (p. 97). A common way to depict the complexity of innovation activity is in terms of the many forms of research—from upstream "basic research" to downstream "product development"—where the different types of research depend on different systems of funding. Some relate what they would consider the stages of the innovation process to NASA's framework of "Technological Readiness Levels"; others describe innovation in terms of "eco-systems" that translate knowledge into increased value (e.g., Autio & Thomas, 2014).

Adner (2006) described innovation *eco-systems* as "the collaborative arrangements through which firms combine their individual offerings into a coherent, customer-facing solution. …When they work, ecosystems allow firms to create value that no single firm could have created alone" (p. 2). Jackson (2011) of the U.S.'s National Science Foundation noted that the biological metaphor of an innovation eco-system recognizes "a complex set of relationships among the living resources, habitats, and residents of an area, whose functional goal is to maintain an equilibrium sustaining state" (p. 1). She saw the innovation eco-system as comprising two related economies: a research economy and the commercial economy. She also related this interdependence of R&D (where the core activity is invention) and commercialization to the idea of an innovation spectrum of activities ranging from discovery (often in academic-science/research environments) to technology demonstration (often in small businesses or "start-ups"), to development (which requires investors) and commercialization (which requires industry and/or government investment). Jackson

argued that the challenge of innovation was to help ideas and inventions cross what is commonly called the "valley of death" towards commercialization. Thus, in an innovation eco-system, R&D is only one type of activity, albeit a key and driving one.

The Human Dimension and Challenges of Innovation Workforce Development

Perhaps most fundamental to the eco-system metaphor is the fact that innovation is ultimately a human activity and a social one that involves more than any single individual. In a recent literature review, Salter and Alexy (2014) highlighted that even though all new ideas originate from the individual inspirational efforts, innovation was essentially a relational activity which required the interaction of actors and functions (i.e., the team) to turn the ideas into innovation. Similarly, the U.S.'s National Science Board (2012) also recognizes the need for vibrant communities of scientists, technologists and entrepreneurs that can facilitate the flow of knowledge and information in innovation eco-systems. Taking this broad view, the National Science Board believes that the nurturing of any innovation ecosystem goes beyond R&D to include the system of education. It is therefore important not only to study the core innovation processes (e.g., from research to commercialization) but also the systems for nurturing and managing the people in the innovation enterprise, i.e., innovation workforce development and R&D human resource management.

In the last decade, increasing calls have been made for better workforce planning for the innovation and more specifically to address the unique management and development needs of highly specialized scientific/engineering workers for innovation. Writing in the *American Journal of Physics*, Smith et al. (2002) highlighted how the "training, careers and work" education of Ph.D. physical scientists was "not simply academic". Writing in the *Nature*, Cyranoski et al. (2011) highlighted the concern that the world was producing too many Ph.D.'s without adequate concern for the available work or resources to employ these specialized talents. Such macro-level concerns related to the mismatch between education/training processes and subsequent employability are issues related to workforce development for the science, technology and innovation sector.

Today, workforce development is recognized as an emerging field of *practice* that is increasingly gaining prominence in both government policies and organizational practices (cf. Harris & Short, 2014). Beyond organizational-level processes of training, human resource development and career development, workforce development aspires towards an integrative response to the future skills needed in a sector of work at a macro/eco-system level, and inter-organizational perspective. It also recognizes the individual work motivations and concerns for employability and mobility over the course of a working career.

In an OECD document entitled *Dynamizing National Innovation Systems*, Remoe and Guinet (2002) observed that despite labor markets and education systems' impact on innovation processes, the labor market aspects were not adequately integrated in the planning of national innovation systems. Edquist (2005) also echoed the view that there "is little systematic knowledge about the ways in which the organization of education and training influences the development, diffusion and use of innovations" (p. 185). In a review of the literature on workforce skills and innovation, Toner (2011) concluded that at the macro-level evidence supported a strong causal relationship between the supply of higher levels of education, training and skills with an increased demand-for and supply-of technical and organizational innovation. Fundamentally, the evidence indicates that investment in capital equipment, innovation and human capital are broadly complementary and also mutually reinforcing (see also Lloyd-Ellis & Roberts, 2002).

However, there is still a gap in our understanding of how micro-level, individual abilities, skills, motivations and behaviors (e.g., learning) contribute to the innovation process and system. As a result, micro- and meso-level organizational researchers have called for more nuanced approaches to the management of highly talented scientific/technical experts operating in R&D contexts (e.g., Bignon & Szajnfarber, 2015; Bobadilla & Gilbert, 2015; Cabello-Medina, López-Cabrales, & Valle-Cabrera, 2011; Judge, Fryxell, & Dooley, 1997; Mignonac & Herrbach, 2003). What is the underlying motivation of scientists for their research? Is it for knowledge creation for its own sake or for innovation that results in commercial or social impact? Does this lead to clashes with grant/funding and commercialization managers or even with entrepreneurs? Are scientists and researchers adequately trained in their doctoral programs to understand the complexity of the innovation journey? Do they have the skills and abilities beyond their deep disciplinary and research expertise to understand the "markets" and to work with industry to commercialize their ideas/inventions? What is the nature of R&D careers in the innovation sector? How are such careers different from academic (e.g., tenure tracked) careers in the education sector or corporate/managerial careers? As Defillippi and Arthur (1996) noted: "Traditional ideas on employment emphasize stability, hierarchy, and clearly defined job positions for career progression…Alternative ideas emphasize continuous adaptations of firms—and so of careers—to a hypercompetitive, rapidly changing environment…However, current writings on career and human resource management—including those on 'strategic human resource management'—persist in emphasizing a vertical coordinated, hierarchic approach (Arthur & Rousseau, 1996)" (pp. 116–117). Can R&D workers depend on organizations to manage their careers, or, should they be more self-directed or "Protean" (cf. Hall, 1996) in the management of their careers?

This chapter attempts to address the more micro-level, social-psychological nature of the innovation workforce and how this affects the larger business of innovation. We begin by examining the unique challenges of the innovation workforce, including the motivations and traits of R&D knowledge workers, and the skills and behaviors that they need for performing in their innovation context (e.g., creativity, scientific/technical professionalism, innovation and entrepreneurship, collaboration and teamwork, team and organizational leadership, and career management). Next,

explore the usefulness of the Chan et al. (2012) Entrepreneurship-Professionalism-Leadership (EPL) framework for guiding broader workforce and human capital development for the innovation sector of a national economy. We do this by highlighting four unique challenges of innovation that arise from the unique management and development needs of highly specialized scientific/engineering workers for innovation, given the motivational complexity and diversity of this workforce.

Challenge #1: Diverse Range of Talents Lacking Common Understanding of Innovation, Where Core R&D Workforce is Generally Better Prepared for Academia than Innovation

Noting that "The innovation ecosystem mobilizes around wicked problems", Body and Habbal (2016) argued that "it is not possible for one person to hold all the expertise and knowledge to attenuate those problems". In their view, individuals and groups representing a diverse set of disciplines need to come together to collaborate in ways that transcend their individual disciplines. They cite for example how a complex health issue could require the perspectives of a wide range of experts from medical practitioners to educators, from service providers to the health industry to providers of medical software systems, from organizations that establish accreditation and standards setting to medical ethicists, privacy advocates and guardians, from government health agencies to central government fiscal agencies and, of course, the patients or health consumers.

Unlike more established and vocationally or disciplinarily-defined workforce sectors like education, defense, healthcare, engineering/construction, informational/communications technology, journalism/media or even tourism, where workers tend to experience common and systematic educational/training, the innovation workforce requires talents from different disciplinary, industrial and occupational sectors to deal with complex problems. Innovation can also occur within any of these disciplinary or practice fields. However, this diverse range of talent brought together to innovate to address problems or challenges may lack a common understanding of the nature of the innovation process itself.

To the extent that doctoral-level scientific/R&D graduates form the core of the innovation workforce, concerns have been raised about their ill-preparedness for working beyond the more individualistic mode and basic nature of academic research. In the early 1990s, a study by the National Academy's Government–University–Industry Research Roundtable (GUIRR) indicated that while U.S.-educated scientists and engineers are well trained to conduct research, they lacked skills in management, communication, and team-based problem solving that are critical to decision making in innovation-related careers (Armstrong, 1994; COSEPUP, 1995; GUIRR, 1991). The concern for the lack of holistic training for doctoral graduates had earlier origins in the U.K. where as early as 1968, the U.K. Research Councils established a non-profit Careers Research and Advisory Centre (CRAC) to address the need for more

holistic doctoral education to ensure greater employability of Ph.D. graduates beyond academia. Attention to this issue was given a boost in 2002 with the publication of a government review of the supply of people with science, technology, engineering and mathematics skills entitled *Set for Success* (Roberts, 2002) which called for the "ring-fencing" of long-term funding of more holistic researcher development through grant and organizational mechanisms, and which led to the establishment of "Doctoral Training Centres" across universities that aimed to break the apparent silos found in the apprenticeship model of doctoral training (Cressey, 2012; Lunt et al., 2014). This allowed the U.K. to establish an organization called VITAE that today implements a holistic "Researcher Development Framework" (VITAE, 2011) that is adopted by many research funders and operators in the U.K.

In 2002, a U.S. National Science Foundation-funded study of doctoral graduates also concluded that doctoral students are educated and trained too narrowly. In the same study, it was also stated that the doctoral graduates lacked transferable skills such as leading, managing or collaborating and working effectively in teams, and they were also ill-informed about employment beyond academia (see Nerad & Cerny, 2002; see also Nerad, 2004). In 2004, firms such as IBM sought to address a gap in STEM education by calling for the development of more "T-shaped" professionals with both deep, disciplinary skills/expertise and broad transferable skills like collaboration (Spohrer & Kwan, 2009). In 2011, the U.S. National Institutes of Health (NIH; which funds biomedical research) raised concerns with the sustainability of the biomedical research enterprise, in particular, with the failure of many doctoral programs to prepare graduates for jobs beyond academia (cf. National Institutes of General Medical Sciences, 2011). This led to the NIH establishing a *Broadening experiences in scientific training* (BEST) grant in 2013 (NIH, 2013) that aimed to better equip graduates for work in non-academic contexts. An OECD (2012) report observed: "The formation and careers of researchers are important policy issues and training for transferable skills—skills that apply in a broad variety of work situations—is a challenge that attracts increasing policy interest" (p. 9).

Writing in a Dutch context, Oskam (2009) noted: "In a field of work in which innovation is gaining increasing attention and where more and more work is being done in interdisciplinary teams in an open innovation environment, different requirements are now being set for the knowledge, skills and attitude of the young technical professional. The mere possession of knowledge and expertise in the individual's own field is no longer sufficient. It is now necessary to have a basic knowledge of adjacent and connecting fields in order to be a good discussion partner and collaboration partner, both within and outside the organization. The higher professionally educated engineer must therefore become more of a so-called T-shaped professional…" (p. 5). Oskam added that networking skills were also vital for effective collaboration in interdisciplinary design or research teams; he also argued that with the employment of more open innovation approaches, project teams are increasingly formed across the boundaries of companies.

In a mixed-methods field study of inventors working in 3M, Boh, Evaristo, and Ouderkirk (2014) found that scientists/researchers' expertise varied in breadth and depth (i.e., in a T-shaped manner) to relate to different aspects of innovation: "breadth

of inventor expertise relates to the generation of many inventions, but not necessarily to those that are technically influential. Depth of inventor expertise enables individuals to generate technically influential inventions, as measured by patents granted. However, both breadth and depth of expertise are required for innovators to be deemed highly valuable" (p. 349). Hence, innovation workforce development can benefit from having a "T-shaped" framework that can articulate the wide range of competencies and expertise, including both deep (technical, field-specific) and broad (transferable) skills, that is broad enough to be applicable to a diverse range of talents involved in innovation work.

Challenge #2: Beyond Deep Scientific Expertise, Innovation also Requires Entrepreneurialism Which is not Inherent to Academically-Socialized Scientists

Schumpeter (1934) emphasized the intimate link between entrepreneurship and innovation when he argued that the entrepreneur is a person with the instinct to create new combinations, including new products, markets, materials and forms of organization. Today, entrepreneurship is recognized an activity involving the discovery, evaluation, and exploitation of opportunities that introduces new goods and services, new markets, work processes and materials through organizing efforts that previously had not existed (cf., Shane & Venkataraman, 2000; Venkataraman, 1997). Entrepreneurship is also associated with an orientation towards taking action or personal initiative (cf. Frese, 2007); the term entrepreneur in fact comes from the French word *entreprendre*, which means "to undertake an action". Hence, if innovation focuses on the *implementation* of ideas, core to entrepreneurial behavior is the recognition-of and initiative-to-act-on opportunities.

In their studies of the innovation process, van de Ven et al. (1999/2008) observed: "This journey typically includes entrepreneurs who, with support and funding of upper managers or investors, undertake a sequence of events that creates or transforms a new idea into an implemented reality" (p. 3). In particular, they noted that it is at the gestation stage of the innovation journey that more alert entrepreneurs or champions would act as the central forces or nodes that would connect and focus seemingly unconnected events, activities and players to create new opportunities for their organizations. Such entrepreneurs would then offer ideas or projects to the organizations as a way to solve a problem or exploit an opportunity commercially.

It is also useful to nurture more entrepreneurial capacity in the broader social system of the innovation workforce—beyond having only individual entrepreneurs. As van de Ven et al. (2008) observed: "Contrary to the view sometimes implicit in the literature that innovation consists of an entrepreneur who works with a fixed set of fulltime people who develop an idea, we observed that many stakeholders fluidly engage and disengage in the innovation process over time as their interests and needs for inclusion dictate" (p. 13). They concluded: "… innovation is

not the enterprise of a single entrepreneur. Instead, it is a network-building effort that centers on the development of transactions or relationships among people who become sufficiently committed to their ideas to carry them to acceptance and legitimacy" (p. 14). Similarly, Smith (2006) noted that while at the individual-level, scientists/researchers working in an innovation eco-system need to understand markets, customer and the technology transfer process beyond their core science, technical or professional expertise; at the social, collaborative/organizational or network level, innovation also requires business-minded entrepreneurs to know how to work with scientists/researchers so that ideas/inventions can be combined and connected to relate to commercial opportunities.

Unfortunately however, entrepreneurialism is not a dominant trait of the scientists and researchers who are the core of the science, technology and innovation workforce. A long tradition of research on vocational interests has established that people differ in their vocational personalities on six dimensions which are best arranged in a hexagonal, "circumplex" model called the R-I-A-S-E-C which stands for Realistic, Investigative, Artistic, Social, Enterprising and Conventional interests (cf. Holland, 1959, 1997). Based on this approach, scientists/researchers who have strong "investigative" interests would tend to have low interest and are generally quite the opposite of enterprising types. Others highlight the contrasting "mindsets" of scientists/engineers versus entrepreneurs. In a textbook entitled *Entrepreneurship for Scientists and Engineers*, Allen (2010) remarked: "the formulaic approach to solving problems, which is inherent in both science and engineering, is the antithesis of what is required for entrepreneurship. Entrepreneurs must be comfortable with ambiguity and uncertainty, be flexible in their thinking, and be prepared to change quickly should the market give them new information that warrants it" (p. 2).

Culturally, there exists a tension between academic goals (i.e., research and teaching) and environments (e.g., academic freedom; publicness of knowledge) of universities versus their new role as economic engine of the state. Yet, at the core of the science, technology and innovation workforce is doctoral-level scientists and researchers who are trained and socialized in the academic setting of universities. Until the later part of the 20th century, the primary missions of universities were academic—focused on knowledge creation—often of a basic or fundamental nature, and knowledge dissemination or teaching. A "third mission" of universities—to become engines of economic growth (cf., Etzkowitz, 2001; Feller, 1990)—emerged with the U.S.'s 1980 enactment of the Boyh-Doyle Act, which encouraged universities to commercialize their research outputs via patents and licensing. With these developments arose the ideas of the "entrepreneurial university" (Etzkowitz, 2003) and the "academic entrepreneur" (cf. Shane, 2004). By the turn of the millennium, research intensive universities around the world started to establish Technology Transfer Offices to support and encourage entrepreneurialism and commercialization among academics (cf. Bercovitz & Feldman, 2006, 2008) and science parks to engage with industry.

A study by Lee (1996) found that faculty in highly ranked academic institutions were less in favor of academic entrepreneurship because of a concern that industry involvement or commercial-interests would restrict curiosity-driven research or their academic freedom. Studies of German academics also found that rather than for

entrepreneurial motivations like economic impact and profit, many academics were motivated to engage with industry in order to acquire research funds and to learn from industry (Meyer-Krahmer & Schmoch, 1998); or, that academics were attracted to patenting as a symbolic way to signal their achievements and build their reputation in both the academic or industrial community (Göktepe-Hulten & Mahagainkar, 2010). In a large-scale survey of 1528 university researchers in the U.K., D'Este and Perkmann (2011) identified four factors that motivate academics to engage with industry, of which three were research-related (i.e., to learn from industry; access to funding; access to in-kind resources) and only one was commercial. Their results showed that commercialization was ranked as the lowest motive among the survey respondents: most academics were motivated to engage with industry in order to further their own research. In a study that interviewed 36 and surveyed 735 scientists from five major U.K. research universities, Lam (2011) also concluded that most engage in research commercialization "for reputational and intrinsic reasons" (i.e., professional motivations), and, "that financial rewards play a relatively small part" (p. 1354).

Hence, to the extent that the core of the innovation workforce (i.e., scientists/researchers) are trained and socialized in academic environments, the nurturing of entrepreneurial skills, understanding or even networks—relative to their more dominant scientific/technical expertise—may be the key to successful innovation beyond mere invention or ideation. Entrepreneurialism is not only important at the individual level but also at the innovation-system level. Commenting on the "valley of death" between product development and a market-competitive product that customers would pay for, Allen (2010) observed: "the skills and focus on the market required to move the technology through the valley are distinct from the skills required during product development" (p. 3). This reinforces the need to examine innovation from an eco-system perspective with multiple actors possessing a mix of scientific, engineering, and also entrepreneurial and management or leadership skills.

Challenge #3: The Complexity of Leading and Organizing for Innovation

If at the heart of entrepreneurship is the recognition-of and orientation to act-on *opportunities*, core to the concept of leadership is the process of influencing (including inspiring and rallying) *people* to achieve outcomes efficiently and effectively. While leadership research has generally shown that extraversion is an important predictor of leadership, meta-analyses (e.g., Feist, 1998, 2006) have also shown that scientists/researchers tend to be more introverted. A recent meta-analysis by Lounsbury et al. (2012) found that while scientists are characterized by significantly higher levels of openness to experience, intrinsic motivation, tough-mindedness (low

agreeableness facet), and they also score significantly lower on assertiveness, conscientiousness, emotional stability, extraversion, optimism or visionary style—traits that are commonly associated with leadership (cf. Judge, Bono, Ilies, & Gerhardt, 2002). The personality traits of scientists/researchers also make it even more challenging to lead them—as Lounsbury et al. (2012) commented: "The unique constellation of personality traits of scientists also creates inherent difficulties for the manager of scientists. As one wag noted, 'Managing scientists is like herding cats. You can't get a scientist to work 9–5 and make breakthroughs at a given time.' (SciForums.com, 2011). At the heart of most of these difficulties is the tension created by dispositionally non-conscientious scientists working in conscientiousness-driven organizations which require compliance with rules and policies, proper organizational conduct, and good citizenship behavior, developing a well-funded program of mission-relevant research, and meeting ever-higher performance standards based on criteria like citation rates and the dollar value of grants" (p. 55).

Just as entrepreneurial skills and capacities are important for innovation, leadership is also important in science, R&D, and innovation. Experts on the study of leadership and innovation have highlighted the unique challenges of leading for innovation related to both the nature of the innovation journey and process (cf. van de Ven et al., 1999), and the collaborative and networked social-organizational context in which innovation occurs. As Robledo et al. (2012) noted: "Creative work, characterized by idea generation as well as the evaluation and implementation of ideas to generate viable products (Mumford et al., 2002), is unusually complex. Individuals engaged in creative work must work with novel, ill-defined concepts in an unstable environment. The intellectually demanding nature of creative work implies that an unusually wide range of skills and expertise will be needed. Thus creative work is likely to be collaborative, pointing to the importance of social skills for those involved" (p. 141).

Viewed as a process, innovation can be described as a nonlinear cycle of divergent and convergent activities that may repeat in unpredictable ways over time (van de Ven et al., 1999). When divergent (i.e., creative, exploratory) activities are dominant, the kind of leadership needed is pluralistic or shared where different leadership roles are "distributed" across the actors. When the innovation journey is in a "convergent" (or implementation or exploitation) phase, "unitary" (i.e., directive yet consensus-building) leadership is needed. Some have described the need for such highly flexible forms of leadership as "ambidextrous" (Rosing, Frese, & Bausch, 2011). van de Ven et al. (2008) note: "many entrepreneurs are replaced by professional managers because the former often flounder in growing the innovation into a self-sustaining business" (p. 45). Because of the importance of trust and openness needed for the inherent uncertainty and risk involved in innovation, van de Ven et al. (1999) state: "Entrepreneurs and managers cannot control innovation success, only its odds" (p. 65). Efforts to organize for innovation therefore need more distributed, people-centred leadership than management by command and control.

In a review of 30 years of leadership research in R&D contexts, Elkins and Keller (2004) observed: "The R&D environment is a unique work context that is laden with leadership challenges. Project leaders are confronted with rapid changes in

science and technology, difficulties in assessing R&D contributions and personnel with work values, experiences, and attitudes that are much different from other types of employees" (p. 3). They also highlighted how the R&D environment has become increasingly more competitive and diverse, and how it increasingly relies on alliances and outsourcing, is focusing more on development than research activities, and where there are greater demands on the reduction of project cycle time. In this context, they argued that effective R&D leadership is ever more critical. Thus, an important aspect of innovation workforce development concerns how one raises the quality of leadership needed to organize the people or "talents" for the complex and challenging innovation journey across dynamic (at times weak or loose, at other times strong or tightly-networked) organizational settings and contexts.

Challenge #4: "Boundaryless" and "Protean" Nature of Careers in Innovation

In a historical review of "National Innovation Systems", Freeman (1995) describes how the first specialized R&D departments were established in German industries in 1870 and suggests that until the 1960s, these R&D units were seen as the source of innovations. From this perspective, one could broadly say that until the later part of the last century, scientific research for innovation mainly occurred in bureaucratic, organizational settings of firms, universities or public sector research organizations whereby scientific or research careers were organizationally managed: If universities had their tenure-tracked academic careers, large firms like P&G implemented dual-tracked career systems, where they would distinguish between scientific versus management paths for managing their scientific talents.

Towards the later part of the 20th century, social scientists studying the general nature of work and careers started to observe the emergence of new forms of careers and the breaking of traditional employment relationships between individuals and employers. Hall (1996) for example introduced the concept of "Protean careers" to describe "a career that is driven by the person, not the organization, and that will be reinvented by the person from time to time, as the person and the environment change". For Hall (1996), "The traditional psychological contract in which an employee entered a firm, worked hard, performed well, was loyal and committed, and thus received ever-greater rewards and job security, has been replaced by a new contract based on continuous learning and identity change". At about the same time, Arthur (1994) also introduced the concept of "Boundaryless careers" which emphasized "independence from, rather than dependence on, traditional organizational career arrangements" (p. 6; Arthur & Rousseau, 1996). For them, examples of such careers were found in academia, where individuals would draw validation and marketability from outside the present employer; and in the "stereotypical" Silicon Valley career, that move across the boundaries of separate employers.

To a large extent, it can be said that scientific careers in innovation today mirror the shifts from traditional, linear and organizationally managed careers towards more Protean, mobile and boundaryless careers. Several researchers of scientific/Ph.D. careers have observed that today's Ph.D. graduates and post-doctoral fellows pursue more diverse career paths, unlike most of their predecessors who took a linear career path from doctoral to postdoctoral training, and ultimately to tenure-track faculty positions. Making reference to several National Research Council Reports and academic publications, Fuhrmann et al. (2011) observed changing career patterns among scientists and new challenges faced by those who do pursue the academic path. Lee, Miozzo, and Laredo (2010) also observed: "many Ph.D.-trained scientists enter private sector jobs other than research or technical departments in manufacturing. They often serve as consultants in knowledge-intensive business firms. The nature of their jobs is interdisciplinary, cross-organizational and international…In some other instances, science and engineering Ph.D's might even choose jobs that are outside the conventional technical occupations and outside occupations such as dedicated managers or consultants/experts" (p. 872).

Increasingly, career guidance for R&D workers has also started to recognize the "widening funnel" of jobs (see pp. 8–9, VITAE, 2013) for doctoral level graduates in the innovation sector beyond academic jobs. Commenting on the NIH's BEST program, Meyers et al. (2015) reviewed several national reports and commentaries that analyzed the numbers, composition, career outcomes, and trajectories of the U.S. biomedical workforce and found that a large majority of the graduates of the biomedical training programs were found to be in careers other than tenure-track or undergraduate faculty positions. These included careers in government, regulatory science and academic administration, industry/biotechnology, science writing and communication, and public policy. They concluded: "there is a growing consensus that the full range of career paths should be included and defined such that tenure-track academia is only one possibility among many other options—all being viewed as successful outcomes" (p. 2).

Beyond an awareness of the diversity of career paths for scientists/researchers in innovation, there is also recognition of the need for such highly specialized talents to have a high degree of mobility, which is integral to the concept of boundaryless careers. Innovation work which is highly project based, and especially under competitive funding regimes, and where employment is often based on short-term contracts (cf. relatively more stable and predictable employment offered in corporate or academic/teaching settings). The nature of innovation work also requires scientists to have high levels of career mobility across employment settings from academia, to public sector science-technology organizations (STOs) to industry R&D (Kaiser, Kongsted, & Rønde, 2015; Kitagawa, 2015). Today, the need to support researcher physical mobility is recognized at the highest policy levels. For example, in 2005, Europe adopted a Charter for Researchers and a Code of Conduct for the Recruitment of Researchers that aimed to make research an attractive career, which is a vital feature of its strategy to stimulate economic and employment growth. In 2014, the European Union launched its Horizon 2020 program for Research and Innovation which not only aimed to fund innovative and important research projects, but also

to develop researchers more holistically for employability, and to support researcher mobility in the Union.

In an innovation eco-system where R&D talents would regularly enter and exit innovation projects to pursue boundaryless careers within the industry, the individuals need to take career risks to flow across organizational or employment contexts to work on ideas and problems at different stages of innovation process, where they do not necessarily have permanent employment contracts but work on project-contracts and thus cross company boundaries over time (Arthur & Rousseau, 1996; Inkson, Gunz, Ganesh, & Roper, 2012; Tams & Arthur, 2010). They would therefore benefit from a framework that can help them to "construct" their careers (cf. Savickas, 2005). They also need to be more mobile, have a more boundaryless career perspective and support for (macro) innovation to occur in a competitive global economy. All these suggest the need for more boundaryless career framework—both to help scientists think about their careers subjectively in career space or to map scientific job options and career paths in multidimensional, functional space, for which the EPL is one such framework.

Motivational Complexity of a Diverse Innovation Workforce

Psychologically, the above discussion indicates how innovation depends on a diverse range of talents with different traits, motivational orientations, competencies and skills that vary in scientific/technical, entrepreneurial, and managerial dimensions at different stages of the innovation journey or process. Correspondingly at the eco-system level, different "logics" are needed in the workforce for innovation to succeed.

Given the heterogeneous motivations in the innovation workforce, various researchers (e.g., Ángel & Sánchez, 2009; Cabello-Medina et al., 2011; Judge et al., 1997) have called for a more nuanced approaches to the management of highly talented scientific/technical experts operating in R&D contexts. Recognizing the "tensions, conflicting logics and orders of worth" in R&D work settings, Bobadilla and Gilbert (2015) commented: "It has also been observed that scientific and technical experts have very distinctive career orientations, value systems and reward preferences, necessitating a different psychological contract with this 'rare resource' (Bobadilla, 2014) and different management of it". In a field study of the challenges of managing highly specialized, scientific and technical experts in several R&D firms, Bobadilla and Gilbert (2015) found that three different competing logics co-exist to create tensions in R&D work: "a *technical* logic marked by the world of inspiration, a *market* logic based on the market world and a *managerial* logic inspired in the industrial world" (p. 226). They argued against any "one size fits all" approach to managing the R&D experts, who primarily operate via a technical (or "professional") logic. Instead, they suggested that "the way to move forward in managing knowledge workers lies in the enrichment and deepening of arrangements and the hybridization

of logics, practices and roles, rather than in the increasing sophistication of managerial tools that are very similar from one company to the next and whose efficiency is questionable" (p. 232).

Hence, it is useful to have a conceptual framework that can represent the different logics (or motivations/orientations) of the workforce in an innovation system. Such a conceptual framework should also be broad enough for application across levels of analysis from the individual to the firm and innovation eco-system or workforce.

Entrepreneurship-Professionalism-Leadership as a Broad Conceptual Framework

In 1989, Kanter explored the (multi-level) relationship between the individual-level careers and the macro-level national economic outcomes. She presented a framework of three principal career forms defined by its own logic—*bureaucratic* (or leader/managerial), *professional*, and *entrepreneurial* careers—as a way to think about careers at the macro, organizational, and even national socio-economic levels. If bureaucratic or managerial career logic was characterized by advancement and hierarchy, professional careers were characterized by craft, skill, knowledge or reputation; while entrepreneurial logic was characterized by a desire to create new value from opportunities. Interestingly, Kanter's three meta correspond well with Bodadilla and Gilbert's (2015) observations of the motivational dynamics operating in R&D firms.

While Kanter described the three career forms as three different *types*—each with their own logic, Chan et al. (2012) conceptualize the three forms as *dimensions of career space* such that all individual careers can be defined as vectors in a three-dimensional entrepreneurial, professional, and leadership (EPL) subjective career space. To the extent that the three dimensions of EPL career space are justified on the basis of the contextually-derived career frameworks proposed by Kanter (1989) and Schein (1978) at national/economic and organizational levels, Chan et al. (2012) suggested that the EPL framework can be readily adapted "for conceptualizing and diagnosing the human resource capacities of organizations and segments of a national workforce". They suggested, "One can, for example, measure the EPL competencies and motivations of individuals and then aggregate this data for the purpose of organizational- or national-level human resource planning (e.g., for talent management or adjusting workforce development and education policies)" (p. 81).

With its potential for multilevel application, we propose that Chan et al. (2012) EPL framework can serve as a broad schema that can address the above challenges of innovation workforce development. Firstly, with only three broad theoretically-justified dimensions, EPL can serve as a parsimonious framework to articulate the wide range of "T-shaped" competencies and expertise, including both deep/technical and the broad/transferable skills needed in the diverse range of talents involved in innovation work (see also Chap. 8 of this book). Secondly, the EPL framework

also includes entrepreneurship as a dimension which is a vital capacity needed in both the core scientific/researcher workforce and the larger innovation eco-system. Thirdly, the EPL framework includes leadership as a dimension without specifying the specific kind of leadership or social-organizational context (e.g., hierarchical vs. distributed/flat). This allows for more specification of the specific kinds of leadership and organizational capacities that are needed as part of developing the innovation workforce. Finally, as presented in Chan et al. (2012) research, the EPL framework can help people think of their careers in multidimensional and boundaryless ways, which we have argued above is increasingly needed for the worker in the innovation sector.

The next section discusses ways in which the EPL framework can be used to guide the development of the innovation workforce and its management in organizational settings.

Potential Applications of EPL Framework for Innovation Workforce Development and Human Resource Management

Education, socialization and training of early career researchers for innovation. As mentioned, countries such as the U.S., U.K. and some other countries in the Europe have taken active steps to address the need to broaden doctoral education to ensure greater employability of graduates for work beyond academic settings. In doing so, some have developed and adopted competency models to guide the training and development of scientists/R&D workers. Two of the more well-established frameworks are the U.K.'s VITAE RDF (VITAE, 2011) and the U.S.'s National Postdoctoral Association's Core Competencies (NPA, 2004) which is the basis for the Science Careers "MyIDP" system (see Fuhrmann et al., 2011) that is popularly adopted by many U.S. universities. To the extent that some of these frameworks attempt to address the skill gaps for general employability, they may not provide adequate emphasis for the preparation of doctoral graduates for innovation. Table 10.1 is our attempt to map the skills in these well-established frameworks in relation to Chan et al.'s EPL dimensions. Clearly, if entrepreneurship is an important skill or capacity needed for innovation, then it seems that both of these frameworks may need more emphasis on developing entrepreneurial skills to prepare graduates for innovation work.

Beyond incorporating E, P & L skills into doctoral programs, it is also useful for R&D organizations employing such talents to socialize them to better understand the nature and importance of E, P and L development throughout their careers—in relation to the complex and dynamic nature of innovation work. Such socialization initiatives can also allow for building collaborative networks across individuals with varying E, P and L profiles. The latter may in turn raise the possibility of putting together R&D teams with a mix of E, P and L talents and skills—thereby enhancing the adaptability and resilience of the teams in the face of uncertainty inherent in the innovation journey.

Table 10.1 Mapping of U.K.'s VITAE RDF and U.S.'s postdoctoral association core competencies in relation to Chan et al. (2012) EPL dimensions

Framework	Core competencies for researcher development	EPL dimensions
VITAE's RDF	*Domain A: Knowledge and Intellectual Abilities*	*P*
	A1. Knowledge base	P
	A2. Cognitive abilities	P
	A3. Creativity	E-I
	Domain B: Personal Effectiveness	*L*
	B1. Personal qualities	L
	B2. Self-management	L
	B3. Professional and career development	L
	Domain C: Research Governance and Organisation	*P*
	C1. Professional conduct	P
	C2. Research management	P
	C3. Finance, funding and resources	P
	Domain D: Engagement, Influence and Impact	*L-E*
	D1. Working with others	L
	D2. Communication and dissemination	L
	D3. Engagement and impact	L-E
U.S.'s postdoctoral association's six core competencies	*A. Discipline-Specific Conceptual Knowledge*	*P*
	A1. Analytical approach to defining scientific questions	P
	A2. Design of scientifically testable hypotheses	P
	A3. Broad based and cross-disciplinary knowledge acquisition	P
	A4. Detailed knowledge of specific research area	P
	B. Research Skill Development	*P*
	B1. Research techniques and laboratory safety	P
	B2. Experimental design	P
	B3. Data analysis and interpretation	P

(continued)

Table 10.1 (continued)

Framework	Core competencies for researcher development	EPL dimensions
	B4. Effective search strategies and critical evaluation of the literature	P
	B5. Grant application and scientific publishing processes	P
	C. Communication Skills	*L-P*
	C1. Writing	P
	C2. Speaking	P
	C3. Teaching and mentoring	L
	C4. Interpersonal communication skills	L
	C5. Special situations	L
	D. Professionalism	*P-L*
	D1. Assess and uphold workplace etiquette, performance standards, and project goals	P
	D2. Comply with rules, regulations, and institutional norms	P
	D3. Respect, evaluate, and enhance the intellectual contributions of others	P
	D4. Advance and promote the discipline by participating in public and professional service activities, such as professional societies, editorial and advisory boards, peer review panels, and institutional committees	P
	D5. Advance and promote the discipline by participating in partnerships with government agencies, foundations, and/or nonprofit organizations, such as funding agency grant panels or other advocacy/advisory boards to contribute to the advancement and promotion of the discipline	P
	D6. Identify and manage apparent and actual conflicts of interest, ethical violations, and violations of expected professional behavior	P-L

(continued)

Table 10.1 (continued)

Framework	Core competencies for researcher development	EPL dimensions
	E. Leadership and Management Skills	*L*
	E1. Personnel management	L
	E2. Project management	L
	E3. Leadership skills	L
	E4. Serving as a role model	L
	F. Responsible Conduct of Research	*P*
	F1. Data ownership and sharing	P
	F2. Research with human subjects	P
	F3. Research involving animals	P
	F4. Identifying and mitigating research misconduct	P
	F5. Conflicts of interest	P

Noting that "innovation is implicitly a team activity, which relies on participants understanding at least some aspects of each other's expertise as well as effective communication across areas" and that "studies in technology entrepreneurship recommend integrated approaches to educating students to operate in this space" (pp. 389–390), Thursby, Fuller, and Thursby (2009) describe an NSF-funded graduate education program called "Technological Innovation: Generating Economic Results" (TI:GER®) which brought science and engineering Ph.D., MBA students and JD (Juris Doctor) students to examine the technical, legal, and business issues involved with moving fundamental research to the marketplace. The core idea of such a program can also be adopted in the socialization of the diverse range of workers in innovation organizations and settings. Similarly, it would also be interesting if some of the U.K.'s doctoral training centers could also be configured based on the E, P & L mix of talents and developmental emphases.

On the same basis, organizational HR can also adopt EPL as a broad framework to support the holistic, T-shaped development of scientific/engineering staff. Boh et al. (2014) found that scientists/researchers at 3M could be categorized into specialists with deep expertise, generalists with breadth of expertise, and T-shaped "polymaths" who had both deep and broad expertise. They concluded: "Organizations should not necessarily cultivate all their inventors to become polymath inventors. Instead, an organization should build an eco-system made up of specialist, generalist and polymath inventors. Organizations can also consider these archetypes when they make hiring decisions for inventors. An individual with diverse interests, who likes to work on different and new things, may be a good candidate for a generalist, whereas an individual with impeccable focus and perseverance to keep working on a single problem could be a potential specialist. As for potential polymath inventors, we suspect such individuals would need to be cultivated, which means that organizations need

to provide room for individuals to develop both breadth and depth simultaneously, if they have the inclination to do so" (p. 364). The EPL framework is thus one way to capture of the idea of breadth and depth, but in terms of transferable (E & L) skills, and deep, technical (P) knowledge and skills.

Hiring, selecting and forming teams and collaborative networks with a mix of capacities needed to traverse the innovation journey from idea development to idea implementation. In a literature review on "Hiring an innovative workforce", Hunter, Cushenbery, and Friedrich (2012) remarked, "With innovation emerging as a key priority for a significant portion of the workforce, it becomes imperative that organizations be adequately prepared to recruit, select, and retain individuals capable of undertaking the difficult work of innovation" (p. 126). However, their review focused on the predictors of individual-level *creative* performance (e.g., domain specific expertise and skills, broad knowledge base, creative processing and various cognitive abilities) and did not appear to address the broader innovation journey which includes also idea implementation and commercialization. In a review of "Team Innovation", van Kippenberg (2017) concluded: "For many innovations (e.g., new product development, business model innovation), teams typically need to mobilize resources, support, and collaboration outside the team to make the innovation reality (e.g., Alexander & van Knippenberg, 2014). This is no trivial observation: Most ideas for innovations never make it to implementation, and ideas that are more creative may often be less likely to be implemented because they carry a greater (perceived) risk of failure than more incrementally creative ideas. In that sense, the bigger challenge in team innovation may not be the development of innovative ideas but their implementation" (p. 226). In a recent analysis of R&D manpower data collected in 938 Singaporean firms, Faems and Subramanian (2013) concluded that "size is not the only relevant R&D manpower characteristic in explaining firms' technological performance… that it is also important to assess the actual composition of the R&D work-force in terms of demographic and task-related sources diversity to fully grasp the technological performance implications of firms' investments in R&D employees" (p. 1631). From this perspective, one can ask: How could one think of the hiring of R&D talent to ensure diversity at various levels from innovation eco-system to firms or even teams?

From these perspectives, the EPL framework can be used to guide the hiring of R&D talent for innovation because it would include elements of entrepreneurial capacity needed to address the risks at different stages of the innovation journey/process, while also including elements of leadership capacity needed to rally, align and motivate the diverse groups of people to move from ideas to implementation in both innovation teams and collaborative R&D networks. Having such a mix of skills in the talent pool can in turn better enable the possibility of forming innovation project teams with a mix of E, P and L skills and orientations that can help move ideas and discoveries along the innovation journey towards implementation. As featured in studies on team composition (Chi, Huang, & Lin, 2009; Post, 2012; Somech & Drach-Zahavy, 2013), the strength of any team lies on the mix of talents, diversity of skills, orientations and motivations amongst the individuals. In meta-analysis of the relationship between team composition and performance, Bell

(2007) concluded that the composition of a team in terms of individual attributes can help us to understand why some teams are more innovative than others. For example, it was found that team performance is higher on teams where members on average are more conscientious, agreeable, open to experience and emotionally stable.

While traditional approaches to team composition mostly looked at configuring a team of different personalities and team roles, in the context of innovation, we think it will be useful to think of team composition in terms of a mix of EPL skills and motivations. This is, however, not about typing people into E or P or L, but recognizing that each individual can have different EPL strengths in terms of skills and/or motivations as illustrated in Fig. 10.1. In this regard, EPL can serve to provide a broader framework for conceptualizing the wide range of qualities needed for innovation to occur from the individual to the team/group or organizational level.

Career development and support of scientists/researchers for innovation careers. The establishment of organizations like VITAE in the U.K., and adoption of the ScienceCareers MyIDP system across U.S. universities were driven primarily by concerns for the general employability of doctoral graduates beyond academic jobs in higher education. An OECD (2012) survey of transferable skills training across various countries noted: "Today, career paths are evolving owing to the greater use of science and technology (S&T) in some industries, the large numbers of Ph.D. graduates relative to the demands of the academic job market, the increasing circulation of workers among research occupations, and policies that encourage intersectorial mobility" (p. 16).

However, we have also argued that innovation careers tend to be more boundaryless, and that innovation can also be effective if there is greater career mobility for researchers across different employment settings (e.g., from universities to researcher institutes to industry R&D or to "start-ups"). Just as VITAE and the NIH's BEST researchers (cf. Meyers et al., 2015) have attempted to describe the career multiple paths or trajectories for scientists, one could attempt to code the various jobs for scientists in the broader innovation ecosystem according to E, P and L skill demands, so that individuals can better prepare and equip themselves with the necessary skills for the path that fits their interests and strengths. Figure 10.2 illustrates this idea by

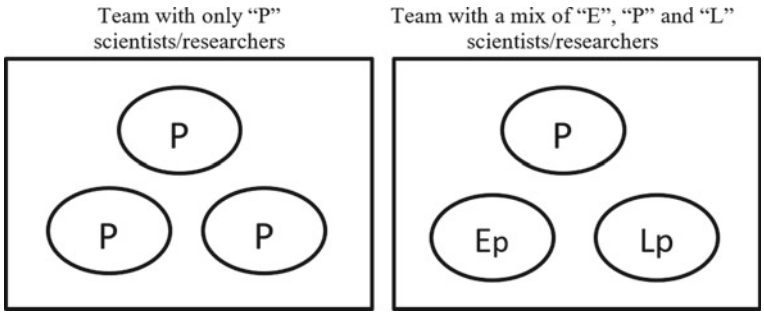

Fig. 10.1 Team compositions based on Chan et al. (2012) E, P and L dimensions

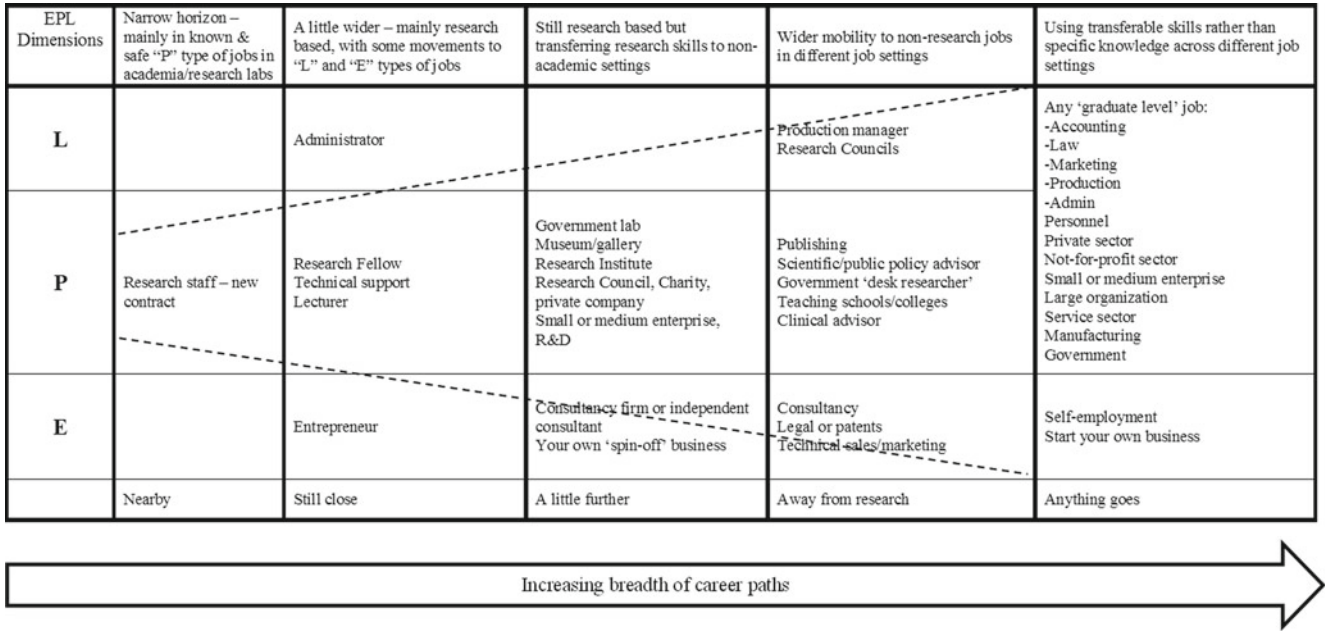

Fig. 10.2 Vitae's "widening horizons funnel" of job options for PhD graduates mapped to Chan et al. (2012) "E", "P" and "L" dimensions (note: adapted from Vitae's *The Career-wise Researcher*, 2013, pp. 8–9)

attempting to map VITAE's "widening funnel" of job options (see VITAE, 2013) for doctoral graduate scientists in a broader innovation ecosystem in terms of EPL skill "demands". Having such a mapping of possible jobs in the innovation ecosystem based on the EPL framework can help the highly specialized R&D workers to plan their careers and to take charge of their career development, instead of only depending on their organizations in these aspects. This is particularly important if the researchers are to have career mobility to work across disciplines, organizational and geographic boundaries.

The EPL career aspiration feedback system described in Chap. 12 in this book can also be adapted to help R&D workers to understand their motivations and efficacies in EPL dimensions, and to guide them in planning their career development to prepare for different stages of innovation work. Such initiatives could attempt to address challenges in the early professional socialization and the (lack of) holistic training/education and subsequent (lack of) employability of doctoral researchers if professional development is left solely to academia. Also recognized are the fundamental realities of scientifically-driven innovation, including rapid change/obsolescence, complexity and competition, and the fact that scientists and researchers need supportive environments to dare to take the risks to constantly challenge, learn, adapt, create and move ideas to market.

Performance management, talent assessment and leader development for innovation. While the previous section focused on the individual scientist/researcher's responsibility for managing their careers (and development), many scientists/researchers also operate as employees in industrial, academic or public sector scientific organizations which are concerned with their performance in relation to the organization's mission, which is often not in the individual's control (e.g., timing, competition, market lack of readiness). Also, as Robledo et al. (2012) commented: "scientists and engineers tend to identify more with their field, or profession, than with the organization. Thus they are likely to be more responsive to professional evaluation than to evaluations coming from their leader or organization" (p. 141). Moreover, innovation endeavor requires team effort and a good mix of talents (e.g., leadership skills, professional expertise, and entrepreneurial skills) over a lengthy process of taking ideas to the market where the results entail a certain level of risk and uncertainty. This, in turn, poses a challenge in the performance management of R&D talent in that there is a need for differential performance management to account for the different kinds of work performed in the innovation process. There is really no one-size-fits-all approach when it comes to the performance management of the R&D workers.

Writing in *Washington Research Evaluation Network's Management Benchmark Study*, Jordan and Malone (2002) noted that while performance information is required for effective management and for demonstrating the relevance and value of R&D work to funders and stakeholders, publicly-funded R&D organizations find that existing assessment approaches and tools are inadequate for current requirements because of the different nature of performance at different stages of the innovation process. They therefore developed a logic model for the R&D program and identified the core skills needed for performance at different stages of the innovation process.

In this regard, we have mapped the EPL dimensions on the core skills identified by Jordan and Malone (see Fig. 10.3) as a way to illustrate how Chan et al. (2012) EPL framework can used as a tool for assessing performance at different stages of the innovation process.

Often tied to performance management is the separate goal of "talent management" in organizations, which is driven by concerns for identifying and nurturing a pipeline of organizational leaders for the organization. On one hand, it is not difficult to argue that everyone in the innovation system is a "talent" to the extent that each individual brings to the innovation process a highly specialized set of skills and experiences. On the other hand, there is still a need for institutional and organizational leadership in various parts of the innovation eco-system. Observing that "traditional models of leadership tend to ignore the importance of scientists and engineers in an organization" (p. 140), Robledo et al. (2012) called for more research on scientific leadership as a unique phenomenon. One way to understand the complexity of leadership in innovation is via the competing values framework. In a study sponsored by the U.S. Department of Energy, Jordan (2005) generated a competing values framework that captures four most common perspectives and models of attributes for R&D organizational effectiveness. We believe that the EPL can be mapped on the core attributes and skills identified in the framework which is particularly useful for R&D leadership. The first model in this competing values framework emphasizes the importance of *human resources development* including Leadership attributes such as valuing the individual, building teams and teamwork, and commitment to employee growth. The second model looks at *internal resources and processes* covering Leadership (and management) attributes such as providing capital, knowledge resources, ensuring good technical management and insisting on efficient, low burden systems. The third model concerns *innovation and cross-fertilization of ideas* which emphasizes Professional and Entrepreneurial attributes and skills such as encouraging exploration, risk taking, integrate ideas, internally and externally, and encouraging change and critical thinking. The fourth model is about *setting and achieving relevant goals* and includes Leadership attributes such as clearly define goals and strategies, plan and execute well and build strategic relationships.

The innovation ecosystem can benefit from some concept of how talent can be optimized "organizationally", e.g., to identify the potential CEOs, CTOs, or Chief Scientists, or who can be the best start-up entrepreneurs or even venture capitalists. Figure 10.4 illustrates the use of EPL framework for the assessment and development individuals' future potential for innovation in a multidimensional way, beyond focusing on them only professionally or leadership-wise/managerially as is common in corporate organizational settings.

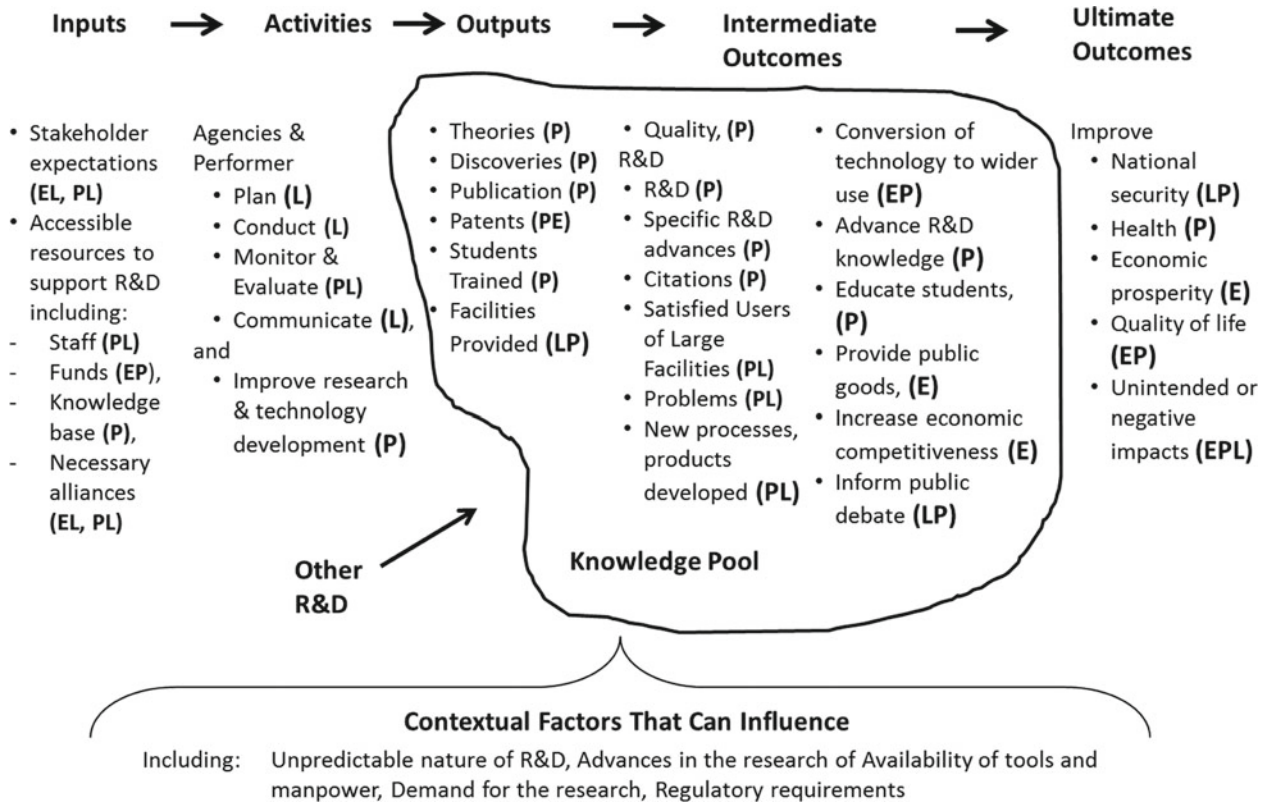

Fig. 10.3 Mapping of Jordan and Malone's Logic Model for R&D process/program (2002) with Chan et al. (2012) "E", "P" and "L" skills and motivations

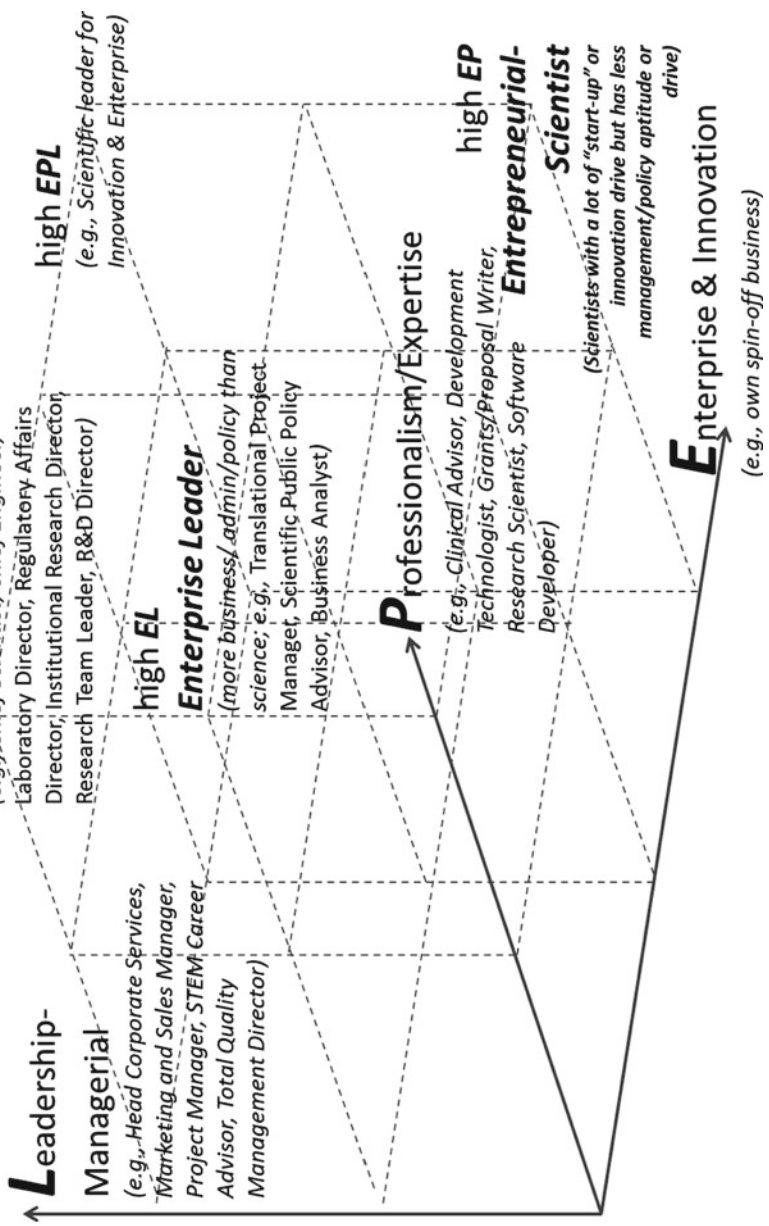

Fig. 10.4 Adapting Chan et al's EPL Framework for assessing and developing future innovation talents and "potentials"

Conclusion: Towards EPL Human Capital Mapping of the Innovation Sector

In a commentary on Singapore's journey to build its innovation eco-system, the Chairman of Singapore's Agency for Science, Technology and Research, Lim (2016) highlighted the need for a right mix of talent to drive innovation and enterprise: "we must pay particular attention to the development of talent to translate research into original products or services with new business models, and to help create Singapore's future economy. The starting point is always excellent science. The end goal is to bring benefits to society and we need our talent to span the spectrum of activities from research and innovation to high-growth enterprise" (p. A20).

This chapter has explained how Chan et al.(2012) EPL can serve as a broad framework to specify the dimensions of talent needed for innovation to succeed. Conceptually, the EPL framework can be applied in a manner that allow aggregation at multiple levels (from individuals to teams, to units & organizations and national innovation ecosystem) to articulate the human resource capabilities needed for innovation to work. Specifically, the E & L dimensions articulate the transferable capacities that highly specialized, technical (P) scientists/engineers/R&D workers generally lack either dispositionally or from their academically-based doctoral education/socialization.

In contrast to Kanter's (1989) sociological description of E, P and L as different career "logics", Chan et al.'s articulation of E, P & L as *dimensions* does not categorize people into discrete E or P or L "types"; instead, it suggests that everyone can grow themselves in E, P & L dimensions over a career—which may be especially vital for innovation, where careers may need to be highly mobile and boundaryless for optimal innovation. From a developmental perspective, it would be useful to study how both dispositional and educational experiences result in doctoral R&D graduates with different EPL profiles. Research could also examine how researchers with different EPL profiles fit into different types of R&D work in the innovation spectrum and how different leadership roles in an innovation system may require individuals with different E, P & L skills and motivations.

The three dimensions (E, P and L) can be applied beyond representing the individual-level subjective career space; they can also be used to represent objective space of many different jobs or roles at the team, organizational and national innovation eco-system levels. Researchers could also examine how innovation team or organizational E-P-L composition affect outcomes in different contexts (by type of R&D or level of analysis).

Schumpter (1934) suggested that innovation often derives from the combination or recombination of different ideas; the innovation process also requires the intermixing of people and scientists with different motivations and logics. To the extent that the EPL framework makes no assumption that E, P or L orientations are non-conflicting—it would be useful to examine how different agents in an innovation journey with different E, P and L profiles succeed or fail to collaborate with each other to move ideas into implementation to create economic and/or social impact.

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Chapter 11
Using the EPL Framework to Understand Career Preferences of STEM Researchers

Terri S-M. Tan, Marilyn A. Uy and Emma Yoke Loo Sam

Abstract Singapore's focus on innovation requires a better understanding of the career preferences and career development for Science, Technology, Engineering and Mathematics (STEM) doctoral-level graduates. To that end, we conducted and report a survey on the preferences of 310 STEM doctoral students and post-doc researchers for academic teaching versus R&D careers in various settings including university, government, industry and start-up contexts. We found interesting patterns in how our participants' self-reported career preferences may have changed since the start of their doctoral education. Additionally, faculty culture shaped participants' career preferences, and meaningful relationships were observed between these preferences and participants' entrepreneurial, professional and leadership (EPL) efficacy and motivations. We discuss the findings from this study in relation to enhancing the career development aspect of STEM doctoral education as part of the broader innovation workforce development.

Keywords STEM · Profiling · Careers · Innovation · Industry

Introduction

In recent years, we have witnessed a surge in interest and emphasis on the pillars of Research, Innovation, and Enterprise (RIE) within Singapore's economy. RIE is instrumental to establishing a "knowledge-based, innovation-driven economy" (National Research Foundation, 2018), with Science, Technology, Engineering, and Mathematics (STEM) domains as crucial catalysts in forging Singapore's desired innovation and enterprise (I&E) landscape. In line with this, the government unveiled

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its RIE 2020 plan in 2016—a strategic, four-year investment of $19 billion for the advancement of the I&E sector and its affiliated institutes. This macro-scale focus warrants a need to develop the local STEM workforce, and for tertiary institutes, to revamp existing training procedures to ensure that STEM graduate researchers are equipped with requisite knowledge, competencies, and skills for I&E-related careers.

Ongoing efforts to fortify and nurture the local I&E workforce are met with numerous challenges, two of which were outlined in the Chap. 10, "Entrepreneurship-Professionalism-Leadership: A framework for nurturing and managing the R&D workforce for the innovation ecosystem". They are: (1) the lack of mutual understanding amongst a diverse range of talents with respect to innovation, where the core R&D workforce is better equipped for traditional academic research rather than for the innovation landscape, and (2) the dearth of entrepreneurialism among academically-trained scientists and researchers. Such challenges arise from how universities typically socialize their graduate students and post-doctoral (post-doc) researchers for institutional placements (e.g., tenure-track faculty, or faculty members with an emphasis on teaching), with disproportionately fewer opportunities in knowledge and skill development for I&E positions in the industry. While this practice is congruent with universities' traditional emphases on knowledge creation and impartation, it remains discrepant with commercial interests and needs of the I&E sector, which include strong leadership and entrepreneurial skills for the eventual commercialization of research outputs.

To compound matters, the conventional approach of academic socialization remains pervasive among STEM graduate programs amidst a widespread paucity of research faculty placements. In a recent survey published in Nature, more than 57,000 Ph.D. students responded to items assessing life in their Ph.D. program, as well as their career aspirations. With strong and equivalent representations from major regions such as North America, Europe and Asia, the survey found that despite the global shortage of research faculty vacancies, more than half (52%) of the respondents hoped to attain positions in academia; the industry was the next favoured sector, with 22% of respondents reporting an interest in working there (Woolston, 2017). Furthermore, a report released by the National Science Foundation indicated that only 33% of recent doctorate holders from science and engineering fields hired in academia identified research as their primary activity, with full-time faculty positions growing at a slower pace compared to other full- and part-time positions (National Science Foundation, 2012, Chap. 5). With a declining availability of tenure-track positions in universities, many STEM doctoral graduates turn to industrial and government I&E placements.

It is crucial for collaborative networks within the I&E workforce to be multidisciplinary in order to leverage on diverse knowledge and competencies. Ph.D. students and post-docs from a variety of STEM-based disciplines play an instrumental role in the innovation system (Kaufmann & Tödtling, 2001), and a growing numbers of STEM Ph.D. graduates are pursuing entrepreneurial-related positions in various industries (Camesano, Billiar, Gaudette, Hoy, & Rolle, 2016). Specifically, some of them pursue R&D projects within start-up firms by becoming "joiners" who work alongside "founders" (Roach & Sauermann, 2015). Moreover, development

of the I&E landscape necessitates seamless knowledge and skills transfer between academia and industry to ensure efficient and effective results, particularly when traversing the stages of innovation (e.g., from idea conception to the planning, development, and marketing of new products). Human capital, which comprises "formal education, training, employment experience, start-up experience, owner experience, parent's background, skills, knowledge, and others …" (Unger, Rauch, Frese, & Rosenbusch, 2011, p. 343), thus needs to be tailored to individual businesses' needs in optimizing venture success (Unger et al., 2011). The ongoing need for multidisciplinary teams within the I&E sector indicates that in order to be I&E-relevant, companies should acquire human capital crucial to generating economic value for entrepreneurial ventures (e.g., taking initiatives to collaborate, be creative, and possess the ability to inspire and lead others toward achieving mutual goals). Consequently, STEM doctoral graduates should possess both depth and breadth of skills (i.e., to become a "T-shaped professional"; Oskam, 2009), and be adept at transferring those skills to meet the dynamic needs of the I&E sector. To that end, initiatives such as the U.S. *Science* Careers Portal's "My Individual Development Plan" (MyIDP; Fuhrmann, Hobin, Lindstaedt, & Clifford, 2011) were developed to bridge (non-academic research related) skill gaps and increase employability of graduate students.

In addition to possessing requisite skills and competencies, it is necessary to examine the career trajectories of STEM Ph.D. students and post-docs prior to their entry into the workforce. Specifically, do their career preferences change over the course of their graduate education, and what might the processes underlying these changes be? Such information would undoubtedly prove useful to innovation workforce development, as well as human resource planning and management within the I&E domain. Understanding STEM doctoral graduates and post-docs' career aspirations is also crucial, as many appear to be more inclined toward pursuing diverse career paths apart from the conventional tenure-track academic path. To illustrate, a large-scale study of graduate students from various disciplines demonstrated how males and females alike tended to aspire toward research faculty positions at the outset of their training, but subsequently aligned their preferences toward more applied I&E jobs in industry and government-related positions (Mason et al., 2009); this shift was noted to be more dramatic for students in STEM domains. Similarly, Gibbs and Griffin (2013) acknowledged the widespread shift in career preferences of graduate students as they moved along their doctoral programs, but added that the mechanisms undergirding career-interest changes remain understudied.

Given the current state of affairs concerning career aspirations of STEM Ph.D. students and post-docs, we aimed to verify whether similar patterns of career preferences would emerge among STEM counterparts in Singapore. Examining the career preferences of Singapore's STEM doctoral students and post-docs thus presented the opportunity to identify relevant person and situation factors that shape their preferences. In this chapter, we present findings from a survey involving STEM Ph.D. students and post-docs (hereafter called STEM researchers) from a public university in Singapore. Drawing on the Entrepreneurship-Professionalism-Leadership (EPL) framework developed by Chan et al. (2012), this study represents an initial attempt

to explore individual and environmental factors contributing to the career preferences and motivations of STEM researchers in Singapore. We conclude the chapter with a discussion of our findings and highlight their implications to Singapore's I&E workforce.

EPL Framework

The EPL framework was proposed by Chan and colleagues (2012) to enable individuals to map potential career options within a multidimensional, subjective career space. The framework was adapted from previous organizational models developed by Kanter (1989) and Schein (1978), and conceptualizes all careers as vectors subsumed within a three-dimensional space comprising entrepreneurial, professional, and leadership domains. The framework was initially validated with a sample of over 10,000 university students in Singapore with a motivational profile generated for each student (Chan et al., 2012). Using the EPL model, students' career preferences can fall under a single dimension (single-tracked), or combination of two to three dimensions (multi-tracked). Notably, an individual's career trajectory can proceed in any direction, and thus, EPL career paths should not be viewed as competing entities. Rather, they may be complementary and provide a holistic perspective from which lifelong career development can be better understood.

The EPL framework is relevant to Singapore's I&E workforce in several ways. First, its three dimensions of entrepreneurship, professionalism and leadership provide a well-rounded platform which delineates the competencies and skills required to flourish within an innovation system. Individuals can thus consider their career preferences within a broadly defined space from which they are also able to freely move, in line with current efforts to increase researcher mobility. Moreover, the parsimony of the framework not only provides an elegant conceptualization of E, P and L skills needed to succeed in the I&E workforce, but also promotes the importance of acquiring a breadth and depth of skills that are highly transferrable from academic to industry, as well as across innovation jobs.

Second, the motivational profiles generated for each individual may serve to facilitate human resource management within the I&E sector and promote skills diversity in workflow, by enabling organizations to establish collaborative networks comprising individuals with a mix of E, P, and L motivations. As earlier mentioned, the innovative process requires a multidisciplinary skillset to thrive, and hiring individuals with varying skillsets and competencies ensures more effective, adaptive team operations across the innovation stages which range from idea conception to implementation.

Third, the EPL framework can help organizations in I&E better manage employee performance, assess incoming and current talent, as well as cultivate leaders who are highly proficient in spearheading the innovation process. The non-discrete and flexible EPL motivational profiles and competencies enable organizations to assess performance at various stages of innovation, optimize talent to meet organizational

needs, and identify and nurture well-rounded leaders who are not only professionals but also team managers who are able to inspire and mobilize their colleagues to action. Thus, the EPL framework is highly relevant to studying career preferences of STEM researchers in Singapore, as it enables one to explore how STEM researcher career profiles can be used to determine the human resource capabilities required to drive Singapore's fast-growing I&E economy. In adopting the EPL framework, we were not only able to identify how EPL motivational profiles are related to individual career preferences and perceived employability, but also reinforce the framework's potential utility for socializing STEM researchers into I&E workers by incorporating the training and acquisition of E, P and L skills into future graduate curriculum.

Method

In this section, we report the method and findings of our survey conducted in 2016 that involved STEM researchers. In investigating STEM researchers' career preferences, we assessed both personal (e.g., motivations, experiences, skills, etc.) and environmental factors (e.g., career encouragement from laboratories and departments) that could potentially influence the types of careers STEM researchers would prefer as they progressed in their Ph.D. program, or from their Ph.D. program to a post-doc role.

Participants

Participants were recruited from a public university in Singapore. Recruitment spanned over three months, with e-mail invitations disseminated to STEM researchers upon securing prior endorsement from the respective STEM college deans and school chairs. Our final sample comprised 200 Ph.D. students and 110 post-doc researchers. Of these, 74% were male, and the mean age of the participants was 30 years. Majority of the participants (74.5%) were non-Singaporean (e.g., Indian or Chinese nationals). In terms of the field of concentration, 69% of the participants were from engineering (e.g. electrical, aerospace, civil), 23% from science (e.g., biology, mathematics, medicine), while 8% were from other STEM fields. These proportions mirrored the actual proportions of the university's STEM population. Participants were reimbursed 25 Singapore dollars for their participation.

Measures

EPL competencies. To assess EPL competencies and enable us to generate their respective motivational profiles, we used Chan et al.'s (2012) EPL motivation scale

(18 items, e.g.,*"Ever since I was a kid, I have dreamed of opening my own business"* sample for E motivation; *"I am the kind of person who strives to be highly specialized in my field of study"* sample for P motivation; and *"I have always enjoyed leading others and have assumed leadership roles whenever I could"* sample for L motivation). We also used the EPL efficacy scale, which assessed confidence toward performing numerous entrepreneurial, professional and leadership-related tasks (19 items, e.g., "*Coming up with ideas for products and services that may be needed in a market"* sample for E efficacy; *"Become one of the best experts or professionals in my field of specialization"* sample for P efficacy; *"Align and rally people around a common goal"* sample for L efficacy). The EPL motivation and efficacy items were measured on 5-point Likert scales (1 = "*Strongly disagree*"/ "*Not at all confident*", and 5 = "*Strongly agree*"/ "*Extremely confident*", for motivation and efficacy scales respectively).

Stage in graduate program. All Ph.D. student participants indicated the current stage they were at in their respective graduate program. The earliest stage listed was, "I have not yet passed my qualifying exam", while the latest stage was, "I am actively looking for a job or a post-doc position" (Sauermann & Roach, 2012). Post-docs were asked to provide how long they have been working as a post-doc in the university.

Career preferences. As a measure of career preferences, participants completed three scales from Sauermann and Roach (2012). The scales (1 = "*Certain not to pursue*", 5 = "*Certain to pursue*") required participants to report their career preferences at the time of completing the survey (hereafter called "current career preferences"), and at the start of their Ph.D. program (hereafter called "retrospective career preferences"). Examples of the careers listed included university faculty with an emphasis on research or development, or a job in start-up/entrepreneurial firm with an emphasis on research and development. Additionally, we measured the extent to which such careers were encouraged by participants' laboratory teams or departments (1 = "*Strongly discouraged*", 5 = "*Strongly encouraged*").

Perceived employability. Participants completed 5 items from Berntson and Marklund (2007), which assessed their perceived employability, (e.g., *"My competence is sought after in the labour market"* and *"I know of other organizations/companies where I could get work"*) using a 5-point Likert scale (1 = "*Strongly disagree*", 5 = "*Strongly agree*").

Results

Stage in Graduate Program

Based on our sample of 310 STEM researchers, about 31.3% are early stage Ph.Ds., 33.3% are in the middle to late stages (23.9% + 9.4%), and 35.5% are postdocs (see Fig. 11.1).

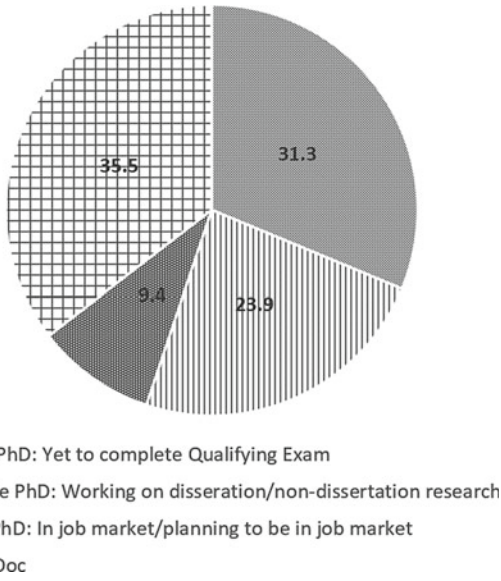

Fig. 11.1 Breakdown of sample by stage in graduate program (for Ph.D. students), or post-graduate program status (for post-doc researchers)

Career Preferences of STEM Researchers

Current career preferences. We aggregated participants' current career preference scores across five career options and obtained the following results: First, among traditional academic careers, participants reported a significantly higher preference toward a conventional research (tenure-track) career compared to a teaching career in academia, $t(309) = 8.47, p < 0.001$ (see Fig. 11.2). A teaching career in academia was also least preferred among all available options, which included research-intensive I&E careers in non-academic settings such as the government sector, industry, and in start-up-firms. This finding indicates that, in alignment with their current or previous doctoral training, STEM researchers were most attracted to research-based placements, either within or outside the academia.

Among non-academic I&E career options, there was a statistically significant difference in preference, $F(2, 308) = 31.87$, $p < 0.001$. I&E careers in established firms ($M = 4.10$, $SD = 0.77$) were significantly more preferred than both government I&E careers ($M = 3.95$, $SD = 0.86$), $p = 0.012$, and I&E careers in start-up firms ($M = 3.63$, $SD = 0.96$), $p < 0.001$. Government I&E careers were also more preferred than I&E careers in start-up firms, $p < 0.001$. The preference for an I&E career within a start-up firm was the weakest, possibly because new venture failure rates are high and therefore could elicit uncertainty (Mitchell & Shepherd, 2011). This contrasts with the relatively higher stability often associated with jobs in the public sector (Lewis & Frank, 2002), or even in an established firm, which tend to offer not only job stability but also increased opportunities for professional growth (e.g., timely career progression). In fact, at the time of the survey, an I&E career within an established firm

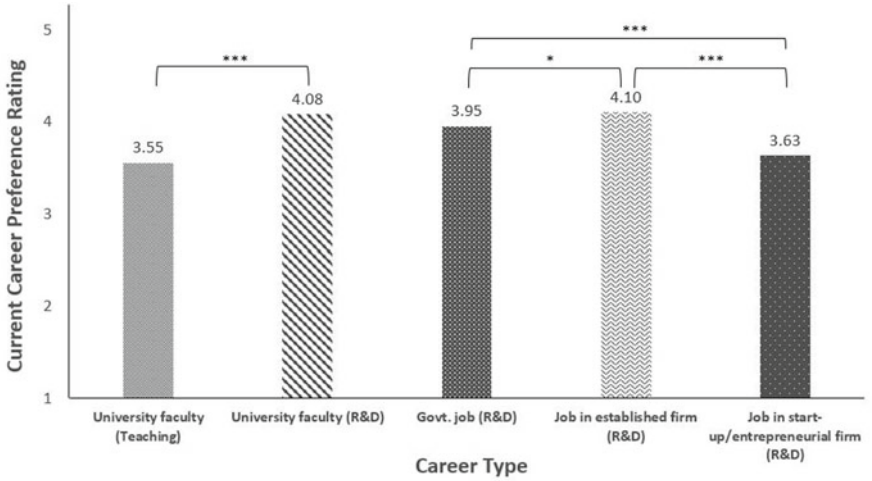

Fig. 11.2 Current career preferences of STEM researchers as a function of career type. *$p < 0.05$; ***$p < 0.001$

was rated as the most preferred career option, and slightly preferred over a tenure-track academic career option. This strong preference may be attributed to factors such as a mismatch between researchers' changing expectations of job attributes and attributes characteristic of academic research (Roach & Sauermann, 2017). This mismatch could also explain the corresponding interest in research work within a secure organization that offers such attributes (e.g. job stability and professional growth).

Retrospective versus current career preferences. We compared all participants' retrospective career preferences against their current career preferences, and categorized these by stages and career type (see Fig. 11.3). Based on our analyses, some differences are worth noting. Among academic careers, no significant differences emerged between current versus retrospective attractiveness of a university teaching career within any of the program stages for Ph.D. students nor for post-doc researchers. This finding suggests that preference for an academic teaching career, while not only weaker relative to other careers, remains stable as participants progress in their graduate programs. In terms of an academic research career, Ph.D. students in the late stage of their program (i.e., those who were intending to begin actively looking/currently actively looking for a job/post-doc position) viewed an academic research career as significantly less attractive compared to when they began the program, $t(28) = 2.07$, $p = 0.048$. This finding corroborates extant research, which highlights STEM researchers' dwindling interest toward tenure-track academia over the course of their graduate training (Roach & Sauermann, 2017).

Across all non-academic I&E career types, we observed a general increase in preference over time; this increase was also observed across every stage of training for Ph.D. students, and for post-docs. For a government I&E job, significant increases

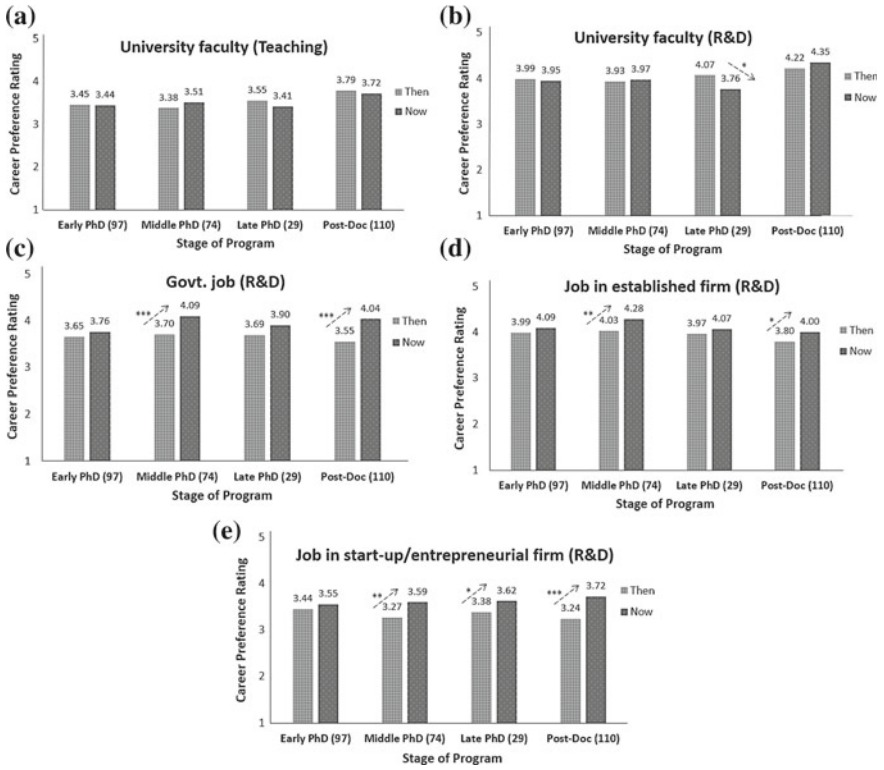

Fig. 11.3 Current and retrospective career preferences against program stage (early, middle, late, post-doc). **a** and **b** represent traditional academic careers, while **c**–**e** represent non-academic I&E careers. Dashed arrows indicate significant shifts in preferences between the retrospective stage and current stage, for each career type. $^{*}p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$

in preference were observed among middle-stage Ph.D. researchers, $t(73) = 3.86$, $p < 0.001$, as well as among post-docs, $t(109) = 5.28$, $p < 0.001$. For an industry I&E job within an established firm, significant increases were similarly found among middle-stage Ph.D. researchers, $t(73) = 2.91$, $p = 0.005$, and post-docs, $t(109) = 2.13$, $p = 0.035$. Notably, growing interest in non-academic I&E careers was most prominent for a start-up I&E career, with significant increases in interest across time for STEM researchers in all stages except those in the early stage of the Ph.D. program, $t(73) = 3.18$, $p = 0.002$ (middle-stage Ph.D. researchers), $t(28) = 2.05$, $p = 0.05$ (late-stage Ph.D. researchers), and $t(109) = 5.09$, $p < 0.001$ (post-docs). These results once again lend support to how interest in non-academic I&E careers tends to increase as STEM researchers progress in their graduate training.

Taken together, our findings highlight a gradual shift in STEM researchers' career preferences, which is congruent with prior literature that illustrates how STEM researchers' interest in traditional academic careers is diminishing, with many turning to non-academic placements (Larson, Ghaffarzadegan, & Xue, 2014; McAlpine

& Emmioğlu, 2015; Roach & Sauermann, 2017). Crucially, this shift in preference occurred most prominently for those in the middle and late stages of the graduate program, and post-doc researchers. These individuals demonstrated either no difference or a marked decrease in preference for a traditional academic research position over time, while aligning that preference toward jobs outside academia which presumably offered similar opportunities for growth and development in research. Perhaps most importantly, increases in perceived attractiveness were most consistent for a research job in a start-up firm. Although interest in a start-up I&E career remained modest relative to other non-academic I&E careers despite its steady growth across most stages (see Fig. 11.3), this consistently *marked* growth in interest highlights an increasing receptiveness toward an I&E career which departs from the traditional academic careers that researchers are typically trained for. This finding is encouraging in light of Singapore government's current efforts to strengthen its I&E workforce; however, we were also interested in the environmental factors which contributed to the observed trend. To this end, we examined if STEM departments and/or laboratory team contexts were related to the focal STEM researchers' career preferences.

Environmental/Contextual Factors

We analysed STEM researchers' reported levels of encouragement received from their respective laboratory teams/departments, for academic and non-academic I&E career types. As shown in Fig. 11.4, an academic research career was consistently the most encouraged career type across early, middle and late stages of the graduate program for Ph.D. students, as well as for post-docs. While affirming our participating university's strong emphasis on academic research, this finding also reinforces the broader, pervasive focus on traditional academic research careers, despite the scarcity of available positions in many universities (Fuhrmann, Halme, O'Sullivan, & Lindstaedt, 2011). Notably, an I&E career in a start-up firm remained the least

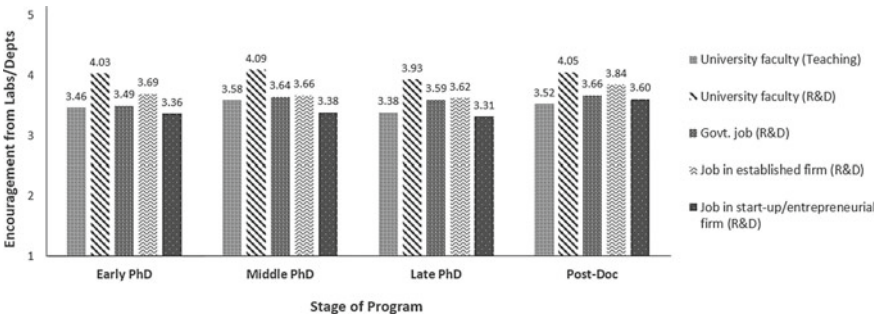

Fig. 11.4 Career paths most encouraged in STEM laboratories/departments. No significant interaction was found between career paths encouraged and stage of program (early, middle, late, post-doc)

encouraged career across all stages in the Ph.D. program. This ran contrary to STEM researchers' declining interest toward an academic research career and corresponding interest toward non-academic I&E careers, suggesting that the gradual shift in preference toward non-academic I&E careers was unlikely to be influenced by their respective laboratory teams or departments.

EPL Profiles and Perceived Employability of STEM Researchers

We were mainly interested to explore the EPL motivational profiles of STEM researchers, as well as how these profiles were related to researchers' career preferences and perceived employability. To that end, we analysed responses from the EPL motivation scales (see Fig. 11.5). STEM researchers were then classified into one of eight EPL profiles which could be either single, dual, or multi-tracked (see Fig. 11.6). For example, someone with a single-tracked profile could be highly motivated in either the entrepreneurship, professional, or leadership domain (or none of the three), while another with a dual-tracked or multi-tracked profile would possess motivation and strengths in at least two or all of these dimensions respectively. In this study, we generated STEM researchers' EPL profiles (based on their responses to the EPL questions) and examined their relationship with researchers' perceived employability and career preferences. Figure 11.6 illustrates the relationship between EPL profiles and perceived employability among our participants. Our findings revealed that EPL profiles were related to perceived employability. Specifically, STEM researchers who had a multi-track profile (i.e. scoring highly on all three EPL dimensions) generally reported higher perceived employability compared to researchers who had single-track profiles. Further, we found a highly significant difference in reported perceived

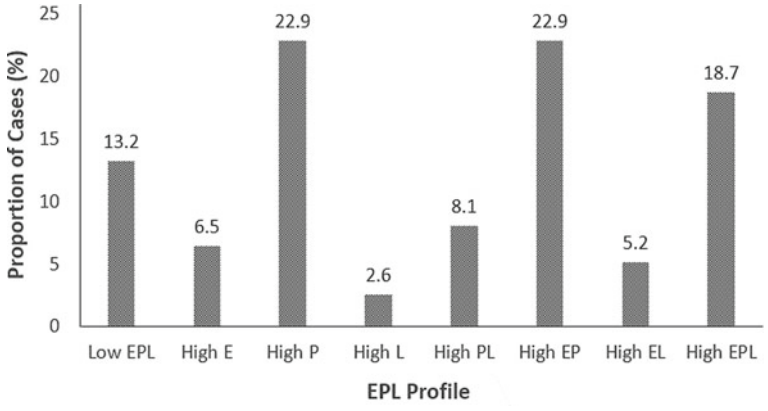

Fig. 11.5 Breakdown of EPL motivational profile types by percentage (n = 310)

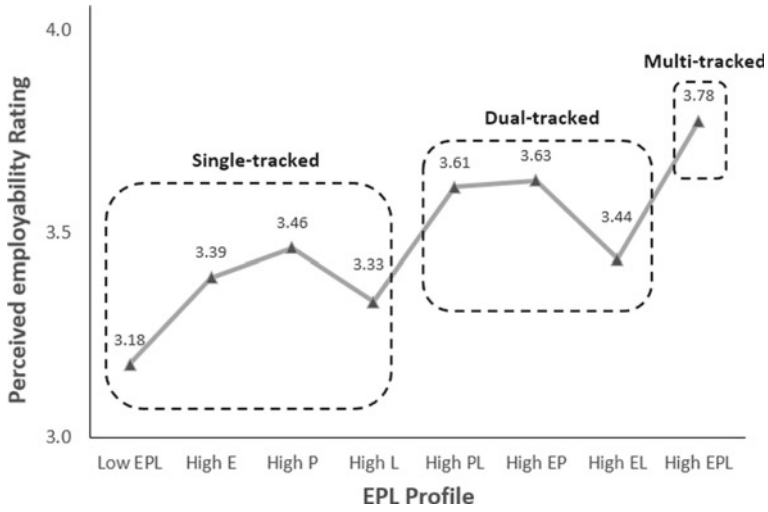

Fig. 11.6 The relationship between EPL profiles and perceived employability among STEM researchers

employability between STEM researchers with a low EPL single-tracked profile (n = 41; $M = 3.18$, $SD = 0.61$) and researchers with the high EPL multi-tracked profile (n = 58; $M = 3.78$, $SD = 0.69$), $t(97) = 4.45$, $p < 0.001$. This pattern of results lends support to how individuals who possess more holistic or well-rounded motivations correspondingly hold greater confidence in their opportunities for subsequent employment, either upon graduation or completion of their post-doc stints.

Compared to their multi-tracked counterparts, STEM researchers who attained dual or single-tracked EPL profiles reported relatively lower perceived employability, with the lowest scores coming from single-tracked researchers. This shows that individuals who tended to report motivation in solely entrepreneurship, professional, or leadership domains were also more likely to perceive themselves as being the least employable. Among single-track STEM researchers, those who attained a "High L" profile also reported the lowest perceived employability, followed by "High E" and finally "High P"; among dual-tracked researchers, "High EL" researchers reported the lowest perceived employability compared to dual-tracked researchers with professional competencies, i.e., "High EP" and "High PL" researchers. Taken together, these findings shed some light on the importance that STEM researchers place on professional competencies and motivations relative to leadership and entrepreneurship ones. Specifically, leadership competencies appear to be regarded as least crucial for future employability, while professional competencies are regarded as most crucial. While this finding may seem unsurprising given how graduate training mostly prepares researchers for a professional academic career, it also warrants the need to create greater awareness of the importance of developing oneself into a "T-shaped individual" who possesses both depth and breadth of competencies. This would prove especially vital, given the increasing interest in non-academic I&E careers

which require not only specialized knowledge, but broad and translatable skills that remain relevant throughout the innovation process.

EPL and Career Preferences

In addition to perceived employability scores, we analyzed participants' (i) individual E, P and L motivations and efficacies, and (ii) overall EPL profiles against their current career preference scores. This analysis allowed us to further examine participants' inclinations not only across the eight different EPL profiles, but also within each individual category of E, P and L for the dimensions of motivation and efficacy.

In considering participants' individual E, P and L motivations and efficacies, several distinct patterns of career preferences emerged (see Table 11.1). First, start-up I&E jobs were most strongly correlated with both E and L motivation and efficacy, highlighting that individuals who reported more motivation and confidence toward entrepreneurship and leadership competencies accordingly displayed a greater preference for research jobs with an entrepreneurial focus. Second, academic positions were strongly correlated with P and L efficacy. This confirms current sentiments in academia, where professionalism and leadership are highly regarded as crucial for success. Additionally, government I&E jobs were positively associated with all EPL motivations and efficacies, although this association was strongest for the L domain. Finally, industrial I&E jobs were found to be marginally associated with both P and L motivations.

When comparing participants' EPL profiles with their current career preferences, we found that relative to most other EPL types, "High E"s (which encompassed "High E", "High EP" and "High EL" individuals) tended to prefer a start-up I&E career. "High P"s (which encompassed "High P", "High PL", and "High EP" individuals) tended to prefer traditional academic research careers, and an I&E career within an established firm (see Fig. 11.7). Finally, "High L"s (which encompassed "High L", "High EL" and "High PL" individuals) reported a strong preference for an I&E career in the government sector. Moreover, "High EPL" individuals (who most likely possessed a T-shaped profile as well) reported a strong preference toward industry

Table 11.1 Career preferences of STEM researches based on E, P and L motivation and efficacy

Current career preference	ENT motivation	PRO motivation	LDR motivation	ENT efficacy	PRO efficacy	LDR efficacy
Faculty-teaching	0.04	0.17**	0.16**	0.18**	0.21**	0.30**
University R&D	0.05	0.16**	−0.01	0.11	0.25**	0.15**
Govt. R&D	0.13*	0.13*	0.20**	0.11*	0.17**	0.17**
Industrial R&D	0.10	0.14*	0.15*	0.01	0.07	0.05
Start-up R&D	0.34**	0.02	0.15**	0.29**	0.09	0.19**

*$p < 0.05$; **$p < 0.01$

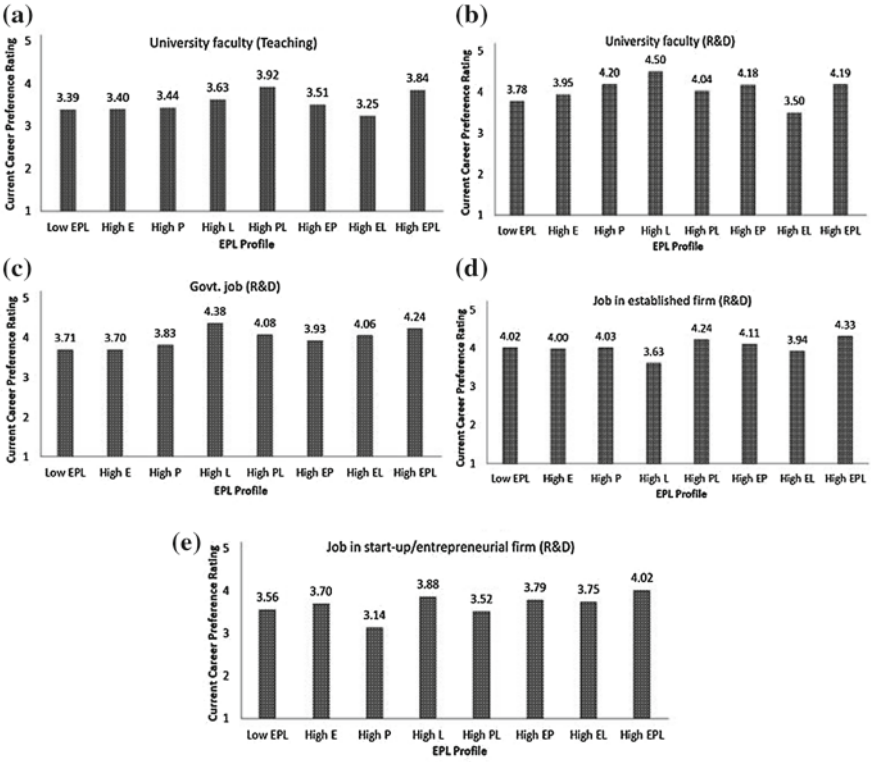

Fig. 11.7 Current career preferences based on EPL profile and type of career. **a** and **b** represent traditional academic careers, while **c**–**e** represent non-academic I&E careers

I&E careers. Thus, the congruence between the respective EPL profiles generated for our STEM participants and their self-rated, current career preferences support the utility and predictive value of the EPL framework in better understanding the dynamic pathways which guide career preferences of STEM researchers. In further considering our results, it also appears that individuals motivated and competent in all three EPL dimensions are, in turn, most attracted to industry I&E careers. It would thus be helpful to develop and train more "High EPL" individuals, who are industry-ready and able to remain relevant and adaptable when collaborating in a multi-disciplinary team within which their multi-tracked competencies and skillsets would be constantly utilized.

Discussion

The present study represents an initial effort to apply the EPL framework as a relevant and comprehensive career lens to understand career motivations and preferences of STEM researchers. Findings from this survey offer fresh insights into how personal competencies and motivations in specific domains may accordingly predict preference toward academic and non-academic careers. Moreover, these findings shed light on STEM researchers' perceptions of their employability, and indicate a general shift in career preferences from traditional academic careers to industry I&E ones.

We conclude this chapter with three main takeaways. First, it was found that interest in non-academic I&E careers steadily increased with time, across STEM researchers in different stages of their graduate program as well as among postdocs; this increase was particularly pronounced in the case of a start-up I&E career. While this finding is encouraging in light of Singapore's efforts to grow its I&E workforce, interest in I&E work (such as founding or joining an entrepreneurial venture) needs to move beyond mere interest and into actionable outcomes. Van Gelderen, Kautonen, and Fink (2015, p. 656) aptly capture this sentiment by stating that "a lack of action then means that potentially fruitful entrepreneurial initiatives are not realized. Entrepreneurial action is not only a necessary condition to get businesses started, but it is also important in determining if an attempt to start a new venture will ultimately be abandoned". Further, we found that laboratory teams/departments were strongly encouraging STEM researchers to pursue an academic research career, despite widespread shortages of available positions. Although this contextual factor did not appear to diminish interest in non-academic I&E careers, it is possible that STEM researchers may not currently possess sufficient confidence and requisite competencies to enter and subsequently excel within an innovation system. This gap means that academic institutions have a vital responsibility to revamp existing graduate training for STEM researchers, such that they are tailored to not only meet the rigours of academia, but those of a steadily expanding I&E economy as well.

Second, dimensionality of EPL motivations proved to be a strong predictor of STEM researchers' perceived employability. Specifically, STEM researchers with a multi-tracked EPL profile (i.e., highly motivated across all three dimensions) believed they were more employable, relative to single and dual-tracked researchers. Although perceived employability does not denote one's odds of being employed per se, the confidence that one's competencies and skills are in demand coupled with an awareness of available avenues for employment opportunities, is nonetheless valuable in galvanizing one to seek employment more actively. High EPL individuals might also demonstrate more openness toward different types of non-academic I&E jobs (e.g., government sector, private firms) due to their multidimensional motivations. Thus, one potential avenue for future exploration would be to track how STEM researchers' EPL profiles may change with time, and whether such changes are associated with individuals' perceived employability. Importantly, academic institutions could utilize STEM researchers' respective EPL profiles to develop and implement initiatives targeted at enhancing employability based on researchers' specific motivations; this

might generate greater perceived employability in the long run, particularly for single and dual-tracked individuals.

Finally, EPL profiles were found to be positively and significantly associated with STEM researchers' job choices. Moving forward, we advocate the creation of a more customized or targeted career development approach based on EPL motivational profiles, where individuals who may lack proficiency in any of the three domains can deliberately strive to develop competencies in those domains. Such an initiative would also aid in human resource management processes (e.g., hiring and promotion), talent management, and leader development within I&E organizations. We also emphasize the importance of developing more T-shaped individuals, to facilitate movement across and success in various I&E careers and stages. Career development initiatives based on individual EPL profiles would, however, need to be accompanied by strategic revisions to current STEM graduate school curricula that incorporate training which satisfies the needs of the broader I&E workforce. In such a scenario, the EPL framework can be used by academic institutions to plan and develop programs that will equip STEM research graduates with requisite knowledge and skills to thrive within an innovation system.

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Chapter 12
NTU Career Aspiration System: Providing "Boundaryless" Career Development and Feedback to University Students for Employability in the 21st Century

Kim-Yin Chan, Regena Ramaya and Moon-Ho Ringo Ho

Abstract This chapter begins by documenting the origins of Chan et al.'s (2012a) early Entrepreneurship, Professionalism and Leadership (EPL) research, which began with an annual university-wide survey of students' entrepreneurial motivation. Following that research, we embarked on a 3-year project to transform the Nanyang Technological University (NTU) Career Aspiration Survey into an IT-based career development and feedback System, whose goal was to provide students with career development and feedback based on EPL framework. Original career development content was developed that aimed to help NTU's students to better understand the increasingly "boundaryless" and Protean nature of careers in the 21st century as part of supplementing conventional vocational guidance and job matching services already provided by the University. We conclude by sharing a vision of how universities can better support the life-long career education and development of its students for greater employability in a more complex and changing world of work.

Keywords Entrepreneurial · Professional · Leadership · Career · Development · System · Education · Employability · T-shaped · University

Background: An Annual University Survey

In 2010, Singapore's Nanyang Technological University (NTU) unveiled a five-year strategic plan that identified "Five Peaks" or areas of focus that mapped out how it

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could transform into a great global university by 2015. One of the Peaks, "Innovation Asia" called on the University to embrace entrepreneurship education and outreach efforts, and to incubate start-ups and license-out technologies. In 2011, officials from the university's Innovation and Enterprise office approached a group of social scientists to collaborate on an effort to design and implement a survey that would help the university to measure entrepreneurial motivation in the NTU student population on an annual basis.

Building on the ideas by Kanter (1989) and Schein (1978), the researchers developed their "Entrepreneurship-Professionalism-Leadership or EPL framework" and argued that in a post-industrial, 21st century context of work, it was as important for students to develop entrepreneurialism alongside the professional and vocational education, and leadership development already emphasized in the university. They added that measuring all three (E, P and L) dimensions was particularly important in Singapore's drive towards becoming a knowledge-based, innovation economy. They therefore proposed to measure the students' entrepreneurial motivations, efficacies and intentions alongside Professional and Leadership motivations, efficacy and intentions (collectively called "career aspirations"). The University supported this idea, and with seed funding provided to the researchers, the NTU Career Aspiration Survey or NTU CAS was thus established.

In early 2011, the researchers conducted a pilot survey involving 304 students to develop the EPL motivation, efficacy and intention scales. Using Chan and Drasgow's (2001) 3-factor (affective, calculative, social-normative) conceptualization of the "motivation to lead", they developed an initial pool of 60 items for the E, P and L motivation measures. Item analysis of the original items led to a revised set of items administered as part of the first university-wide NTU CAS which was launched in August 2011. All full-time university students were invited to participate in the first NTU CAS online survey. Participation was voluntary and a lucky draw was offered as an incentive. A total of 11,324 students participated with a completion time of 17 min. Together, the pilot study and annual survey data established that E, P and L motivations, efficacies and intentions could be measured independently, and that these career dimensions were independent of the RIASEC model of vocational interests. These findings were reported in Chan et al. (2012a), which also noted that "Individuals concurrently high in entrepreneurial, professional, and leadership career motivations, and those high in entrepreneurial and leadership motivations are highest in boundaryless and self-directed career attitudes, while those primarily motivated for professional careers hold the most traditional career attitudes" (p. 73).

As a tool for monitoring students' career aspirations in E, P and L dimensions, the first NTU CAS also revealed that only 8% of NTU students intended to pursue entrepreneurship (compared to 70% professional and 21% leadership roles) upon graduation. Even more interesting was a negative correlation observed between entrepreneurial and professional career intent, which suggests that Singaporean university students tended to see professional and entrepreneurial careers as competing options—which was a concern given that the 21st century would see more professionals having to operate in more entrepreneurial settings and career modes (e.g., medical doctors in the private sector). These findings were shared by the university

at the World Entrepreneurship Forum held in Singapore in November 2011 (see Cai, 2011; Chan, 2011), and also at other academic conferences such as the Academy of Management, the Babson College Entrepreneurship Research Conference, and the European Association of Work and Organizational Psychology (Chan et al., 2011, 2012b; Uy et al., 2013).

To date, the NTU CAS has been conducted annually since 2011 with yearlyreports submitted to the University's Board (see Chernyshenko et al., 2016 for a sample Report). Over the years, the NTU CAS has provided the University with a useful long-term indicator of student career motivation and intentions in the entrepreneurial, professional and leadership domains, both for purposes of monitoring long-term "cultural" or "mindset" changes, as well as for more immediate program evaluation. The survey also served as a useful feedback mechanism to shape the University's innovation and enterprise eco-system. For example, the 2011 NTU CAS found that students with different levels of entrepreneurial motivation and experience had different reasons for not starting a business. This suggested the need for NTU to adopt different strategies to promote entrepreneurship. For examples, students with already higher levels of entrepreneurial experience or activity would need help to find capital and resources to start up; while those with some entrepreneurial ideas wanted more information, training, knowledge and skills, and facilitated networking events. Students with no nascent entrepreneurial activity and who never considered it as a viable career option were provided with career guidance using the CAS, so as to "plant the seeds of enterprise". The NTU CAS also revealed that students believed that while the University had provided resources and structures to encourage entrepreneurship, more could be done to strengthen the entrepreneurial culture among the NTU students and faculty.

3-Year Project: From a Survey to a Career Development System

In 2013, the Singapore Ministry of Education (MOE) launched a grant that drew on the Nation's five-year Research Innovation and Enterprise 2015 budget, and was targeted at the local Universities' Technology Transfer Offices or TTO's. The two objectives of the MOE Autonomous University TTO grant were to support projects in order to help: (1) nurture each university's "Innovation and Entrepreneurship" culture, and, (2) maximize the translation volume (of moving ideas to market) and realize the commercialization potential of the university's research outputs.

The NTU Innovation and Enterprise Office and the NTU CAS researchers collaborated to apply-for and were successfully awarded a 3-year project grant to extend the NTU CAS project beyond its initial measurement and policy formulation purpose to include applications of the data for the purpose of enhancing innovation and enterprise promotion and career development. The approach was to design an IT system (including website/portal, database and computational engine) that would enable the

automated production of CAS Feedback Report for all NTU CAS participants, and to develop new content that would provide EPL-related career coaching (content) guidance. The career coaching content aimed to help the NTU students better understand the increasingly "boundaryless" (Arthur, 1994; Arthur & Rousseau, 1996) and "Protean" (Hall, 1996) nature of careers in the 21st century, while also providing all participants with useful information on entrepreneurship development opportunities and resources offered by the University. The career guidance content also aimed to supplement the more conventional vocational guidance/job matching assessment services already provided by the university. It was also desired that IT survey-report system would be flexible enough to be adapted for purposes beyond the annual NTU CAS, e.g., for specific courses; for NTU Alumni, faculty and research community, etc. The vision was to transform what was a mere measurement tool into a system for more holistic, entrepreneurial, professional and leadership career development for the NTU population, including students, researchers, faculty and even alumni.

Implementation: An Iterative Process of Design, Implementation and Feedback

The first phase of the project from 2014 to 2015 involved the initial design of a CAS feedback report linking existing generic career advice (from the University Career Office) to available EPL relevant programs and activities within the university. In doing so, the project team reviewed contents from the university's printed and online contents relevant to careers in the 21st century as well as EPL-relevant programs/courses. This phase also focused on designing the report with a view to automating the report generation process to be built into the university's Information Technology (IT) system that hosted the CAS survey. The entire system was tested and ready for university-wide implementation by August of 2015. To develop the feedback report, the project team analysed the statistics and the interpretations of the 8 group profiles (see Chan et al., 2012a) to be generated from the online EPL survey system. In addition, the team developed generic career contents relevant to 21st century career development and identified EPL-relevant resources/programs, and provided tips for students to follow-up on their CAS feedback. A review of the initial versions of the EPL report were also conducted to design a user-friendly report that would serve both online access and printable versions.

Phase I of the project was completed with three online modules in the CAS feedback system which students were able to access by August of 2015. Three modules were designed in the system as follows:

- Module 1: The feedback report.
- Module 2: An 8-step career guidance model.
- Module 3: Tips and resources for students' reference for developing their E, P and L skills.

Module 1 (Selection and Presentation of Statistics for the Feedback Report). The project began with the selection of suitable statistics to support the feedback report. Average EPL scores (raw scores), standardized scores and percentile scores with the norm comparisons were explored. Different presentation styles including radar charts, various types of bar charts and tables were compared. Two important principles guided our choice of the type of statistics and presentation formats and they were: ***clarity*** (the data should be easy to read and self-explanatory and students should not face difficulties in understanding their reports) and the ***use of the T-shaped bar graph*** to represent the 3-dimensional concept of a career that the EPL framework supports. The team selected three types of statistics to be presented in the feedback report:

- individual's average raw EPL scores for motivational or efficacy profiles,
- percentiles which represented the relative standing of the student's scores compared with the motivational or efficacy norms and,
- the relative position of the student based on the motivational or efficacy percentiles (i.e., "Very Low", "Low", "High" or "Very High" compared with the norms).

Figure 12.1 shows a screen-capture of the EPL motivational profile page of the final version of the report illustrating how the data are presented in both tabulated and graphical formats (i.e., the T-shaped bar graph displaying the percentiles and the student's position on the graph). The table presenting the individual's data was followed by the motivational T-shaped bar graph on the same page. The T-shaped bar graph was designed with a fixed color code for the EPL motivational profile (*red* for Entrepreneurship, *green* for Professionalism and *blue* for Leadership). Similarly, in the EPL efficacy profile page (see Fig. 12.2), the T-shaped bar graph was designed with lighter shades of the corresponding red, green and blue colors to differentiate them from the motivational profile data. To accompany the pictorial or graphical displays of the data, interpretive statements were developed for all 8 EPL motivation and efficacy profiles (see below) to facilitate the students' understanding of what the scores meant.

Developing Interpretive Statements. The interpretive statements for the motivational profiles were written based on 8 motivational profiles by Chan et al. (2012a): High E, High P, High L, High EP, High EL, High PL, High EPL or Low EPL. Figure 12.3 is the Interpretation of a Motivational Profile, based on the final version of the report design. For efficacy interpretations (Fig. 12.4 shows the Interpretation of the Efficacy Profile), generic statements were developed and these depended on whether the feedback recipient received "High" or "Very High" efficacy scores on 1 EPL dimension, 2 EPL dimensions or on all 3 EPL dimensions. Specific statements of efficacy score interpretations were provided next and these depended on either one of the two categories: "Very High/High" and "Very Low/Low". The efficacy interpretations are then followed by a table indicating the individual's confidence levels compared with the norms for each of the E, P and L tasks or efficacy items using two categories, "Confident" or "Less Confident" as illustrated in Fig. 12.5. Finally, the report included an introduction page on careers in the new world of work and instructions on how to use the report along with detailed and self-explanatory

Your EPL Motivational Profile

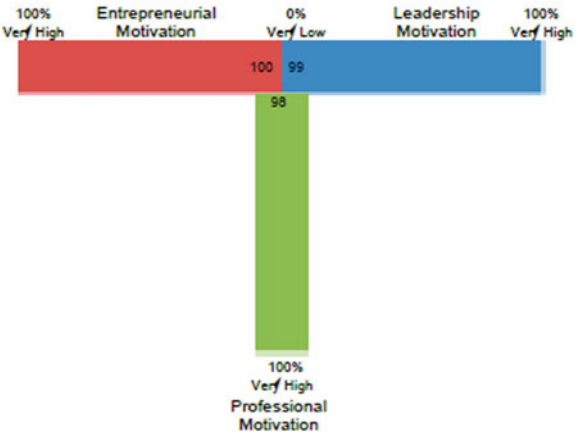
Your EPL Career Motivational Profile Group	High EPL

Table 1: Your EPL Career Motivational Profile Scores

What your scores mean	E	P	L
Your Raw Score Calculated based on your survey responses.	5	5	5
Your EPL Percentile* You are at _% of the students in the norm group.	100	98	99
Your Position Your motivational level, relative to norm group.	Very High	Very High	Very High

**Note: Motivational percentiles vary based on the norm group you select.*

Your scores are represented on a T-shaped graph below.



Interpreting Your EPL Motivational Profile Scores

Your EPL motivational raw scores are computed based on your responses in the CAS survey. The scores represent your inclination towards the 3 career spaces. The scores are also converted to percentiles which show how you compare with the norm group in terms of your career inclinations. Your percentiles for E, P and L determine your relative motivational level and your position in the T-shaped graph (Very Low, Low, High or Very High). The T-shaped graph for your EPL motivational profile is to be read together with the interpretive statements that explain what your EPL motivational profile means (see page 6).

What Your Percentile Rankings Mean

- High percentile ranking for E, P or L motivations means that you have strong inclinations for the respective career dimensions compared to the norm group.
- Low percentile ranking for E, P or L motivations means that you have weaker inclinations for the respective career dimensions compared to the norm group.

Fig. 12.1 The EPL motivational profile

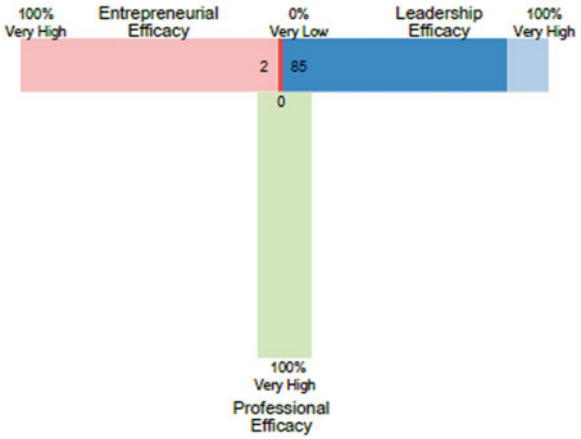
Your EPL Efficacy Profile

Table 2: Your EPL Efficacy Scores

What your scores mean	E	P	L
Your Raw Score Calculated based on your survey responses.	1	1.2	4.29
Your EPL Percentile* You are at _% of the students in the norm group.	2	0	85
Your Position Your efficacy level, relative to the norm group.	Very Low	Very Low	Very High

Note: Efficacy percentiles vary based on the norm group you select.

Your scores are represented on a T-shaped graph below.



Interpreting Your EPL Efficacy Scores

Your EPL efficacy raw scores are computed based on your responses in the CAS survey. The scores represent your perceived competence in the proficiencies relevant to E, P and L career spaces. The scores are also converted to percentiles which show your perceived competence compared with the norm group. Your percentiles for E, P and L determine your level of efficacy and your position on the T-shaped graph (Very Low, Low, High or Very High). The T-shaped graph for your EPL efficacies is to be read together with the interpretative statements which explain what your EPL efficacy profile means (see page 8). You can also view your efficacy scores by items on page 9.

What Your Percentile Rankings Mean

- High percentile ranking for a particular task means that your perceived competence to perform the respective EPL task is high compared to the norm group. These can also be your strengths to leverage on.
- Low percentile ranking for a particular task means that your perceived competence is lower compared the norm group. You will need to acquire the relevant skills and competencies particularly if you are also motivated to pursue a career in that dimension(s).

Fig. 12.2 The EPL efficacy profile

notes about EPL career framework. The report for Phase 1 ends with a glossary page explaining career-related concepts. Printable versions of the report include a list of tips and references based on **Module 3** (see below).

Module 2 (The 8-Step Career Guidance Model). The rationale for Module 2 on the 8-step career guidance model was to provide students with a structured approach to career development using the EPL content. This module was designed as a reflective

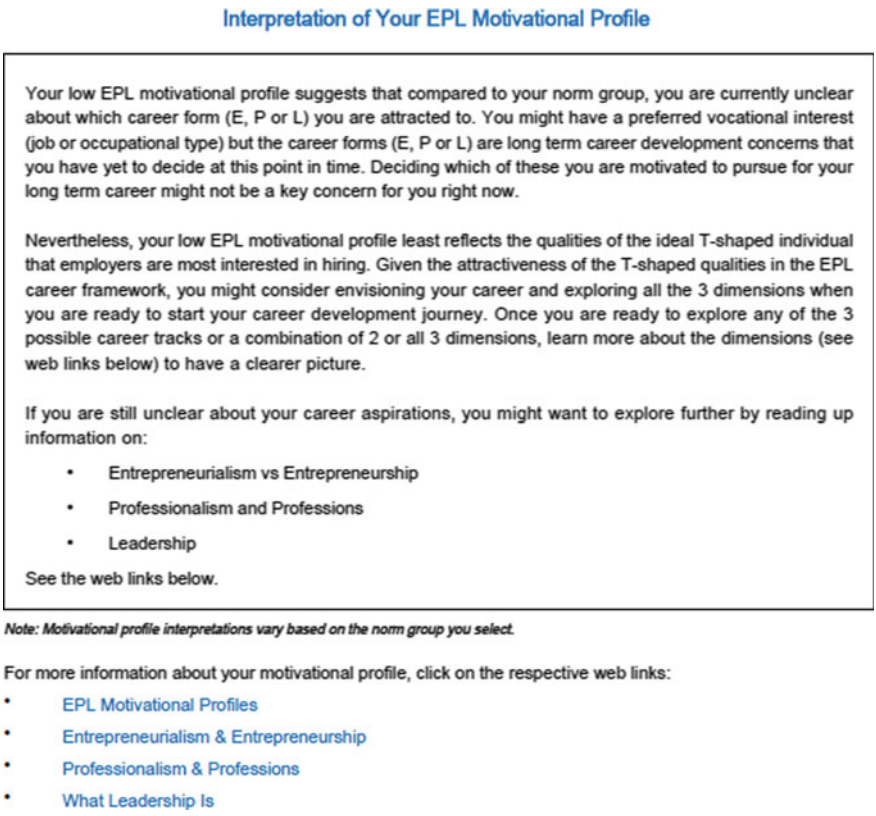


Fig. 12.3 Interpretation of the motivational profile

exercise to guide students through their thinking about the three career dimensions so that they could plan their development based on EPL competencies. The eight steps came with reflective questions and a space for the students to write their thoughts in response to the questions. The 8 steps are:

Step 1—Reflecting on "Who You Are"
Step 2—Understanding Your EPL Motivation
Step 3—Understanding Your EPL Efficacies
Step 4—Taking Stock of Your EPL Competencies and Skills
Step 5—Creating Your Career Vision and Describing Your Career Journey
Step 6—Enhancing Your EPL Competencies and Skills
Step 7—Developing Your Career Strategy and Goals

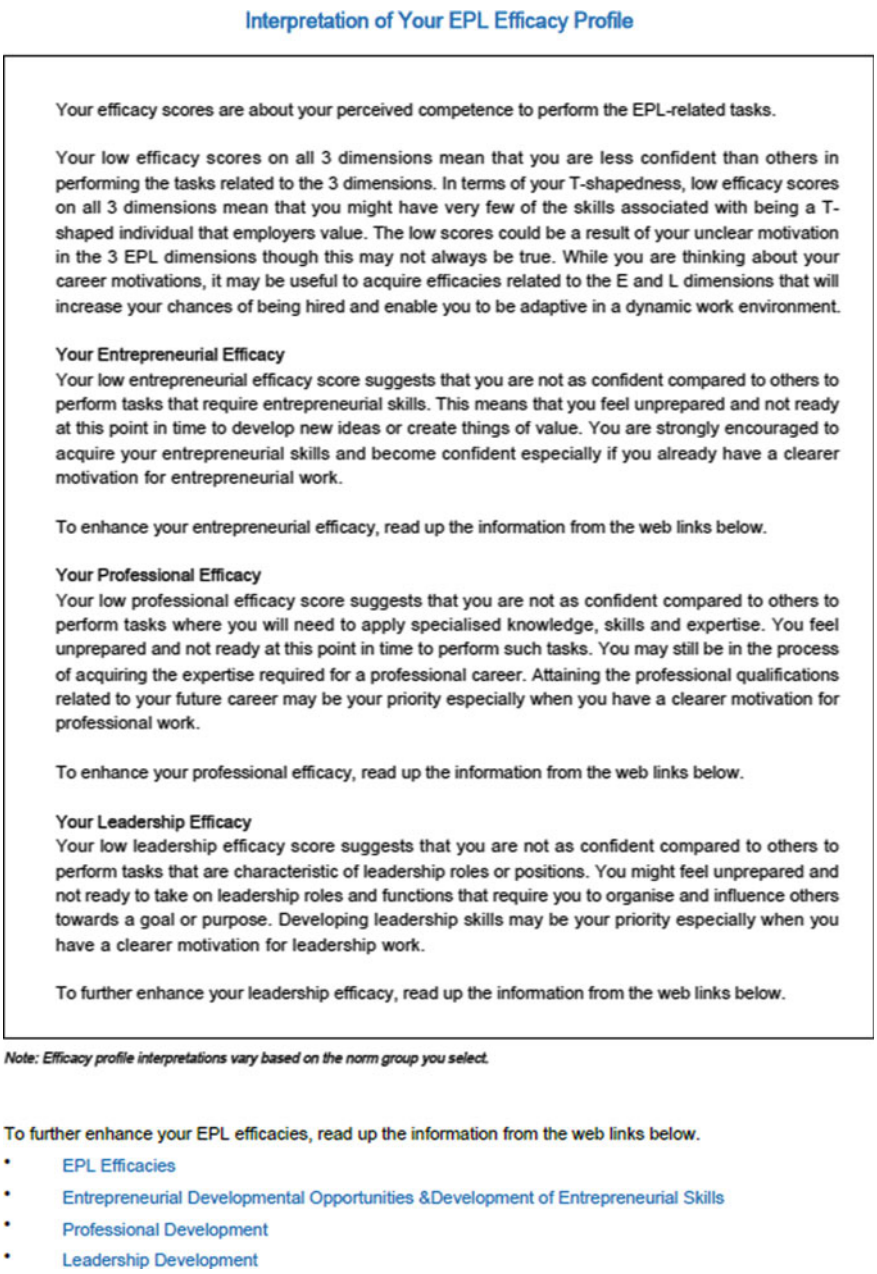


Fig. 12.4 Interpretation of the efficacy profile Page

Your Efficacy Scores by Items

EPL Tasks	Your Score	Your Confidence
Entrepreneurial		
Come up with ideas for products and services that may be needed in a market	2	Less confident
Identify opportunities to start-up viable businesses	2	Less confident
Plan a business (including market analysis, pricing, financing/costs, marketing/sales)	1	Less confident
Build a network of contacts or partners who will support my business	1	Less confident
Manage the financial assets and performance of a company or firm	1	Less confident
Start a firm and keep it growing	1	Less confident
Design an effective campaign for marketing a new product or service	1	Less confident
Professional		
Become one of the best experts or professionals in my field of specialization	2	Less confident
Teach or share with others my knowledge, experience, and expertise in my chosen area of work specialization	2	Less confident
Conduct research to further advance knowledge in my area of expertise, specialization, or profession	2	Less confident
Constantly keep up with the advancing knowledge and skills in my area of expertise, specialization or profession	1	Less confident
Write research papers/books and make presentations at professional meetings	1	Less confident
Leadership		
Align and rally people around a common goal	2	Less confident
Motivate others working with me to do more than they dreamed they could do	2	Less confident
Take charge of decisions needed for a group or organization	2	Less confident
Plan, direct, organize and prepare others as to what they need to do	2	Less confident
Use rewards and punishments to get people to work harder	2	Less confident
Create and/or build a vision that will inspire others	1	Less confident
Develop and train future leaders for an organization	1	Less confident

Note: Your confidence in performing each of the tasks varies based on the norm group you choose.

Interpreting Your Efficacy Scores

- Based on the norm comparisons, you may be (a) **More confident** compared to others, (b) as **Confident** as others, or (c) **Less confident** than others.
- If you are less confident in the domain where you also have a high career motivation profile, you may consider building your confidence in that domain.
- For e.g., you may have a high E career motivational profile but are less confident in the E-type tasks. To enhance your confidence in E-type tasks, enroll yourself in entrepreneurial programs and courses to get started.

Fig. 12.5 List of EPL efficacy items

Step 8—Revisiting Your Career Vision Each Year

Module 3 (“Tips and Resources”). As more time was needed to work on developing the EPL-related content, Phase I therefore focused on only developing career information consisting generic career tips and resources linking to the EPL dimensions. These formed the content of Module 3 which covered four key areas:

- *On career skills and career development*. Tips included “reading up on career guides”, “reading career books”, “engaging in career planning exercises”, “building a network of friends/contacts from the university”, “attending alumni events/talks” etc.
- *Building-up one’s knowledge-base and developing competencies and skills*. Tips in this section focused mainly on entrepreneurialism and entrepreneurship.

- *Job-search and job preparation advice*. The advice in this section included "finding out information about current industry focus", "type of jobs created or in demand", "exploring alternative careers" and "talking to people to find out more about specific jobs".
- *Attending courses and workshops*. Advice in this section included not only attendance of relevant courses and workshops but also encouraging students' engagement in self-reflective exercises on a career journey with EPL dimensions.

While the team was aware that these tips and resources were largely generic (i.e., not substantial enough for the development of EPL efficacies) and overlapped some content already available from the university career attachment office and other online sources, they were meant to support Module 2 and the next steps to be taken by students. However, content development for EPL efficacies required more literature search and customization to cater to the students in the university and this was followed up in Phase II of the project.

Focus Group Feedback following Phase I. Focus group (FG) sessions were held with only 9 students who volunteered and consented to participating in the sessions. The participants comprised students enrolled in the different years (Year 1 to Year 4) and from different faculties and they responded to the invitation to participate in the FG sessions. They were each rewarded with S$30 for their participation. Participants were given a set of discussion questions to prepare for the sessions. All nine participants were instructed to print their answers and bring these to the FG session for their personal reference during the sessions. Findings of the FG sessions were as follows:

- **Feedback on Module 1**. The participants in general found the feedback report very useful and highlighted that their reports generally described their career aspirations quite accurately. In particular, they found that the feedback prompted them to think about their careers which they would otherwise not spend time on while they were studying. Participants in their final year in particular indicated that they wished they had such feedback in their first year of study so that they could better plan their career development early than to worry about their career just before graduation. Participants also generally liked the flow and organization of the report. They particularly liked the T-shaped graphs which they said grabbed their attention and formed the most illustrative parts of the feedback report. While they appreciated the profile interpretations for motivation and efficacy, some thought that the statements could be clearer and more concise. Majority of the participants thought that the table containing the list of efficacy items was most useful in planning their next steps. Some students, however, felt that the report was, on the whole, quite lengthy to read while a few requested for more notes to accompany the tables and T-shaped graphs to help them understand their profile data better. The participants also thought that the interpretive statements could be better linked to the follow-up suggestions about their E, P and L development.
- **Feedback on Module 2**. As this module was optional, majority of the participants skipped the 8-step career guidance. A couple of participants who tried out the 8-step process found it too tedious and did not complete the module.

- **Feedback on Module 3**. All nine participants skipped Module 3 on the tips and resources and only read the information when preparing for the FG session. Most felt that the information provided in module 3 presented useful ideas for them to work on, nevertheless.

The FG feedback from the participants was very informative and useful in enhancing the CAS feedback system in Phase II, particularly in terms of improving the report contents. The FG feedback gave the team good reasons to revamp the contents in Modules 2 and 3. While students in general appreciated the value of the career advice in these two modules, they thought that there were too many steps in career guidance approach and were not as motivated to explore the ideas. The challenge was to design a website to help students to not only understand careers in the 21st century but also use the feedback system for their self-directed career development while they are enrolled in the university.

With the specific feedback from Phase 1 of the project, the team set out to improve the feedback system to enhance the overall student feedback experience. In Phase II of the project, the second version of the feedback report was expanded and supplemented with specific EPL relevant career development content. Specifically, the enhancements focused on producing a more user-friendly report and creating a CAS website to facilitate and support students in their understanding about careers in a future workplace, and to point students in a direction where they could explore multidimensional careers and prepare for career challenges in a dynamic workplace. The feedback system also needed contents presented in a way that would motivate students from a largely tech-savvy millennial generation to learn more about self-directedness in career development with the EPL framework. In addition, the system had to motivate students to attain other 21st century careers skills i.e., boundaryless mindset, career-adaptability and proactive career behaviours to help them navigate the new world of work.

The Enhanced EPL Report. The team reviewed the CAS feedback report format including the structure, content and presentation. In response to the specific user feedback that the report was too lengthy, the team designed two separate report formats: (1) a simplified, short feedback report that presented only the results and interpretation of the individual's data for students who only wanted to know their EPL motivational and efficacy profiles and (2) a detailed full version of the report that displayed first the EPL motivational and efficacy profiles (as in the short version) followed by the detailed career development content focused on E, P and L development, for students who needed more information about the EPL career development. Both the motivational and efficacy profile interpretive statements were revised and some parts re-written to include suggestions for follow-up EPL development. The revisions included re-phrasing statements to facilitate easier understanding of the feedback given that the contents are to be "self-explanatory". Notes to help students better understand the technical aspects of the report were inserted below respective tables and graphs.

The enhancement of the feedback system also included the integration of the report with new content on self-directed approach to career development with the EPL framework. The new content replaced the 8-step career model, and the self-help tips and resources in Phase I, i.e., in Modules 2 and 3. In the full EPL report, feedback recipients were given career development information that was created by drawing on relevant and up-to-date literature available to guide specific E, P and L development (see below under "EPL Content Development"). Students who read content for the development of the EPL efficacies were also referred to specific faculty programs, seminars, talks and activities organized and conducted by the various departments and faculties in the university. Relevant website links to the university programs and activities were included in the full version of the feedback report. While students could access the EPL career development content through their print version of the full reports, they could also view the same career development information on the CAS website.

EPL Content Development. The EPL content development was in the following areas:

- defining each of the EPL concepts and elaborating the ideas related to the type of work and EPL tasks
- identifying and articulating the traits, skills and competencies related to E, P and L dimensions and,
- career development advice and suggestions for how to develop the E, P and L efficacies.

For example, if a student's motivation was for Entrepreneurialism (i.e., High E, High EP or High EL or High EPL profile), and he/she wanted to develop entrepreneurial skills in particular, he/she will first learn what "entrepreneurialism" is and how that differs from "entrepreneurship". The student will next learn about personality traits and skills related to "entrepreneurship success" and will be presented with advice on how to develop skills like "entrepreneurial alertness". Students who are interested in "entrepreneurship" in particular, will be referred to university resources like open innovation laboratories, start-up programs and funding schemes designed by the university to support entrepreneurship and entrepreneurial development. Information on these was briefly described in the website to motivate students to find out more. The E, P and L career development contents were created to support the students' follow-up actions with the CAS feedback and to sustain their interest in developing themselves earlier instead of waiting until their graduation to start thinking about their career development.

The NTU CAS Website. The team worked with the IT professionals to design and host EPL career development contents on the CAS website (see Fig. 12.6 which shows a screen capture of the NTU CAS Website Homepage). The Modules 2 and 3 contents in Phase I that were meant to provide generic career development advice were replaced with the new career development information focusing on concepts of "employability", "lifelong learning" and "new career skills" required to navigate the dynamic workplace of the future. While the career development contents in the

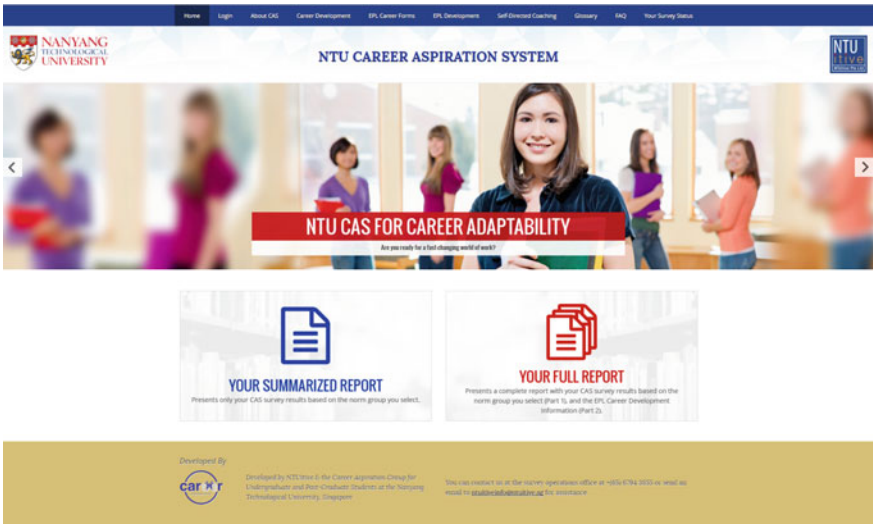


Fig. 12.6 Homepage of NTU CAS website

full report were similar to that of the website contents, additional contents were created for the website and all contents were organized under the following topics or sub-headings:

- Generic Career Development Information
- The EPL Approach and the T-shaped Employability Concept
- EPL Development
- Self-directed Coaching and Career Skills for the 21st Century.
- Glossary of EPL-related Terms.

Contents that were specific to EPL development were developed by drawing on relevant online literature on entrepreneurial/entrepreneurship development (E & ED), professionalism and professional development (P & PD), and leadership and leadership development (L & LD) respectively.

Generic Career Development Information. Under this topic, students were introduced to ideas of "continual learning" and "lifelong employability". Students were encouraged to think about careers as different from the traditional notion of "jobs" and become aware of the need to prepare for careers in a dynamic workplace. The information was also written to create the awareness in students, of the difference between "preparing a first job" versus "preparing for a career" where continued employability and lifelong learning were expected to be a part of their career journey. A clear understanding of their motivations for the E, P and L dimensions was a good and early start to a student's career journey.

The EPL Approach and the T-shaped Employability Concept. In this section of the Report, the EPL framework for multidimensional careers was elaborated and

students will learn about the EPL framework, the difference between "EPL motivations" and "EPL efficacies" and how efficacies are different from actual E, P and L competencies and skills. Students will also learn about the importance of being "T-shaped"—a metaphor of an ideal employee that is highly sought after by 21st century employers—and are encouraged to develop their EPL efficacies to increase their "T-shapedness". Figure 12.7 is an extract of the website information that follows Fig. 12.6 to show a range of broad skills in the E and L dimensions that students should develop, in order to be T-shaped.

What Are Broad (Transferable) Skills?

Most broad skills and competencies are in the E and L career dimensions. Some are required for entrepreneurial tasks while others are related to leadership functions. Some skills may be shared between the two dimensions. Table 1 shows the type of skills related to each or both dimensions. For instance, "communication skills" are important to both E and L tasks.

TABLE 1

Broad / Transferable Skills (and Competencies) For Student Development		
Entrepreneurial Development vs Enterprise or Entrepreneurship	**For Both Entrepreneurship and Leadership Development**	**Leadership / Management Development**
Entrepreneurial - Opportunity Recognition - Exploiting Opportunities - Design Thinking - Creative Thinking - Problem-Solving - Risk Assessment & Risk Management **Enterprise or Entrepreneurship** - Business Start-up - Business Operations - Sales and Marketing - Finance Management - Knowledge of the Economy (Spotting trends etc.)	- Systemic Thinking (strategy, goal-setting) - Ethical Reasoning - Critical Thinking - Decision-Making - Communications (Oral and Written; Persuasive Influence and Selling) - Negotiation - Networking - Cultural awareness & cultural competence - Digital Savviness - Information Processing	- Principle-Centered / Values-Based / Ethical Leadership - Self-Awareness; Self-Management / Self-Regulation - Effective Leadership Competencies (Task, Relations and Change-Focused Behaviours) - Effective Leadership Styles (Transactional & Transformational) - Team Leadership (Building a shared vision to inspire followers, building team identity, trust and collaboration among members; team development) - Facilitation Skills (facilitating discussions, team conversations and leading change) - Effective Feedback, Coaching and Development

Developing Broad / Transferable Skills

The E and L competencies and skills form the breadth of skills or the arm of the T-shape while the P competencies and skills form the depth of knowledge and skills, or the leg of the T-shape. If you are more T-shaped and already have the transferable (broad) skills such as creative thinking, leadership, communication, teamwork, problem-solving as well as a depth of professional knowledge and competence (e.g., engineering), you will have more job opportunities to consider.

Critical Skills for the Future Workplace

In an increasingly digital world, future workers will need, in addition to the broad skills in the E and L career spaces, a set of technical, cognitive and behavioural skills that will become fundamental to the way work is done. While the post-millennial generation will found it relatively easy to navigate this new world of work, older generations of workers (those born before 2000) will need to learn these new skills. The diagram below shows the type of skills, besides the broad or transferable skills, that are critical in a future workplace.

Fig. 12.7 The range of broad/transferable skills for the E & L dimensions

EPL Development. This topic helps students understand the EPL concepts before deciding which EPL skills they want to develop first. For example, the concept of "entrepreneurship" is differentiated from the concept of "entrepreneurialism" and, "profession" is differentiated from "professionalism". Students also learn what "leadership" is about and how "understanding leadership" is not the same as the tools, methods and processes involved in developing their leadership skills. In the NTU CAS website, this information is followed by a list of university programs and resources for students to tap into.

Glossary of EPL-related Terms. The glossary information that was provided in the Phase I version of the report was removed. Instead, the information on the CAS website was presented graphically via a "word cloud" (see Fig. 12.8 which also presents the glossary of EPL-related terms). Each word in the word cloud was linked to an interactive page that explained the concepts in bite-sized information. Following the conceptual explanations, students were prompted with follow-up reflective questions about their career development.

Focus Group Feedback following Phase II. Focused group sessions were held with a total of 14 participants to gather feedback on the CAS system as a whole with a view to implementing the system beyond the university. On the whole, participants' overall experience with CAS feedback system was generally positive in terms of the survey completion, receiving the feedback reports and learning about the EPL career development approach. Feedback was particularly positive and encouraging

Fig. 12.8 The glossary of EPL related terms presented in a word cloud

when students approached the CAS as a system that dealt with the long term view of "careers" rather than the short-term aspects of "job-fit". Feedback was not as positive when they expected the CAS system to provide answers for specific job-related questions which the CAS system was not designed-for. In general, the participants found the CAS reports very user-friendly and clearly written. Most participants had no problems in understanding the technical aspects of the report, i.e., the data table, T-graph, and use of footnotes. Participants gave above average ratings on these aspects of the report as well as good suggestions on how to further enhance the user-friendliness, clarity and ease of understanding of the technical aspects. On the CAS website, participants in general found career development contents informative and useful; they particularly liked the presentation of the word cloud and the glossary webpages where they learnt about the EPL–related concepts illustrated with images and graphics. However, participants in general thought that instead of the "textbook" style of presenting information, the "look and feel" of the website could be immensely improved to make it more appealing and interactive to students who prefer information presented to them in "bite-sizes". They suggested the use of infographics for visual impact to attract the students' attention and to motivate them to explore and learn more about EPL career development. The participants (who are from the "millennial generation") said they were more comfortable with digital platforms and did not appreciate information presented to them in lengthy "textbook" style. The project team was conscious of this generational need though priority was given to the development of the contents first in Phase II and presentation aspects second, due to budget constraints. Presentation formats and website user-friendliness which would have incurred additional design costs were items to be followed-up in Phase III of the project.

Phase III of the project began in 2017 where further refinements were made to the CAS report and the CAS website contents for implementation within NTU. The main focus in this final phase was to design a separate generic CAS system with contents, including the survey items, for implementation beyond NTU (i.e., in any tertiary institute). The aim was also to design a website with less text and to include more infographics.

The Feedback Report. In the generic version of the CAS feedback report, the contents were identical for the technical feedback on EPL motivational and efficacy profiles and the interpretative statements. The generic version had a new cover design and contents that were written specifically for the NTU context were either removed or replaced with more generic EPL career development content applicable beyond NTU. Minor revisions were made to parts of the interpretive statements and the notes accompanying the graphs and tables. Unspotted errors previously in the Phase II version were also corrected. The final version of the online CAS feedback report also included useful follow-up suggestions and linked parts of the feedback report to the respective webpages where the E, P and L development were elaborated for follow-up. Finally, both the summary and detailed versions of the reports included a 4-step career development guide (see Fig. 12.9) as a quick guide to link the feedback with

Refer to Report	**STEP 1: EPL Career Motivation** Have a clear EPL motivational profile before developing your career vision and goals. Explore a variety of jobs.
	STEP 2: EPL Efficacies Review your efficacies and know your gaps. Acquire skills and professional qualifications to support your EPL motivational profile and your career vision.
Refer to Career Development Information in the website	**STEP 3: Career Vision & Goals** Constantly review your career vision and goals in the E, P & L dimensions of your career.
	STEP 4: Career Development Plan Plan your continual development. Enroll in courses and programs to be more T-shaped. Acquire broad skills for entrepreneurial and leadership tracks.

Fig. 12.9 4-step guide to career guidance following CAS feedback

the EPL career development content which was accessible from a printed detailed version of the feedback report or from the CAS website itself.

The CAS Website Contents. The contents for the generic CAS website were the similar with the same messages but were written in bite-sized information suitable for infographics and image displays. The contents were organized with slightly different sub-headings from the NTU CAS website:

- Future Careers and Employability: "Careers Now and The Future", "Your Employability" and "Career Skills for the Future"
- EPL Approach: "EPL Framework", "Motivational and Efficacy Profiles" and "The T-shaped Employability Metaphor"
- EPL Development: "Entrepreneurialism and Entrepreneurial Development", "Professionalism and Professional Development" and "Leadership and Leadership Development"
- Glossary of EPL-Related Terms.

Much of the new content was created for the section, "Future Careers and Employability" to help students understand the changing nature of work, careers and employment and what they should be prepared for when they graduate. The intent of this section was to raise students' awareness of the need to prepare well for multidimensional and protean careers of the future and to think about their careers while they study, starting as early as in their first year. With the CAS feedback and the EPL career development approach, students get a head-start to planning, strategizing and even designing their own careers before they graduate from their respective tertiary institutions.

As in Phase II, the focus group feedback also revealed that students' prior expectations about the feedback system determined their feedback reactions, amendments were made to clearly articulate the difference between a "career" and a "job" and

what to expect from the CAS system, i.e., students should not be expecting job-related information which were already available from the university career attachment office. It was important to differentiate the CAS and EPL information from the traditional career advice offered by the university career attachment office, e.g., writing up a resume, preparing for a job interview, taking a personality or career interest profile test, attending networking workshops etc.

Web Design and Application of Infographics. Understanding the students' preference for accessing information through infographics and images instead of the old "textbook style" of presenting web information, the team devoted more effort and resources to develop the infographics and selected images to improve the user-friendliness and attractiveness of the generic CAS website. Figure 12.10 is a screen capture of the generic CAS website. Figure 12.11 shows a sample of the generic CAS website showing one example of an infographic which was designed by a professional infographic designer. With the use of the infographics in every webpage together with suitable images illustrating the content and intended messages, the generic CAS website looked more appealing to the millennial generation of students than the earlier one developed for NTU.

Evaluation of Phase III. Phase III enhancements to the NTU feedback system and the creation of the generic CAS system were both completed and tested for implementation. The NTU CAS system has been implemented in some courses. However, due to time and budget constraints in Phase III of the project, both systems were not evaluated by student users. The generic CAS system is currently awaiting trial by any tertiary institution which is interested to implement such a system to support and prepare students for the future workplace with information beyond the

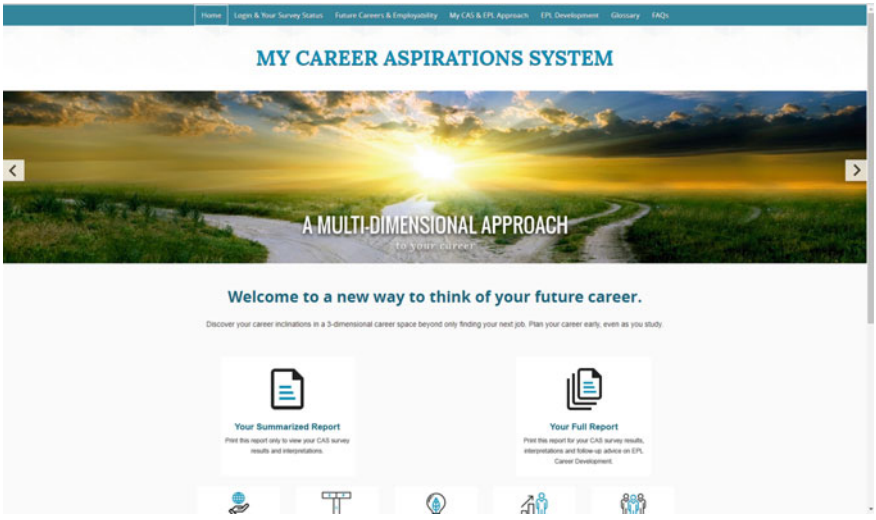


Fig. 12.10 Screen capture of the generic CAS webpage

Fig. 12.11 A sample generic CAS webpage with infographics

traditional job-placement type programs by career attachment offices. The generic CAS system can then be evaluated for further enhancements and changes to cater to the specific needs of tertiary institutes planning to implement such a system.

Conclusion: A Vision

With the successful transformation of the NTU CAS from a survey to a system for career development and feedback, the University now possesses a one-stop gateway to connect all individuals to innovation and enterprise development information and opportunities offered. The NTU CAS feedback and career guidance content can be

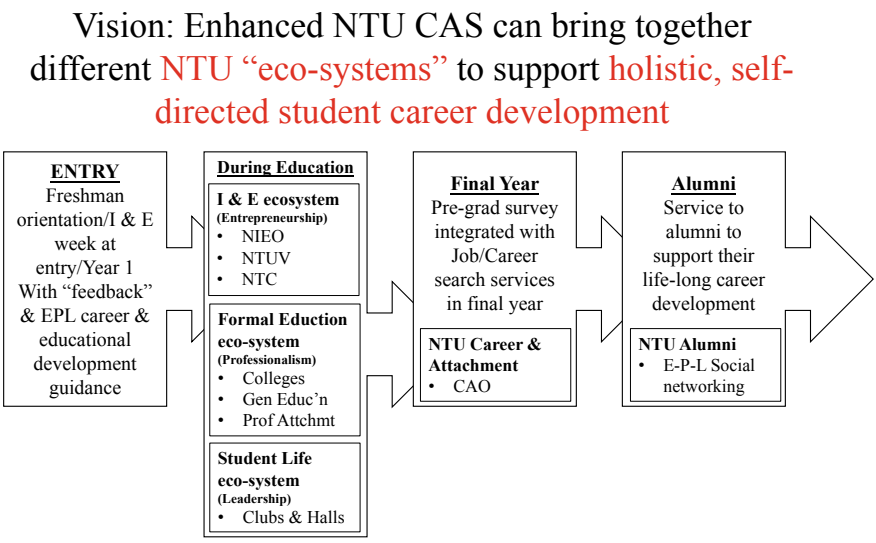


Fig. 12.12 A vision for continuous, holistic career development support by the university

offered to NTU students throughout the period of their studies and also beyond (e.g., when they become alumni) to help them to "construct" more holistic (as opposed to single-tracked) careers with entrepreneurial alongside, professional and/or leadership dimensions over a lifetime.

In our Vision (see Fig. 12.12), all freshmen will be invited to participate in the NTU CAS upon joining the University, and 6–9 months before they graduate. All participants will receive an NTU CAS Feedback Report where they can get to see their EPL career aspiration profile relative to the larger student population, and where they will be encouraged to participate more actively in the many developmental opportunities in the E, P and L aspects during NTU. The Report will then link them to an online career and educational advising website in NTU which will point them to the many educational, curricula and co-curricula (or student life) opportunities to develop their leadership and entrepreneurial potential while in NTU and beyond. Specific programs or "eco-systems" within NTU (e.g., general elective courses on Career Development and Entrepreneurship and/or Leadership, entrepreneurship workshops) can also use this system to measure "change" in the students via the NTU CAS. In the longer-term future, this system can even be enhanced with social networking tools and "Apps" to help our students build networks both within and across E, P and L developmental communities in NTU and beyond (e.g., with the alumni). This system may even be integrated with the NTU Career and Attachment Office system for job placements, to point students to the many E, P and L opportunities (and variants) in the job market.

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Chapter 13
An Examination of Entrepreneurial, Professional and Leadership (EPL) Career Aspirations Among Adolescent Youth

Bianca Ni Ying Kang and Marilyn A. Uy

Abstract In this study, we incorporated the Entrepreneurship, Professional, and Leadership (EPL) framework into social cognitive theory in an attempt to better understand adolescent career aspirations. Specifically, we explored how encouragement, as reported by the adolescent and the corresponding parent at Time 1, shaped the respective E, P, and L self-efficacy and resulting E, P, and L career outcome measures (i.e., motivation and intent) three months later at Time 2. Data from 252 students indicated that parental encouragement played a positive role in increasing the adolescent's career self-efficacy, motivation, and intent, with self-efficacy mediating some of the relationships. We also found gender differences in professional career intent and leadership self-efficacy. Our findings suggest that encouragement from parents is critical in shaping career development of adolescents particularly in the Singapore context. Given the nontrivial parental influence, government initiatives aiming to promote entrepreneurship among adolescents must involve their parents.

Keywords Career aspirations · Youth · Self-efficacy · Parental encouragement · Motivation

Introduction

The career choices of children are shaped early (Bandura, Barbaranelli, Caprara, & Pastorelli, 2001). Occupational preferences may be formed and influenced by gender and socio-economic status in childhood (Henderson, Hesketh, & Tuffin, 1988). These early choices are influential—adolescent career aspirations are related to income, occupational and educational status at adulthood (Ashby & Schoon, 2010). However, occupational choices may also be explained by individual factors besides socio

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economic and family backgrounds. It is highly possible that career motivations are influenced via self-efficacy during adolescence, a crucial stage of life. In this chapter, we describe how our study builds upon social cognitive perspective of occupational preferences and enhanced it with a contemporary view of careers—Chan et al.'s (2012) Entrepreneurship, Professional, and Leadership (EPL) framework—to examine how parental encouragement may influence self-efficacy and the corresponding career-type motivation and intent in young adolescents. Our study highlights that parental encouragement is indeed a noteworthy influence on the career aspirations of adolescents.

Self-efficacy and Careers

Originating from social cognitive theory (Bandura, 1989), self-efficacy is defined as the individual's perception of their own abilities to perform and undertake endeavors needed to achieve certain tasks (Bandura, 1986) and it forms the core of our study. Self-efficacy determines the level of confidence individuals have. This confidence may subsequently influence the level of motivation individuals have with regard to specific tasks; particularly, self-efficacy influences the goals individuals set for themselves and also affects the level of tenacity and effort individuals will allocate to achieve their goals (Bandura, 1993). As argued by Bandura et al. (2001), people have to believe that it is within their capabilities to achieve a target; otherwise they will have little reason to strive towards the goal. With higher self-efficacy, individuals set higher targets and invest more effort and perseverance into achieving their targets (Ballout, 2009).

Typically studied in a domain-specific manner (Turner & Lapan, 2005), the construct of self-efficacy has been applied frequently in the career choice and career development literature. Self-efficacy has also been found to be related to future career outcomes, making it a useful and important construct in our study of career aspirations. Individuals with high self-efficacy and strong academic grades are more likely to achieve subjective career success (i.e., satisfaction) subsequently (Pinquart et al., 2003). Koellinger, Minniti and Schade (2007) conducted a multi-country study and found that the likelihood of an individual starting a business was strongly related to their perceived efficacy in starting one. In children, perceived efficacy (instead of actual academic results) was found to be more important in determining their preferred (and disfavored) future careers (Bandura et al., 2001).

The Relevance of the EPL Framework in the Career Choices of Adolescents

Previous studies on adolescent career aspirations have either examined 'career' as a larger construct without reducing it into specific types (e.g. Anderson & Brown, 1997; Pinquart, Juang, & Silbereisen, 2003) or relied on occupational lists constructed from Holland's Occupational Codes (e.g., Turner & Lapan, 2002; Creed, Tilbury, Buys, & Crawford, 2011). However, the career landscape is evolving rapidly. While previous generations have viewed career development as a vertical progression within an organisation with increasing depth of expertise, recent and contemporary perspectives on career development can be characterized as more horizontal, more person-centred and more person-driven (McDonald & Hite, 2005; Chan et al., 2012). The individual is the main force behind his/her development and decisions (Hall, 2004).

Recognising the agentic role of the focal individual in charting his/her own career, Chan et al. (2012) developed a person-centric career aspirations framework—the EPL framework, which encapsulates entrepreneurial (enterprising-type), professional (specialist-type) and leadership (managerial-type) as independent dimensions defining the 21st century career space. As a reflection of today's increasingly boundaryless and subjective careers, career paths in the EPL framework are not mutually exclusive; an individual can develop himself along any one or all of its dimensions (Chan et al., 2012).

The EPL framework was developed using a large public university sample (Chan et al., 2012) and has since been expanded to the working adult population (Chan et al., 2017) or post-university context. In the current study, we employed the EPL framework to help contextualize career self-efficacy (i.e., as separate domain-specific E, P and L career self-efficacies) and define career aspirations (i.e., as specific E, P and L career motivations and intent) in the pre-university context.

Parental Influence and Careers in the Singapore Context

Despite Singapore's relatively Westernized population (compared to other Asian countries), it is still generally regarded as a collectivistic society (Chang, Wong, Teo, & Gam, 1997). Collectivistic cultures place emphasis on considering the consequences of one's actions on other people and tend to value both 'face' (i.e., their social reputation) and acceptance by their in-group (Hui & Triandis, 1986). Typically, collectivistic cultures have also been characterized by social hierarchies, where acquiescence to one's elders is valued (Tamis-LeMonda et al., 2007). Collectivism has indeed been found to be positively related to authoritarian parenting (Rudy & Grusec, 2001), a top-down parenting style that expects not only deference from the child (Rudy & Grusec, 2001) but also compliance with standards set by the parents (Keshavarz & Baharudin, 2009). In the non-Anglo collectivist context, such a parenting style is not necessarily negative (Rudy & Grusec, 2001); it may in fact be

demonstrative of parental concern and interest in the child's wellbeing and development (Chao, 1994). With this cultural expectation, many Singaporean parents continue to play a critical role in defining and influencing the career choices of Singaporean adolescents. Given that Singapore highly values and puts great emphasis on academic qualifications (Wang & Wong, 2004), it is reasonable to expect that parents prefer their children to pursue traditional professional careers (e.g., accounting, engineering, etc.) over other non-mainstream careers such as entrepreneurship.

Professional careers undoubtedly thrive in Singapore. Singapore has many government-linked companies (GLCs) and continues to attract multi-national companies (MNCs); hence, its education system was tailored with these employment contexts in mind (Bhasin, 2007). The education system has had a large impact on career choices. For example, a study by Poole and Cooney (1985) found that Singaporean adolescents compared to Australian adolescents were more knowledgeable about jobs that are professional, technical-service and skilled in nature, and many highly educated Singaporeans have chosen professional lines of work over other types of jobs within large organizations (Phan, Wong, & Wang, 2002; Wang & Wong, 2004). Job-seekers in Singapore have not given much attention to entrepreneurship until the 1990s (Wang & Wong, 2004). However, in recent decades, the Singapore government has been attempting to broaden the career scene, with special attention and funding support for entrepreneurship (Wong, 2017) given the potential economic benefits of starting new enterprises (Lim, 2016). Recent market surveys suggested that the current generation of Singaporean youth is gradually becoming more open to pursuing less conventional and entrepreneurial paths (Shazni, 2016).

Operationalising Pathways to Adolescent Career Preferences

In the following sections, we discuss how self-efficacy, EPL career aspirations, and parental involvement via encouragement are linked together as we explicitly test the hypotheses in our study. A number of controlled covariates are also highlighted. Briefly, the corresponding E, P, and L parental encouragement was hypothesized as a predictor of adolescent career preferences (defined as E, P, and L motivation and intent) through the respective E, P, and L self-efficacy.

Motivation and Intent

Motivation and intent are part of the operationalization of career aspirations within the EPL framework (Chan et al., 2012). This choice of operationalization stands in contrast to definitions that focus more on individual differences like skills and values (Chan et al., 2012). According to Locke and Latham (1990), motivation involves an inner state that stimulates the direction (one's behavioral choices), intensity (how hard a person works), and persistence (one's duration of action) of one's pursuit of a

particular endeavor—basically, choices and actions that go beyond ability (London, 1983). Motivation and intent in this study were defined following Chan et al. (2012), i.e., the motivation and intention to pursue E, P or L careers. These two concepts are not static; like efficacy, intent and motivation are both changeable parts of an individual's mindset, which thus make this study valuable for career intervention planning (Chan et al., 2012).

Given that self-efficacy influences individual motivations (Bandura, 1993), we hypothesize E, P, and L self-efficacy to positively predict the corresponding E, P, and L career motivation (Hypothesis 1). In addition, in line with process models that have been proposed in the entrepreneurship literature where attitudes and beliefs about taking an action predict intent to perform the action (Segal, Borgia, & Schoenfeld, 2005), E, P, and L motivation in the current study was hypothesized to positively predict the corresponding intent to pursue E, P, and L careers (Hypothesis 2). Because self-efficacy has also been argued to be a crucial antecedent of behavioral intent (Segal et al., 2005), we also modeled E, P, and L self-efficacy as a predictor of the corresponding E, P, and L intent.

Parental Encouragement and Self-efficacy

Self-efficacy, as defined earlier, is not fixed (Lent, Brown, & Hackett, 1994) and is in fact malleable; for example, it is malleable through verbal persuasion, and as argued by Bandura (1997), it is capable of strengthening one's beliefs about one's capabilities to perform certain tasks. Previous studies indicate that receiving verbal encouragement with respect to a specific academic subject increases one's self-efficacy in that particular subject (Lent, Lopez, & Bieschke, 1991; Kiran & Sungur, 2011). Applying social cognitive theory, encouragement can be viewed as social persuasion which in turn has its utility in motivating people to try out or maintain specific actions (Lent et al., 1994).

Encouragement is one of the typical ways people convey support to each other (Wong, 2015). We draw on the Adlerian perspective of encouragement (Ansbacher & Ansbacher, 1956) in line with previous encouragement studies that were primarily inspired by Adler's theory of encouragement (e.g., Dinkmeyer & Losoncy, 1996; Sweeney, 2009). According to Adlerian scholars, encouragement is meant primarily to raise courage and confidence in the focal individual and is therefore meant to change one's motivation (Wong, 2015). At the heart of encouragement is communicating a positive message to the focal individual. It can come in the form of recognition of the focal individual's potential or praise for the relevant competencies s/he possesses.

Given the strong influence parents have over their children in collectivistic societies (as covered in Parental Influence and Careers in the Singapore Context), the current study focused on encouragement from parents. Parental investment—financially and mentally—in the education and achievement of their children is high in Singapore (Stright & Yeo, 2014). In a study involving Singaporean parents, parental support and

involvement in learning were found to be associated with a positive learning profile in the child (Luo, Aye, Hogan, Kaur, & Chee, 2012). The important role parents play in the lives of Singaporean adolescents cannot be understated. Academics aside, a perceived lack of paternal career engagement (i.e., "engagement" involved active participation in career development) was found to be related to lower career self-efficacy in Singaporean male undergraduates, and a perceived lack of paternal career support (i.e., "support" involved the display of concern and encouragement) was related to lower career self-efficacy in Singaporean female undergraduates (Zhao, Lim, & Teo, 2012).

In general, the literature consistently showed that parental influence played a key role in the shaping adolescent career aspirations (Whiston & Keller, 2004; Dietrich & Kracke, 2009; Ashby & Schoon, 2010). A study conducted by Otto (2000) found that adolescents viewed their parents as important co-partners in their career development and that many of them would in fact like to discuss more with their parents about their career planning. Interest and support rather than sharing of detailed information about careers appear to be more important to adolescents; parental belief and interest in the adolescents and their career aspirations and abilities need to be clearly demonstrated to the adolescent (Keller & Whiston, 2008). There is a strong link between perceived parental support for specific careers and the confidence young adolescents have in carrying out behaviors relevant to those careers, which suggests again that adolescent period is a pivotal time for parents to get engaged in their children's career development (Turner & Lapan, 2002).

However, what is perceived as encouragement by the parent may not always be perceived as encouragement by the adolescent. If the actions of a parent are perceived as intrusive and controlling instead of collaborative, the adolescent may view the parent to be unengaged and unsupportive (Dietrich & Kracke, 2009). Research suggests that it is the subjective perception of an adolescent that is critical in determining whether the parental support is beneficial (Noack, Kracke, Gniewosz, & Dietrich, 2010; Garcia, Restubog, Toledano, Tolentino, & Rafferti, 2011). Parent and child reports of child-rearing behaviors do not always corroborate well (e.g. Caster, Inderbitzen, & Hope, 1999), with parents tending to present themselves in a more favourable light (Schwarz, Barton-Henry, & Pruzinsky 1985). A study on child hockey players found that compared to the ratings given by their parents, the children in the study viewed their parents as being significantly less supportive and as exerting significantly higher amounts of pressure (Kanters, Bocarro, & Casper, 2008).

To account for these discrepancies in our study, we captured ratings by parents and adolescents respectively, on encouragement for E, P and L careers. Specifically, we hypothesized that parent-reported and child-perceived encouragement will positively predict the corresponding motivation, with self-efficacy acting as a mediator based on the social cognitive theory (Hypothesis 3).

Background Covariates

Gender was identified as a covariate in the current study due to the extensive literature established on gender gaps and the differential effects of gender on career choices and outcomes, especially in the field of entrepreneurship (e.g., Goldsmith, Veum, & Darity, 1996; Phan et al., 2002; Verheul, Uhlaner, & Thurik, 2005; Kickul, Wilson, Marlino, & Barbosa, 2008). Previous studies found that male entrepreneurs still outnumber female entrepreneurs (Kauffman Foundation Report, 2016).

Presence or absence of a family business was also included as a covariate for adolescents who could potentially have gained entrepreneurial or leadership experiences from running a business. Previous studies have also shown that the likelihood of entry into entrepreneurship was higher for people with family businesses (Djankov, Qian, Roland, & Zhuravskaya, 2006; Lindquist, Sol, & Van Praag, 2012); early exposure to family business may lead to higher levels of interest in entrepreneurship (Wang & Wong, 2004). Furthermore, experience with a family business can have influences similar to mastery experiences and experiential learning through a family business is in fact one of the most effective ways to increase self-efficacy (Kickul et al., 2008).

Summary of Hypotheses

To recap, we tested the following hypotheses using separate models for E, P, and L career aspirations:

Hypothesis 1 Self-efficacy will positively predict the corresponding E, P and L career motivations.

Hypothesis 2 E, P and L motivations will positively predict the corresponding E, P and L career intent.

Hypothesis 3 Parent-reported and child-perceived encouragement will positively predict the corresponding E, P and L motivations, with self-efficacy acting as a mediator.

Method

This study was conducted as part of a larger study on adolescent entrepreneurship in Singapore. In this section, only the measurements and results relevant to the current study are reported. The scales are in the Appendix.

Participants

Participants were recruited from eight secondary schools in Singapore. It should be noted that while participants were not involved in entrepreneurship training programs for the duration of the study, the eight schools had an emphasis on entrepreneurship extra-curriculars. A number of participants in the current study reported as taking part previously in activities like attending talks and sharing sessions on entrepreneurship and receiving lessons on product development.

Participants completed online surveys at two time points. The first survey (Time 1) measured their perceived parental encouragement for E, P and L and whether their family had a family business. Parents responded to a survey at Time 1 and the survey also measured the level of encouragement the parents provided their children for E, P and L careers, respectively. About three months later (Time 2), the participants completed the second survey which measured their E, P, and L self-efficacy, E, P, and L motivation and E, P, and L intent. This study was carried out twice; once in 2015 and once again in 2016. As the procedures were identical, we combined data from both years.

Procedure and Measures

An information sheet about the study was disseminated to the parents three weeks before the administration of the first survey. As participants were secondary school students and thus considered minors, we needed parental consent from each student's participation. The parent survey was enclosed with the parental consent sheet. Students who had successfully obtained parental consent were invited to complete the two-part survey. For the Time 1 survey, participants completed the online questionnaire administered by the research team in computer laboratories of the respective schools. Participants who completed the first survey received a $10-stationery voucher and some light refreshments.

Time 1 reports were screened and participants were filtered according to the exclusion criteria as we will explain later in this paper. The remaining participants were administered the Time 2 survey three months later. Participants who completed the second survey received a notebook and a $10-stationery voucher.

Encouragement. Participants were asked to rate on a 5-point Likert scale, ranging from 1 (*not at all*) to 5 (*all of them strongly*), the extent to which they were encouraged by their immediate family (i.e., parents and/or siblings) to pursue E, P and L careers respectively. Parents of the participants were asked to rate on a 5-point Likert scale, ranging from 1 (*not at all*) to 5 (*very strongly)* the extent to which they have encouraged their child to pursue E, P and L careers respectively. Both parent and child measurements were taken at Time 1. Higher encouragement scores indicate greater encouragement.

Self-efficacy. For entrepreneurial self-efficacy, participants were asked to rate their confidence in completing tasks related to entrepreneurship on a 5-point Likert scale ranging from 1 (*not at all confident*) to 5 (*extremely confident*) for 11 items. Out of the 11 items, three items were adapted from Chan et al.'s (2012) entrepreneurial efficacy scale and eight were new items created to reflect self-reported entrepreneurial efficacy. For P and L self-efficacy, the items were adapted from Chan et al.'s (2012) professional and leadership self-efficacy scales. They were also rated on a 5-point Likert scale ranging from 1 (*not at all confident*) to 5 (*extremely confident*). There were four items for P self-efficacy and six for L self-efficacy. The E, P and L self-efficacy items were measured at Time 2. A higher self-efficacy score indicates higher self-efficacy in the specified E, P or L domains.

Intent. Intent was adapted from the EPL intent scale developed by Chan et al. (2012). Participants were asked to rate items on a 5-point Likert scale from 1 (*strongly disagree*) to 5 (*strongly agree*). There were six items for E, four items for P, and three items for L. EPL intent was measured at Time 2. Higher intent scores indicate higher intent to pursue the corresponding E, P or L careers.

Motivation. Participants were asked to rate their motivation for E, P and L on a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The items were adapted from Chan et al.'s (2012) motivation scales. There were four items for E, four items for P, and four items for L as well. Higher scores indicate greater motivation for the respective E, P or L career domain.

Control variables. We controlled for the effects of gender (0 = female, 1 = male) and family business (0 = no, 1 = yes). Both these information were obtained in Time 1.

Results

In total at Time 1, there were 291 valid responses from students. The mean age of the student participants was 14.56 years ($SD = 1.09$). There were 185 (63.6%) females and 106 (36.4%) males. There were 78 (26.8%) Secondary 1 students, 38 (13.1%) Secondary 2 students, 140 (48.1%) Secondary 3 students and 35 (12.0%) Secondary 4 students. A total of 261 parents responded to the parent survey at Time 1.

A number of students were excluded from taking part in Time 2 according to the following criteria: (1) missing more than two responses in any section of the survey at Time 1, (2) giving the same response within any displayed page in the survey at Time 1 and (3) meeting the first two exclusion criteria and being in the bottom 10th percentile in terms of response time. Due to the exclusion criteria and attrition, the final sample was 252 students in Time 2. Out of the 252 students, 49 (19.4%) students indicated that their family ran their own business. The attrition rate was 13.40% (i.e., 39 participants did not have Time 2 data). From the parent-reported data, we utilized

only those whose child provided a valid response in Time 2. With this, there were a total of 228 parent responses.

Psychometric Properties of Measures Used

Confirmatory factor analysis using MPlus 7.31 (Muthén & Muthén, 1998–2010) was used to examine the factor structure of the EPL scales. Two absolute fit indexes (i.e., root mean squared residual (SRMR) and root mean square error of approximation (RMSEA)) and a relative fit index (i.e., comparative fit index (CFI)) were used as goodness-of-fit measures. Following Hu and Bentler's (1999) and Marsh, Hau, & Wen's (2004) recommendations, a good model fit was defined as one of CFI $\geq$ 0.9, RMSEA $\leq$ 0.08 and SRMR $\leq$ 0.08.

All the items loaded well (>0.30) on their respective factors except for an item in L intent, which had a poor loading of 0.247. This could be because the item was negatively worded ("I do not see myself as a leader or manager, in charge of others in my future working life"). The item was dropped from subsequent analyses. Overall, the three-factor structure fitted the EPL scales well. The E, P and L subscales each achieved good reliabilities, ranging from 0.64 to 0.92. The descriptive statistics, correlations and reliabilities of the finalized scales are presented in Table 13.1.

It was noted that though positive, the correlations between child-reported encouragement for E, P and L were not large in magnitude and it ranged from 0.345 to 0.525. The correlations between parent-reported encouragement for E, P and L were similar and ranged from 0.258 to 0.582. Finally, as with previous research literature, the correlations between child-reported encouragement and the corresponding parent-reported encouragement were all rather weak, ranging from 0.261 to 0.287. Overall, compared to their child, parents tended to report giving higher encouragement for E, P and L career paths.

Comparison Between Child and Parent-Reported EPL Encouragement

Following the weak correlations observed between the parent and child reports on encouragement, we briefly explored the apparent discrepancies between them with a paired samples t-test. These observed differences between child and parent-reported encouragement were significant for P, $t(227) = 5.330$, $p < 0.001$, and L, $t(227) = 3.761$, $p < 0.001$. However, the difference between parent and child-reported encouragement for E was not significant, $t(227) = 1.489$, $p = 0.138$.

The difference between the parent and child-reported encouragement scores for E, P and L were then calculated for each parent-child pair and correlated with EPL motivation, intent and efficacy. There were largely no significant correlations between

Table 13.1 Descriptive statistics, correlations and reliabilities

Variables		No. of items	Scale	M	SD	∝	1	2	3	4	5	6	7	8
1	Gender	1	Female/Male (0/1)	–	–	–	–							
2	Family business	1	Binary (Y/N)	–	–	–	0.023	–						
3	Child-reported E encouragement	1	5-point (1–5)	2.53	1.23	–	−0.017	0.188**	–					
4	Child-reported P encouragement	1	5-point (1–5)	2.94	1.17	–	0.057	0.015	0.418**	–				
5	Child-reported L encouragement	1	5-point (1–5)	3.05	1.26	–	0.146*	0.075	0.345**	0.525**	–			
6	Parent-reported E encouragement	1	5-point (1–5)	2.7	1.26	–	0.036	0.260**	0.261**	0.051	0.026	–		
7	Parent-reported P encouragement	1	5-point (1–5)	3.45	1.05	–	0.125	0.149*	0.081	0.280**	0.172**	0.258**	–	
8	Parent-reported L encouragement	1	5-point (1–5)	3.44	1.18	–	0.075	0.125	0.128	0.217**	0.287**	0.451**	0.582**	–

(continued)

Table 13.1 (continued)

Variables		No. of items	Scale	M	SD	∝	1	2	3	4	5	6	7	8
9	Entrepreneurial efficacy	11	5-point (1–5)	2.95	0.78	0.92	0.110	0.051	0.231**	0.262**	0.300**	0.166*	0.138*	0.241**
10	Professional efficacy	4	5-point (1–5)	3.28	0.83	0.87	0.064	0.039	0.175**	0.344**	0.226**	0.052	0.207**	0.167*
11	Leadership efficacy	6	5-point (1–5)	3.2	0.78	0.89	−0.065	−0.008	0.203**	0.287**	0.311**	0.063	0.165*	0.300**
12	Entrepreneurial intent	6	5-point (1–5)	3.02	0.69	0.84	0.087	0.177**	0.334**	0.157*	0.293**	0.287**	0.089	0.163*
13	Professional intent	4	5-point (1–5)	3.61	0.6	0.64	0.118	−0.031	−0.040	0.244**	0.117	0.068	0.223**	0.139*
14	Leadership intent	2	5-point (1–5)	3.41	0.81	0.72	0.090	0.151*	0.160*	0.150*	0.412**	0.079	0.106	0.256**
15	Entrepreneurial motivation	4	5-point (1–5)	3.03	0.73	0.68	0.111	0.155*	0.332**	0.187**	0.327**	0.269**	0.095	0.149*
16	Professional motivation	4	5-point (1–5)	3.99	0.57	0.72	0.015	−0.010	0.059	0.207**	0.167**	0.045	0.266**	0.205**
17	Leadership motivation	4	5-point (1–5)	3.71	0.66	0.77	−0.076	0.112	0.103	0.207**	0.244**	0.055	0.094	0.220**

(continued)

Table 13.1 (continued)

Variables		No. of items	Scale	M	SD	∝	9	10	11	12	13	14	15	16	17
1	Gender	1	Female/Male (0/1)	–	–	–									
2	Family business	1	Binary (Y/N)	–	–	–									
3	Child-reported E encouragement	1	5-point (1–5)	2.53	1.23	–									
4	Child-reported P encouragement	1	5-point (1–5)	2.94	1.17	–									
5	Child-reported L encouragement	1	5-point (1–5)	3.05	1.26	–									
6	Parent-reported E encouragement	1	5-point (1–5)	2.7	1.26	–									
7	Parent-reported P encouragement	1	5-point (1–5)	3.45	1.05	–									
8	Parent-reported L encouragement	1	5-point (1–5)	3.44	1.18	–									

(continued)

Table 13.1 (continued)

Variables		No. of items	Scale	M	SD	∝	9	10	11	12	13	14	15	16	17
9	Entrepreneurial efficacy	11	5-point (1–5)	2.95	0.78	0.92	–								
10	Professional efficacy	4	5-point (1–5)	3.28	0.83	0.87	0.568**	–							
11	Leadership efficacy	6	5-point (1–5)	3.2	0.78	0.89	0.632**	0.630**	–						
12	Entrepreneurial intent	6	5-point (1–5)	3.02	0.69	0.84	0.363**	0.135*	0.141*	–					
13	Professional intent	4	5-point (1–5)	3.61	0.6	0.64	0.083	0.339**	0.148*	−0.073	–				
14	Leadership intent	2	5-point (1–5)	3.41	0.81	0.72	0.303**	0.241**	0.396**	0.330**	0.103	–			
15	Entrepreneurial motivation	4	5-point (1–5)	3.03	0.73	0.68	0.366**	0.102	0.087	0.754**	−0.69	0.342**	–		
16	Professional motivation	4	5-point (1–5)	3.99	0.57	0.72	0.161*	0.386**	0.229**	0.059	0.578**	0.152*	0.072	–	
17	Leadership motivation	4	5-point (1–5)	3.71	0.66	0.77	0.354**	0.282**	0.545**	0.249**	0.045	0.499**	0.181**	0.156*	–

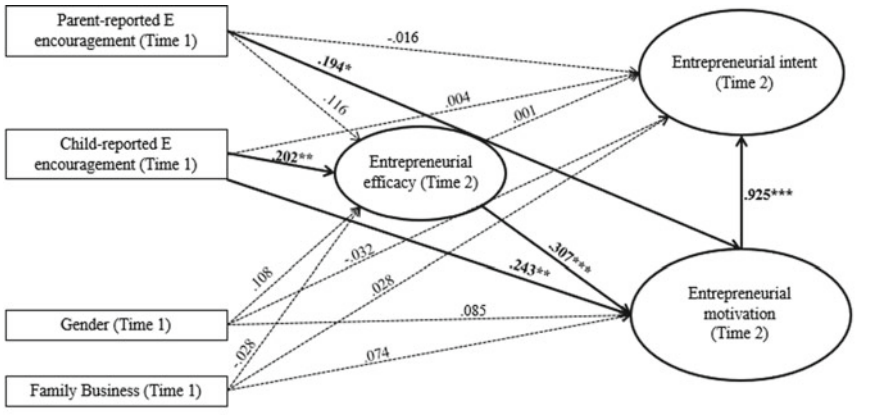
*$p < 0.05$, **$p < 0.01$

the differences in the parent and child reports of EPL encouragement and the EPL constructs. Where there were, the correlations were negative (i.e., smaller differences between the parent and child report of encouragement were related to a higher score on the EPL construct). Significant correlations were observed between the difference in reports for P encouragement and P efficacy ($r = -0.168$, $p = 0.011$), and between the difference in reports for L encouragement and L intent ($r = -0.143$, $p = 0.031$), and E intent ($r = -0.137$, $p = 0.039$) and E motivation ($r = -0.179$, $p = 0.007$).

Structural Equation Modeling

Based on the hypotheses, structural equation models were fitted for E, P and L separately using MLR estimation in MPlus 7.31 (Muthén & Muthén, 1998–2010). To examine mediation, the Sobel test (1982) was used. All analyses controlled for gender and presence of family business. For each of the three models, the same fit indices (SRMR, RMSEA, and CFI) and cut-offs for fit indices as used in Psychometric Properties of Measures Used were used to evaluate goodness-of fit.

Structural Equation Model for the Entrepreneurship Dimension. The model for entrepreneurship achieved the following fit indices: CFI = 0.893, RMSEA = 0.061, SRMR = 0.071. Taken together, the indices suggest good model fit. Figure 13.1 depicts the finalized model for entrepreneurship with standardized estimates.



Note: Standardized regression coefficients are shown. Significant paths are illustrated with solid lines. Non-significant paths are illustrated with dotted lines. Unillustrated for clarity: correlations between parent-reported encouragement, child-reported encouragement, gender, and family business.
*$p < .05$ **$p < .01$ ***$p < .001$

Fig. 13.1 Structural equation model for entrepreneurship

The results show that entrepreneurial self-efficacy was positively related with entrepreneurial motivation ($b = 0.307$, $p < 0.001$) and that entrepreneurial motivation was positively related to entrepreneurial intent ($b = 0.925$, $p < 0.001$), supporting Hypotheses 1 and 2. The indirect effect for entrepreneurial self-efficacy to entrepreneurial intent via entrepreneurial motivation was significant as well ($b = 0.284$, $p < 0.001$).

However, entrepreneurial self-efficacy mediated only the relationship between child-reported encouragement for entrepreneurship ($b = 0.202$, $p < 0.01$) and entrepreneurial motivation. As was expected from these results, the indirect effect for child-reported encouragement to entrepreneurial motivation via entrepreneurial efficacy was significant ($b = 0.062$, $p < 0.05$), while the similar indirect effect for parent-reported encouragement did not achieve significance ($b = 0.036$, $p = 0.120$). Hypothesis 3 was thus only partially supported.

It was also interesting to note that both child-reported immediate family encouragement for entrepreneurship ($b = 0.243$, $p < 0.01$) and parent-reported encouragement for entrepreneurship ($b = 0.194$, $p < 0.05$) had direct significant relationships with entrepreneurial motivation. Consequently, there was a significant indirect effect from child-reported encouragement to entrepreneurial intent via entrepreneurial motivation ($b = 0.225$, $p < 0.01$). There was a similar indirect effect from parent-reported encouragement ($b = 0.179$, $p < 0.05$).

Finally, there was a significant indirect effect from child-reported encouragement for entrepreneurship to entrepreneurial intent via entrepreneurial efficacy and entrepreneurial motivation ($b = 0.057$, $p < 0.05$). The similar effect for parent-reported encouragement did not attain significance ($b = 0.033$, $p = 0.121$). There were no significant differences between presence/absence of a family business and the two genders on the scores for entrepreneurial motivation, entrepreneurial intent, and entrepreneurial self-efficacy.

Structural Equation Model for the Professional Dimension. The model for the professional dimension achieved the following fit indices: CFI = 0.957, RMSEA = 0.043, SRMR = 0.040. Taken together, the indices suggest good model fit as well. Figure 13.2 depicts the finalized model for the professional dimension with standardized estimates.

The results show that professional motivation ($b = 0.425$, $p < 0.001$) was positively related to professional self-efficacy, lending support to Hypothesis 1. Professional motivation in turn was positively related to professional intent ($b = 0.818$, $p < 0.001$), supporting Hypothesis 2. As expected from these results, the indirect effect from professional self-efficacy to professional intent via professional motivation was significant ($b = 0.348$, $p < 0.001$).

However, only child-reported encouragement ($b = 0.326$, $p < 0.001$) from their immediate family was mediated by professional self-efficacy; this indirect effect on professional motivation via professional self-efficacy achieved significance ($b = 0.139$, $p < 0.01$). Parent-reported encouragement ($b = 0.233$, $p < 0.01$) for professional careers had a single significant direct path to professional career motivation. Parent-reported encouragement hence had a significant indirect effect on professional intent via professional motivation ($b = 0.190$, $p < 0.01$), but the indirect effect

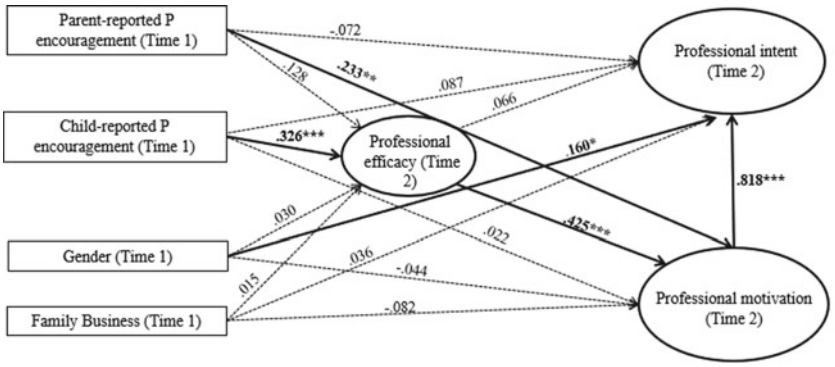


Fig. 13.2 Structural equation model for the professional dimension

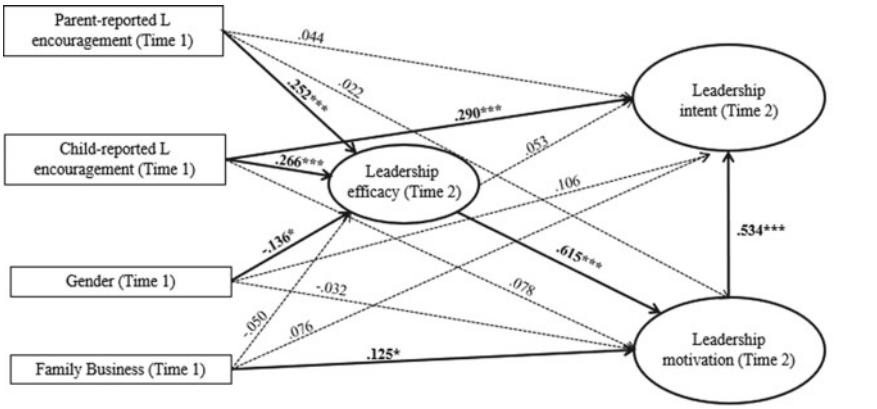
of parent-reported encouragement on professional motivation via professional self-efficacy was not significant ($b = 0.055$, $p = 0.110$). Hypothesis 3 was thus only partially supported in the case of the professional dimension.

Finally, there was significant indirect effect of child-reported encouragement on professional intent via professional self-efficacy and professional motivation ($b = 0.113$, $p < 0.01$). However, the similar indirect effect of parent-reported encouragement did not achieve significance ($b = 0.045$, $p = 0.122$). On average, males had higher professional intent scores ($b = 0.160$, $p < 0.05$). There were no significant differences between presence/absence of a family business on any professional career outcomes or self-efficacy scores.

Structural Equation Model for the Leadership Dimension. The model for leadership achieved the following fit indices: CFI = 0.938, RMSEA = 0.061, SRMR = 0.042, suggesting good model fit. Figure 13.3 depicts the finalized model for leadership with standardized estimates.

The results show that leadership self-efficacy mediated the relationship between encouragement for leadership careers and leadership motivation. Both child ($b = 0.266$, $p < 0.001$) and parent-reported ($b = 0.252$, $p < 0.001$) encouragement had a significant positive impact on leadership self-efficacy. There was a significant indirect effect from child-reported encouragement on leadership motivation via leadership self-efficacy ($b = 0.163$, $p < 0.001$) and a significant indirect effect from parent-reported encouragement on leadership motivation via leadership self-efficacy ($b = 0.155$, $p < 0.001$).

Leadership self-efficacy itself was positively related to leadership motivation ($b = 0.615$, $p < 0.001$) and leadership motivation was positively related to leadership intent ($b = 0.534$, $p < 0.001$). As expected from these results, the indirect effect of leadership self-efficacy on leadership intent via leadership motivation was significant



Note: Standardized regression coefficients are shown. Significant paths are illustrated with solid lines. Non-significant paths are illustrated with dotted lines. Unillustrated for clarity: correlations between parent-reported encouragement, child-reported encouragement, gender, and family business.
**p < .05 **p<.01 ***p<.001*

Fig. 13.3 Structural equation model for leadership

($b = 0.329$, $p < 0.001$). Hypotheses 1, 2 and 3 were thus fully supported for the L dimension.

Child-reported immediate family encouragement had a direct significant relationship with leadership intent ($b = 0.290$, $p < 0.001$). Child-reported encouragement also had a significant indirect effect on leadership intent via leadership self-efficacy and leadership motivation ($b = 0.087$, $p < 0.01$). The similar indirect effect for parent-reported encouragement was also significant ($b = 0.083$, $p < 0.01$).

An interesting observation from the leadership model was that adolescents whose families owned a family business had on average higher leadership motivation scores compared to those whose families did not ($b = 0.125$, $p < 0.05$). In addition, females on average had higher leadership self-efficacy scores compared to males ($b = -0.136$, $p < 0.05$).

Discussion

Consistent with the literature on social cognitive theory, the study found that verbal persuasion in the form of encouragement from the immediate family and parents did indeed positively influence the corresponding domain-specific self-efficacy, and such self-efficacy in turn was positively related to domain-specific motivation. Subsequently, domain-specific motivation was positively related to domain-specific career intent. For the EPL career aspirations, as was in the seminal work of Chan et al. (2012) with university students, the three dimensions appeared to be rather distinct from each other in this sample as well—they were distinctly and differently encouraged. There were relatively weak correlations among the levels of encouragement

for the three domains. Greater encouragement for P careers did not necessarily imply similar greater encouragement for E and L careers.

On the impact of parental encouragement, a key finding was that it is especially important for the adolescent to perceive that their parent is providing encouragement on their choice of careers. Across the E, P and L dimensions, child-reported encouragement was significantly and positively related to the corresponding domain self-efficacy, while parent-reported encouragement was only significantly related to the corresponding self-efficacy for the leadership dimension. In addition, there were direct paths from child-reported encouragement to entrepreneurship motivation and leadership career intent. These E and L results may suggest that, at least in the Singapore context, for careers which are less expertise-based and driven more by 'softer' skills like management and foresight, perceived encouragement is especially important for adolescents in order to boost their motivations and intentions of taking up such careers.

On a related note, it was also interesting to see that the direct path for encouragement in the professional dimension was from parent-reported professional encouragement to professional career motivation. Parent-reported encouragement was not linked directly to professional career intent—the effect of parent-reported encouragement on professional career intent was mediated by professional career motivation. Most strikingly, unlike the entrepreneurship and leadership dimensions, child-reported encouragement for the professional dimension had no direct paths to the outcomes of intent or motivation. It could be that the motivators for professional careers come from beyond the family, for example, from the school environment instead. Because of insufficient evidence in the current study to come to a definite conclusion regarding this finding, future research may endeavor to clarify the nature of this linkage.

It may also be possible that what was observed is an artefact of Singapore's emphasis on professional careers (i.e., the parent 'pushing' the child toward pursuing a professional career, but the adolescent not necessarily perceiving this 'push' as encouragement). Given the tendency to defer to parents in collectivist cultures (Sawitri, Creed, & Zimmer-Gembeck, 2015), adolescents would then still report a higher level of motivation to pursue a professional career as a result of this 'push' even if they did not view the 'push' in a supportive light. If this is indeed the case, it will be important to address these attitudes by working with parents to ensure proper support for their children's careers; adolescents who perceive their parents as being more supportive of their independence and interfering less are more capable of committing to career goals and are more proactive in preparing for careers (Guerra & Braungart-Rieker, 1999; Dietrich & Kracke, 2009).

Furthermore, as mentioned earlier, adolescent and parent perceptions of parental encouragement do not always match—what is viewed as encouragement by the parent may be seen as intrusive by the adolescent. Our results support the assertion that parent and adolescent reports of encouragement are not interchangeable and are relatively dissimilar—as evidenced by the weak correlations between the child and

parent reports and the significant differences found between the parent and child-reported P and L encouragement scores. How exactly the magnitude of this dissimilarity between the perceptions of the parent and child may affect career aspirations and outcomes could be an interesting point to follow up on in future studies. The present study provides some preliminary evidence to show that a smaller discrepancy between parent and child in the perception of P encouragement is related to higher P efficacy, and a smaller discrepancy in the perception of L encouragement is related to higher L intent, higher E intent and higher E motivation.

Other findings that were of interest were the gender differences (or lack thereof) in EPL self-efficacies. There were no significant differences between males and females on average for entrepreneurial or professional self-efficacy scores. However, females on average had higher leadership self-efficacy scores. These findings run somewhat contrary to what would be concluded from some of the literature. A survey done in Singapore by Poole and Cooney (1985) found that Singaporean male adolescents compared to females saw more high-status careers as befitting themselves. Bandura et al. (2001) found that male college students have equally strong efficacy for male and female-majority occupations, while female college students have lesser efficacy for traditionally-male occupations. In adult populations, women attain on average more education than men of the same age, but a greater proportion of men compared to women were found in high-prestige professional occupations (Ashby & Schoon, 2010). It has long been argued that the apparent lack of women in higher profile managerial positions is not due to a lack of interest on their part (Adler, 1993) and that there may be some less obvious types of prejudice against women managers in Singapore that limit career progression (Yuen, 1992). The finding that adolescent females in our sample had higher leadership self-efficacy scores on average lends support to Farmer's (1987) assertion that attempts to weaken occupational gender-stereotyping can start early. If parents can work to support and encourage their female adolescent's leadership development, it may help sustain this leadership career efficacy into adulthood.

Another notable finding involving gender was that adolescent males in our sample had on average higher professional career intent scores. The opposite trend was noted by some academics who found that adolescent females had higher career aspirations (Schoon & Polek, 2011) and were more intent on pursuing professional careers (Sikora & Saha, 2009). However, in adult populations, a traditional gender gap still appears to persist in professional career choices, possibly because of systematic gender-role beliefs, expectations (e.g. pressure to start a family) and societal structures (e.g. Buddeberg-Fischer, Klaghofer, Abel & Buddeberg, 2003; Coltrane, 2004; Jagsi et al., 2006). The current study cannot answer this conundrum but our findings with regard to gender differences, point to the need for appropriate parental engagement among adolescents to ensure that both male and female adolescents receive the encouragement they need to confidently pursue their careers of interest.

Finally, it was also noted that participants whose families owned a business had on average higher leadership motivation scores. This finding suggests that being exposed to and immersed in a family business may urge adolescents to develop their leadership competencies—perhaps in preparation to take over the business from their parents in the future.

Limitations and Practical Implications

The study did not consider a number of other factors which may be considered in further research. For example, the gender of the parent was not noted; studies have found that same-sex parent-child pairs may be particularly important to career development (Pizzorno, Benozzo, Fina, Sabato, & Scopesi, 2014). The study also did not consider attachment style, which has been found to be differently predictive for females and males for self-efficacy in career decisions (Lease & Dahlbeck, 2009). Socioeconomic status was also not accounted for—there is evidence that adolescents from higher income backgrounds are more likely to work towards achieving professional, expertise-based careers (Ashby & Schoon, 2010). With a Gini coefficient of 0.459 (Singstat, 2017), this consideration may be relevant to Singapore.

Notwithstanding the aforementioned limitations, the findings from the current study shed light on the applicability of EPL framework in a pre-university context. Specifically, we found that as a contemporary career framework, EPL offers a fresh perspective to understand the career aspirations of adolescents, and how domain-specific parental encouragement shape their respective aspirations in a meaningful way. Most importantly, given the nontrivial parental influence particularly in a collectivistic culture like Singapore, any form of intervention (e.g., entrepreneurship promotion and development initiatives targeting adolescents) must involve the parents to attain the desired outcomes (e.g., plant the desire for starting a business or pursuing enterprising careers) more effectively.

Conclusion

Overall, by grounding itself in the well-substantiated social cognitive theory and by applying the EPL framework as a means to contextualize contemporary career aspirations, the current study manages to provide ample affirmation that it is critical to secure the support of family and parents in helping to healthily encourage and support an adolescent's career development during their formative years. Acting as a bastion of encouragement for the adolescent is sufficient to effectively increase their E, P or L self-efficacy, motivation and intent to pursue these respective paths. At the same time, given the important role of the child's perception of parental

encouragement in influencing these outcomes, encouragement of parents should not come at the expense of the adolescent's own career goals especially when it comes to less traditional routes like entrepreneurship. Strategic programs may be needed to promote these newer career paths as viable and valuable to parents. With strong and appropriate backing and encouragement from parents, such parental influence will be an effective complementary action to school-based career programs. In summary, adolescent-related career development efforts must consider parental involvement and alignment in order to have an enduring impact.

Appendix

Self-efficacy

1	2	3	4	5
Not at all confident	A little confident	Moderately confident	Fairly confident	Extremely confident

Entrepreneurship Domain:

1	I understand the mindset of consumers and how to market my product/service to them
2	I am confident of developing a product using needs identification techniques
3	I know how to pitch and sell ideas and products/services to people
4	I am able to assess the strengths and weaknesses of my business idea in comparison to existing products/services in the market
5	I understand how to develop and analyse income statements
6	I am able to see myself starting and running a business in future
7	I am able to determine appropriate pricing strategies and channels for marketing
8	I am capable of conducting market research by myself
9	I am able to communicate my business ideas to other people such as mentors, potential customers and potential business partners
10	I understand the financial requirements and considerations to start and run a business
11	I am confident of doing up a budget for my business

Professional Domain:

1	I can conduct research to contribute to advanced knowledge in my desired area of specialisation
2	I am confident of becoming one of the best experts or professionals in my field of specialisation

(continued)

(continued)

3	I am able to share with others my knowledge in my desired area of work specialisation or profession
4	I keep up with developments and changes in my desired area of specialisation or profession

Leadership Domain:

1	I motivate others working with me to do more than they dreamed they could do
2	I am able to take charge of decisions needed for a group or organization
3	I am able to rally my team to work towards a common goal
4	I am able to develop and train future leaders for an organization
5	I am able to plan, direct, organize and prepare others as to what they need to do
6	I am able to inspire others through the vision I create

Intent

1	2	3	4	5
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

Entrepreneurship Domain:

1	I am definitely going to be an entrepreneur after my studies and am prepared to do anything to achieve that goal
2	I will start my business within 10 years of joining the workforce
3	When I have enough work experience and funding, I am certain to start my own business
4	If given a chance, I would join a young start-up company to help it to grow
5	I will start my business within 5 years of joining the workforce
6	I have a viable business idea and intend to start my own business soon after my studies

Professional Domain:

1	I'd much prefer a career as a specialized expert or professional in a large and stable organization
2	I see myself continuously furthering or advancing in my specialization and professional/technical expertise throughout my working life
3	I definitely don't see myself working as a professional or a technical expert after graduating from my studies
4	My main career goal is to be a technical expert, specialist or professional in my field of study

Leadership Domain:

1	I do not see myself as a leader or manager, in charge of others in my future
2	I plan to become a leader or manager in the near future
3	My main career goal is to rise up the ranks as a leader or manager in charge of others in an organization

Motivation

1	2	3	4	5
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

Entrepreneurship Domain:

1	I feel I ought to live up to my parents' expectations to work in an entrepreneurial business environment
2	Ever since I was a kid, I have dreamed about opening my own business
3	I am the kind of person who constantly has ideas about making money
4	This country needs more entrepreneurs and I feel obliged to "give it a go"

Professional Domain:

1	The best way to increase my country's competitiveness is for people like me to become highly skilled professional in my field of study
2	It is a privilege and honour for me to excel in my chosen area of study
3	I am the kind of person who strives to be highly specialized in my field of study
4	I like to be highly specialized and experienced in a specific set of skills

Leadership Domain:

1	I am the kind of person who likes influencing and managing people more than doing anything else
2	I agree to lead whenever asked or nominated by other group members
3	I feel that I have a duty to lead others if I am asked
4	I've always enjoyed leading others and have assumed leadership roles whenever I could

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Chapter 14
EPL Career Aspirations and Early-Stage Entrepreneurship Activities: Insights from Singapore Global Entrepreneurship Monitor Adult Population Survey 2012–2014

Oleksandr S. Chernyshenko, Marilyn A. Uy and Weiting Jiang

Abstract This chapter aims to extend past research on predicting early entrepreneurial activities by studying the role of entrepreneurship, professionalism, and leadership (EPL) career aspirations (Chan et al., 2012a, b). Using data from Singapore Global Entrepreneurship Monitor (GEM) Adult Population Survey (N = 6002), we show entrepreneurship (E) career aspirations to have positive relationships with early entrepreneurship activities, while professional (P) career aspirations to have negative relationships with early entrepreneurship activities. Moreover, both E and P career aspirations exhibited incremental validities even after demographics and entrepreneurial attitudes were included in the regression model. These patterns of findings are similar to those obtained with past research using university student samples, suggesting that the EPL career aspirations model may generalize beyond university settings.

Keywords Total entrepreneurial activity · Career aspirations · Entrepreneurial attitudes · Global entrepreneurship monitor · Adult population survey

Introduction: Entrepreneurship in Singapore

Entrepreneurs play a vital role in the overall economic growth and development of any nation. They create new business ventures selling new products or services that enable the development of new markets, and the creation of new wealth and job opportunities (Baumol, 2002). In order for small innovation-driven countries such as Singapore and Israel with limited or no natural resources to stay competitive in the global economy,

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they would need even more entrepreneurs to bring about innovation and community transformation, and to increase the likelihood of homegrown companies entering regional and international markets (Teng, 2016). Fostering entrepreneurship in these environments has therefore become more critical than ever before.

One of the best international indicators of entrepreneurial activity around the world is the Global Entrepreneurship Monitor (GEM). In each participating country, GEM conducts two surveys: the Adult Population Survey (APS) and the National Expert Survey (NES). The APS utilizes phone landlines to interview a representative sample of at least 2,000 or more adults in each country. These respondents are randomly selected citizens or permanents residents of the country and are aged between 18 and 64 years. The APS data are then used to estimate the entrepreneurial participation in the country by counting the percentage of people who report being engaged in entrepreneurial activities. The APS also collects information about attitudes towards entrepreneurship and other related activities, which allows research to be conducted to better understand factors that lead to start-up of new firms.

While the adult population survey captures the general attitude of the population, the NES captures a different but nevertheless vital insight into the dynamics of entrepreneurship from experts deeply involved in the entrepreneurial landscape. In each country, a minimum of 36 experts, selected for their expertise in areas relevant to entrepreneurship such as finance or government policy, are interviewed via phone, email or in-person on the state of entrepreneurship. In total, 60–80 countries participate in GEM every year and the data from GEM allows us to make comparisons between countries having different development levels.

In this chapter, we focus only on data from Singapore and it is based on three years of Global Entrepreneurship Monitor (GEM) data collected in 2012, 2013, and 2014. According to GEM Singapore Report's NES results from 2012 to 2014 that reflected the state of nine entrepreneurial conditions purported to shape entrepreneurial activities in a country, Singapore had been investing heavily on improving its entrepreneurship ecosystem. Singapore was consistently ranked either first or among the top for most of the conditions from 2012 to 2014, in comparison with 25 other innovation-driven countries, such as the US, Australia or Japan (Chernyshenko et al., 2013, 2014, 2015). Notably, Singapore was ranked first in entrepreneurial financial support, government policies, and government entrepreneurship programmes, and among the top five for education and training, research and development transfer, and market openness during 2014 (Chernyshenko et al., 2015). These scores and rankings indicate stable and optimal conditions for individuals to set up their businesses in Singapore, thus demonstrating a vibrant entrepreneurial scenario in the nation.

The ever-thriving entrepreneurial scenario in Singapore was also evident among local residents' level of participation in entrepreneurial activities, as suggested in the results of GEM APS section. The number of respondents who expressed their intent to start a business within the next three years remained relatively high from 2012 to 2014 (2014: 15.0%, 8th; 2013: 20.3%, 3rd; 2012: 21.4%, 2nd), often putting Singapore ahead of many other innovation-driven countries across the years (Chernyshenko et al., 2013, 2014, 2015). This result has also been supported by Singapore's performance in the rate of Total Early-Stage Entrepreneurial Activities (TEA), where it was

consistently ranked among the top. The TEA rate is the sum of the percentages of all respondents involved in either a nascent firm, which refers to a new start-up with no wages paid for more than 3 months, or a young firm or new business for which wages have been paid between 3 and 42 months (GEM, n.d.). In 2014, Singapore was ranked 4th out of 27 innovation-driven countries, with a TEA rate of 11.0%, coming just right behind the US, Australia and Canada (Chernyshenko et al., 2015). This figure is similar to those observed in 2013 and 2012, 10.7% (3rd) and 11.6% (2nd), respectively (Chernyshenko et al., 2013, 2014). Altogether, the GEM results through the years indicate that Singapore's level of participation in entrepreneurial activities has remained stable and comparatively high in relation to other innovation-driven economies.

Individual Factors Predicting Early Entrepreneurial Activity

To promote entrepreneurship effectively, one needs to understand the reasons that propel early entrepreneurial activities not only from the macro level (e.g., effects of government policies, availability of financial and human capital, legal environment), but also from the level of an individual who is contemplating on starting a new business. To this end, studies have generally looked at two types of predictors: demographic and attitudinal. Demographic studies have shown that individuals' likelihood of starting a business develops at a relatively early age, peaks between 25 to 34 years old, and decreases thereafter (Blanchflower, 2004; Lévesque & Minniti, 2011). Additionally, males (Blanchflower, 2004), employed individuals (Blanchflower, 2004; Arenius & Minniti, 2005), and those with higher household income (Evans & Jovanovic, 1989), are more likely to start a business compared to their respective counterparts. Knowing other entrepreneurs also influences individuals' decision to start a business, perhaps because the entrepreneurs serve as role models who have the ability to instil confidence in these aspiring individuals by providing advice, support, and resources (Weber & Milliman, 1997; Minniti, 2005). Finally, there were mixed results for the relationship between educational attainment and the setting up of a business. While entrepreneurs are often thought to possess a broad range of talents with no advanced education in any specific area (Leazar, 2002), post-graduate education seems to have positive effects on high-tech start-up rates (Blanchflower, 2004).

Several entrepreneurial attitudes have been found to be consistently associated with individuals' intention to start a business. First, when individuals see opportunities to start a business, the likelihood of making the decision to set up a new business also intensifies (Baron, 2000; Arenius & Minniti, 2005; Nishimura & Tristán, 2011). Second, perceived fear of failure appears to decrease the likelihood of having the intent to start a new business (Weber & Milliman, 1997). Finally, positive attitudes towards entrepreneurs and entrepreneurship have also been shown to be strong predictors of an individual's likelihood to engage in entrepreneurial activities (Arenius & Minniti, 2005).

EPL and Entrepreneurial Activities

The Entrepreneurship, Professionalism, and Leadership (EPL) Career Aspirations framework proposed by Chan et al. (2012a, 2012b) could meaningfully add to the burgeoning literature on predicting early entrepreneurial activities. The EPL framework focuses on a holistic view of career aspirations, where entrepreneurship motivations and efficacies are considered in the context of alternative career paths such as management and expert/specialist. Studies involving university students, for example, indicated that entrepreneurial career aspiration related negatively with professional career aspirations, suggesting that entrepreneurial and professional career aspirations might be competing career trajectories (Chan et al., 2012a, 2012b). In that study, nascent entrepreneurial activities were positively predicted by entrepreneurial motivation and efficacy, but negatively predicted by professional career motivation and efficacy, suggesting that students interested to pursue professional careers tended to move away from entrepreneurial careers and activities (Chan et al., 2012a, 2012b).

In another study, Chan et al. categorized individuals into eight "profile" groups on the basis of whether their entrepreneurial (E), professional (P), and leadership (L) motivation scores were above or below the mean obtained for the study's sample (Chan et al., 2015). Those who were high in entrepreneurial career motivation would be deemed as less ready to make a choice among traditional career trajectories (i.e., careers which are high in professional motivation—highly specialized vocations and professions, such as doctors), and more likely to steer towards preparation and creation of their own career opportunities (Chan et al., 2015). Hence, these results suggest that students who were high in entrepreneurial motivation and efficacy and low in other competing career aspirations were more likely to set themselves in an entrepreneurial career path and be engaged in nascent entrepreneurial activities.

This chapter builds on aforementioned studies and examines whether EPL career aspirations can predict early entrepreneurial activities in a large and representative sample of Singapore residents. Chan at el. (2012a, 2012b, 2015) studies have been conducted in university settings, where professional ethos and expertise are clearly emphasized, and entrepreneurship and leadership themes are of secondary concerns. It is unclear, however, if the importance of EPL career aspirations for predicting entrepreneurial activities would also hold for the adult population outside the university context. Additionally, this chapter looks at the predictive value of EPL constructs beyond commonly studied demographic variables and entrepreneurial attitudes. Showing such incremental validities would provide evidence for the EPL framework's practical usefulness. Specifically, we expected that, after controlling for demographic characteristics and entrepreneurial attitudes, E and P career aspirations will significantly predict participation in entrepreneurial activities. We also expected that the findings from university EPL studies will generalize to the broader adult population (i.e., regression weights for E career aspirations will be positive, while those for P career aspirations will be negative). L aspirations were not expected to

be related to entrepreneurial activities as people with high L motivations are primarily concerned with improving the functioning of existing organizations rather than starting the new ones.

Method

Participants

Participants were 6,007 Singapore citizens or permanent residents, aged between 18 and 65 years old, who responded to the GEM Adult Population Survey (APS) in 2012 ($N = 2{,}001$), 2013 ($N = 2{,}000$), and 2014 ($N = 2{,}006$). As the GEM APS attempts to collect a representative sample of the nation's population, demographic variables were evenly distributed in the sample. Respondents' mean age was 39.63 ($SD = 13.24$), and they were equally divided by gender ($N_{\text{Male=}}3004$; $N_{\text{Female=}}3003$). Majority of the respondents were working adults ($N = 4395$, 74.8%), while the remaining 25.2% were unemployed ($N = 1480$). Looking at their household income, 34.8% came from the lowest 33rd percentile ($n = 1799$), 34.0% middle 33rd percentile ($n = 1758$), and 31.1% upper 33rd percentile ($n = 1609$). 64.9% of respondents have a post-secondary education degree (e.g., polytechnic or university).

Procedures

The GEM APS data were collected by an independent survey vendor. The survey was translated into Chinese and Malay to accommodate non-native English speakers. To have a representative sample, phone numbers were randomly selected from in-house "digitized Singapore residential listing" and various rules were applied to minimize sampling biases. Data were collected via computer-assisted telephone interviewing (CATI) methods and participants gave informed consent prior to the interview. Responses were then entered and cleaned to ensure that the raw data sets were free of key-punch error, before they were submitted to GEM for data checking.

Measures

As a leading international indicator of entrepreneurial activity around the world, the GEM APS provides valuable insight into the state of entrepreneurship within and across developed and developing economies; typically, 50–60 countries participate in the survey. The core questionnaire module contains a group of mandatory questions which do not change from year to year, and they are usually used to measure

the main GEM indicators, such as attitudes towards entrepreneurship and the TEA rate. Most questions use a dichotomous (Yes/No) response format. Respondents also have the option of "don't know" for refusing to answer the question, of which values were coded as missing. A small set of demographic variable is also collected, including gender, age, education, employment status, and income level. All demographic variables were dummy coded according to conventions with higher codes reflecting higher levels of each variable. Gender was coded as 1 = female, and 0 = male.

Entrepreneurial attitudes were assessed with questions that previously had been shown to relate to entrepreneurial activities. Questions asked about (1) perceived opportunity to start a business, (2) fear of failure that would prevent one from starting a business, (3) knowing other entrepreneurs, and (4) whether successful entrepreneurs receive high status in society. All four questions were presented in a dichotomous (Yes/No) response format.

Early-stage entrepreneurial activities were operationalized as a sum of three dichotomously scored questions (having the intention to start a business in the next 3 years, being a nascent entrepreneur in the process of setting up a business, or being a new-firm entrepreneur with a business that is not more than 42 months old. This is consistent with the definition used by GEM to report on the status of entrepreneurial activities within and across countries.

Finally, we measured EPL career aspirations by asking respondents about their early career motivations ("When you were younger, which of the following career choices were most appealing to you?"), as well as about their perceived EPL efficacies ("Do you think that your abilities, skills, and personality are best suited to be…?"). Due to survey administration constraints, EPL questions were asked in a force-choice format (choosing between "Manager", "Professional", "Entrepreneur", and "None of these"). To create separate indicators of E, P, and L career aspirations, we recoded forced-choice responses into separate dummy variables reflecting E, P, and L motivations and efficacies, which were then combined to create a single variable for each of the three career paths.

Results

Table 14.1 shows the means, standard deviations, and intercorrelations for all variables included in this study. Consistent with past research from other countries, a number of demographic variables correlated with early entrepreneurial activities. Specifically, gender ($r = -0.09$), work status ($r = 0.14$), and income ($r = 0.08$) had highest correlations with this important outcome. Also consistent with past research, personally knowing successful entrepreneurs and seeing opportunities to start a business were positively correlated with reported entrepreneurial activities ($r = 0.26$ and $r = 0.21$, respectively), while fear of failure had a negative correlation ($r = -0.06$). All correlations were significant at 0.01 level, because the sample size was very large ($N = 6{,}007$). On EPL career aspirations, E aspirations had a high positive correlation with early entrepreneurial activities ($r = 0.32$), while P aspirations had a negative

Table 14.1 Means, standard deviations, and intercorrelations of variables under study

	Variables	N	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11
1	Age	5815	39.86	13.24											
2	Gender	6007	0.50	0.50	0.05										
3	Work status	5875	0.75	0.43	0.06	−0.20									
4	Education	5908	0.65	0.48	−0.32	−0.13	0.20								
5	Income	5166	0.96	0.81	−0.01	−0.06	0.14	0.36							
6	Knowing a start-up entrepreneur	5950	0.18	0.39	−0.07	−0.07	0.11	0.17	0.21						
7	Perceived opportunities	6007	0.17	0.38	−0.09	−0.03	0.05	0.11	0.08	0.18					
8	Fear of failure	6007	0.40	0.49	−0.06	0.03	0.03	0.09	0.06	0.00	0.00				
9	E aspiration	6007	0.44	0.72	0.04	−0.06	0.05	−0.07	−0.02	0.11	0.11	−0.06			
10	P aspiration	6007	0.93	0.87	−0.19	0.02	0.03	0.26	0.14	0.01	0.00	0.14	−0.52		
11	L aspiration	6007	0.29	0.59	−0.01	−0.05	0.03	0.09	0.07	0.02	0.01	0.01	−0.20	−0.36	
12	Total entrepreneurial activity	5882	0.30	0.58	−0.05	−0.09	0.14	0.05	0.08	0.26	0.21	−0.06	0.32	−0.12	−0.03

Note All correlations are significant at 0.01; $N = 6{,}007$; work status was coded as 0 = not working, and 1 = working, education was coded as 0 = secondary education only, and 1 = postsecondary education, and income was coded as 0 = lowest 33%, 1 = middle 33%, and 2 = highest 33%

correlation ($r = -0.12$). These results were consistent with our hypotheses and, more importantly, replicated the findings from student samples. Also as expected, L aspirations had near zero correlation with early entrepreneurial activity.

Next, we ran a series of multiple regression analyses to investigate the contribution of demographic, attitudinal, and EPL aspiration variables in predicting early entrepreneurial activities. Step 1 of Table 14.2 shows regression results (standardized beta coefficients and significance levels) for demographic variables only. Note that, before the analyses, the age variable was centered and a quadratic term was created to allow for the testing of curvilinear relationships. As can be seen in the table, demographic variables explained 3.3% of variance in reported early entrepreneurial activities. With the exception of education, all other variables were significant. Age had an inverted U-shaped relationship with entrepreneurial activities as was evidenced by a significant quadratic term.

After adding entrepreneurial attitudes, the variance explained by the model increased by 8.7–11.9% (see Step 2 of Table 14.2). All three attitudes contributed significantly, though fear of failure has a comparatively lower beta weight ($\beta = -0.07$). Consistent with past research, both demographic and attitudinal variables appeared to be important to explaining early entrepreneurial activities.

In the final set of regression analyses, we added to demographic and entrepreneurial attitudes either entrepreneurship career aspirations (Step 3A), professional career aspirations (Step 3B), or leadership career aspirations (3C). Note that we could not use E, P, and L career aspirations variables together, because these variables originated from forced-choice data, and thus are interdependent. As can be seen in Step 3A Table 14.2, adding E career aspirations increased multiple R from 0.35 to 0.44, which translates to an additional 7.5% variance explained. That was despite the fact that many demographic and entrepreneurial attitude predictors of entrepreneurial activities were already included in the model. P career aspirations also provided incremental validity in explaining early entrepreneurial activity, but the regression weight was negative. Consequently, based on these results, we can conclude that the findings from university EPL studies could generally apply to the broader adult population.

Discussion

This study has examined the determinants of entrepreneurial activities; particularly, the applicability of EPL career aspirations as incremental predictors of individuals' engagement in early-stage entrepreneurial activities after controlling for demographic characteristics and entrepreneurial attitudes. The data came from a large and representative sample of Singapore residents and was obtained from the GEM Singapore APS in 2012, 2013 and 2014.

We found that, among the demographic characteristics, significant predictors were age, education and work status. The age variable had an inverted U-shaped relationship with entrepreneurial activities which was congruent with the findings from

Table 14.2 Multiple regression results for predicting total entrepreneurial activity

Variables	Step 1		Step 2		Step 3A		Step 3B		Step 3C	
	Beta	Sig.	Beta	Sig.	Beta	Sig.	Beta	Sig.	Beta	Sig.
Age (centered)	−0.06	0.00	−0.04	0.01	−0.04	0.00	−0.05	0.00	−0.04	0.01
[Age (centered)]^2	−0.06	0.00	−0.05	0.00	−0.04	0.00	−0.05	0.00	−0.05	0.00
Gender (Female)	−0.07	0.00	−0.06	0.00	−0.04	0.00	−0.05	0.00	−0.06	0.00
Work status (Working)	0.11	0.00	0.09	0.00	0.08	0.00	0.09	0.00	0.09	0.00
Education	−0.03	0.06	−0.05	0.00	−0.02	0.12	−0.02	0.11	−0.05	0.00
Income	0.06	0.00	0.02	0.22	0.03	0.07	0.03	0.06	0.02	0.18
Knowing a startup entrepreneur			0.21	0.00	0.19	0.00	0.21	0.00	0.21	0.00
Perceived opportunities			0.17	0.00	0.14	0.00	0.16	0.00	0.17	0.00
Fear of failure			−0.07	0.00	−0.05	0.00	−0.05	0.00	−0.07	0.00
E aspirations					0.28	0.00				
P aspirations							−0.13	0.00		
L aspirations									−0.04	0.01
R	0.18		0.35		0.44		0.37		0.35	
R^2	0.033		0.119		0.194		0.134		0.120	
ΔR^2					0.075		0.015		0.001	

Note $N = 5{,}061$

previous studies (Lévesque & Minniti, 2011; Sepúlveda & Bonilla, 2011). Results for work status were also consistent with prior research that showed that individuals who worked full time were more likely to be nascent entrepreneurs than people in other occupation groups such as those who were not working, retirees, and students (Arenius & Minniti, 2005).

Secondly, all entrepreneurial attitudes were found to be significant factors in driving individuals' participation in at least 1 early-stage entrepreneurial activity. Consistent with previous studies (Arenius & Minniti, 2005, Weber & Milliman, 1997), individuals who know an entrepreneur, perceived the presence of opportunities around them to set up a business, and had lower fear of failure were more likely to engage in early-stage entrepreneurial activities. Entrepreneurial attitudinal variables appeared to be relatively powerful predictors in comparison to demographic variables, as was evident from much larger standardize regression coefficients. These results seem to affirm the importance of fostering entrepreneurial attitudes in driving participation in entrepreneurial activities.

Finally, in addition to entrepreneurial attitudes and demographics, the E and P career aspirations provided incremental validity in predicting early entrepreneurship activities. In fact, E aspirations appeared to have the largest regression weight among all studied variables, indicating that an early interest in entrepreneurship and perceived E efficacy are among most powerful drivers of early entrepreneurship. On the other hand, alluding to what was found in past EPL studies as well as in this study, high professional motivation appear to hinder one's desire to pursue entrepreneurial activities. These results support Chan et al.'s (2012a, 2012b, 2015) earlier findings that individuals who have entrepreneurial motivation and efficacy may tend not to follow traditional career paths and become early-stage entrepreneurs instead. More importantly, although the EPL framework was primarily developed using university student samples, our study shows that it can also be used as a theoretical lens for understanding entrepreneurial aspirations of working adults.

Limitations and Future Research

While the strength of this study was in its representative sampling, the limitation was in the type of survey items that could be administered. Majority of the variables in this study were single-item, dichotomously scored questions, so correlation and regression estimates had likely been attenuated. The EPL questions were administered in a forced-choice format, which necessitated creating interdependent dummy variables (that prevented using all EPL variables in a single regression model). Future studies should use reliable, multi-item measures, so that relationships between predictors and the outcome can be better estimated. Also, because all information was collected at the same time, regression results should be interpreted with caution. Retrospective recall of career aspirations could be prone to errors and there could have been confirmation biases.

Conclusion

In conclusion, we believe our findings provided useful information which shed more light on the underlying factors that influence an individual's participation in early-stage entrepreneurial activities. While most findings on demographic variables and entrepreneurial activities have been consistent with existing literature, the highlighted relevance of EPL career aspirations is novel. The main implication of the study is that, for countries with limited natural resources that must rely on entrepreneurship and innovation as the main drivers of economic growth, local policymakers could consider implementing more targeted efforts toward nurturing favourable entrepreneurial attitudes as well as promoting early entrepreneurial career aspirations.

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Chapter 15
Examining the Influence of Individual, Social Cognitive and Environmental Factors on Students' Entrepreneurial Intentions: Application of the Social Cognitive Career Theory (SCCT) Framework Within a Multidimensional Career Space

Keren-Happuch Fan Fen E and Moon-Ho Ringo Ho

Abstract Chan et al. (2011, 2012) proposed the Entrepreneurial, Professionalism, and Leadership (EPL) framework to characterize one's lifelong career evolutions within the EPL dimensions. However, the current EPL framework does not specify how one's EPL aspirations may develop, nor does it examine the relevant factors that may facilitate or hinder the development of EPL aspirations. This paper adopts the Social Cognitive Career Theory—to delineate how one's career decisions—, as defined by the Entrepreneurial, Professionalism, and Leadership (EPL) career framework, can be facilitated and highlight factors that may affect the career choices. In particular, we examined the influence of individual, social cognitive, and environmental factors on the development of 396 university students' entrepreneurial intentions and the process of career choice-making through structural equation modelling technique. Consistent with earlier findings, the results of this study found support for hypotheses concerning core SCCT variables (self-efficacy, outcome expectations, goals, and interests) while suggesting a need to include additional constructs (such as individual differences and contextual factors). Implications and suggestions for future research on the SCCT choice model and its application within the multidimensional EPL framework are discussed.

Keywords Entrepreneurial efficacy · Entrepreneurial intention · Entrepreneurial outcome expectation · Social cognitive career theory · EPL framework · Risk aversion

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Introduction

Nearly three decades ago, Hisrich (1988) observed a growing interest in entrepreneurship and described it as an avenue where new ways of meeting economic challenges were promoted through the creation of wealth, employment opportunities, and global competitiveness. The interest in entrepreneurship is currently a worldwide one (Levenburg & Schwarz, 2008), as evidenced by not just a surge in research on the nature of entrepreneurship, but also in the fostering of entrepreneurial attitudes and development of relevant skills through entrepreneurship courses offered by an increasing number of tertiary institutions (Charney & Libecap, 2000; Raposo & do Paco, 2011).

Yet, achieving a common definition of what entrepreneurship entails remains a challenging task for researchers given the many ways the concept can be, and has been construed. We see many definitions of entrepreneurship. It has been viewed as a process where new ventures based on innovative practices are started in order to promote profitability and growth (Carland, Hoy, Boulton, & Carland, 1984). It has also been defined as the pursuit of opportunities beyond the constraints of available and controlled resources (Stevenson & Jarillo, 1990). A more recent view of entrepreneurship is from a scholarly examination of the processes, persons, and outcomes involved in the creation, evaluation, and exploitation of potential products and services given certain opportunities (Shane & Venkataraman, 2000). It is becoming clearer that entrepreneurship is a complex phenomenon best understood from its myriad contexts (Bruyat & Julien, 2001).

From Entrepreneurial Economies to Understanding Entrepreneurs

Prior studies on entrepreneurship focused largely on the economics of it; research in this area has primarily been on entrepreneurial behaviour, the outcome of entrepreneurial acts, its impact on businesses, and ultimately, its contribution to the overall economy. More recent studies acknowledge the importance of understanding the person driving such entrepreneurial acts, and attempts have been made to increase our awareness of why individuals choose entrepreneurship over alternative career options. Aspects of entrepreneurial research include the examination of one's entrepreneurial intention and behaviour using indicators such as motivation, personality, and environmental factors (Indarti, Rostiani, & Nastiti, 2010; Mazzarol, Volery, Doss, & Thein, 1999), and the development of career theories that attempt to provide more holistic accounts of the factors underlying one's choice to become an entrepreneur.

Career theories are classified by the focus adopted and there are two broad categories of career theories at present: the person-environment (P-E) fit approach and developmental approach. The P-E fit approach assumes that all individuals have a tendency to locate or create environments where their traits can be applied, and the

more individuals feel aligned with their work environment, the more they are likely to experience positive outcomes at work in terms of satisfaction, performance, and productivity (Su, Murdock, & Rounds, 2015). The developmental approach to career is concerned with the processes and experiences individuals face over the course of their development. This approach emphasizes on the interplay among the person, the context, and the learning experiences.

Lent, Brown, and Hackett's (1994) social cognitive career theory (SCCT) is one such developmental career theory that has gained attention as an integrated framework for examining various issues, particularly in the trajectory of science, technology, engineering, and mathematics (STEM) education, and providing a comprehensive understanding of the career development process (Lent et al., 2001, 2003b). It is an expansion of Bandura's (1986) social cognitive theory; where Bandura's social cognitive theory was concerned with the ways people and their behaviours interact with the environment, SCCT argues that three social cognitive variables (self-efficacy, outcome expectations, and goals) represent key mental processes that allow people to make autonomous decisions in the development of their careers (Lent, Brown, & Hackett, 2006). The theory assumes that individuals engage in activities that they believe they are capable of accomplishing (strong self-efficacy beliefs), which are expected to bring them certain valued outcomes (outcome expectations). SCCT also posits that based on their self-efficacy and outcome expectations, individuals set personal goals either in the form of intention to pursue a particular direction (choice goals), or attain certain levels of performance (performance goals). Outcomes of their goals help them update their self-efficacy beliefs and outcome expectations that in turn guide individuals to either alter or confirm their beliefs and expectations.

While SCCT has been widely applied in the field of vocational psychology (e.g., Brown et al., 2008; Wang, 2013), its application in the entrepreneurial domain only gained traction recently. Existing literature in the field of entrepreneurship primarily explores the development of entrepreneurial intention and is based on models such as Ajzen's (1991) Theory of Planned Behavior (TPB) and Shapero's Entrepreneurial Event (SEE; Shapero & Shokol, 1982) model. In contrast, the roles of core SCCT constructs in the development of entrepreneurial intentions and interests have only just been examined in recent studies (e.g., Segal, Schoenfeld, & Borgia, 2007a; b; Wilson, Kickul, & Marlino, 2007; Zhao, Seibert, & Hills, 2005). To date, there are four SCCT-based models on the development of educational and occupational interests: (1) the interest development model; (2) the choice-making model; (3) the performance and persistence model; and (4) the work satisfaction model (Lent & Brown, 2006, 2013). The present study is focused on examining the development of students' entrepreneurial intention and the process of career choice-making using the SCCT choice model framework. We have opted to adopt this model as it considers the person, the context and experiential-learning influences (Lent, Brown, & Hackett, 1994, 2000) and the indirect influences that personality and context has on choice goals via self-efficacy (Lent & Brown, 2013) in shaping of one's career.

An extension of the interest development model, the SCCT choice model posits that in addition to interests, one's self-efficacy beliefs, outcome expectations, and environmental or contextual influences shape one's choice goals. Self-efficacy and

outcome expectations serve as the core variables of the model and taken together, they can be defined as a dynamic set of beliefs that one holds about one's abilities in various performance domains (Lent, 2005); one's beliefs about the ramifications stemming from certain actions and behaviours that play a part in forming one's eventual action choices (Lent, Brown, & Hackett, 2000, 2002) and these choices include career choices. Environmental influences are conceptualized as distal or proximal, in terms of their temporal relation to actual choice-making. Distal contextual factors occur much earlier in life and can be understood as factors that influence the development of individuals' self-efficacy beliefs and outcome expectations. They include one's opportunities for learning and the nature of the exposure in gender-role socialization. Proximal factors comprise various levels of support and the barriers that one encounters during one's active phase of decision making and this also includes the availability of emotional and financial support for one to pursue certain options. Proximal factors are deemed as direct influences to one's choice goals (Swanson & Fouad, 2014; Lent, Brown, Nota, & Soresi, 2003a; Lent et al., 2003b).

SCCT and Its Application Within the Entrepreneurial, Professionalism, and Leadership Framework of Careers

While existing career theories account for the development of careers within fixed employment trajectories, they are limited in exploring the fluidity and availability of increased options in an individual's working lifespan. Students and active workforce members face demands in adapting to novel responsibilities and opportunities, or in cultivating career adaptability (Uy, Chan, Sam, Ho, & Chernyshenko, 2015). Given the recent paradigm shift from traditional career trajectories to more protean or boundaryless career paths, Chan and colleagues (2011, 2012) proposed a more holistic person-centered framework for understanding the current nature of careers. The Entrepreneurial, Professionalism, and Leadership (EPL) framework was conceptualised with the intent to capture one's lifelong career evolutions within three key dimensions. It posits that the evolution of careers is a continuous and lifelong process which occurs in a multidimensional manner; careers are defined as vectors within the entrepreneurial-professionalism-leadership dimensional career space where time, direction and strengths are represented. However, the current EPL framework does not specify the underlying mechanism for how EPL aspirations may develop. Therefore, we adopt the SCCT framework to try to unpack the underlying mechanisms. In particular, the present study is concerned with the role of personal, social-cognitive, and environmental influences in shaping one's EPL career choices, and particularly the entrepreneurial intentions. We construed family support as a proximal contextual influence, referring to the tangible and emotional resources and assistance rendered by significant others in one's family (Jin, 2009). Perceived family support provides individuals with subjective norms, or what they perceive as social pressure from significant others that help them determine whether starting a new venture will be

well-accepted and supported (Ajzen, 1991) and help overcome both perceived and actual physical barriers (Lent, Brown, & Hackett, 2000). Past research suggests that increases in one's entrepreneurial interest, and its subsequent influences on one's entrepreneurial intention, were associated with support and encouragement from family members (Baughn, Cao, Le, Lim, & Neupert, 2006).

The presence of role models is construed as a background contextual influence. Role models are people whose attributes impact individuals in specific areas, and research suggests that they can be influential in shaping one's career aspirations (Van Auken, Fry, & Stephens, 2006). The presence of and interactions with role models affect one's vicarious learning; besides providing one with observational learning experiences (Scott & Twomey, 1988), role models can directly influence individuals into participating in the learning experience (Van Auken, Stephens, Fry, & Silva, 2006), allowing them to positively interpret their learning experiences and encourage greater efforts in performance. Past studies show that exposure to entrepreneurial role models is positively related to entrepreneurial intention (Pruett, Shinnar, Toney, Llopis, & Fox, 2009). Specifically, parental role models have been shown to exert a positive influence on their children's subsequent choice of self-employment as a career choice (Chlosta, Patzelt, Klein, & Dormann, 2012; Scott & Twomey, 1988). In the present study, we expect that exposure to entrepreneurial role models, who provide career advice and relevant skill enhancements, will not only shape one's learning experience, but also one's entrepreneurial intent.

The SCCT posits that person inputs and background context collectively influence one's learning experiences. Studies have revealed that entrepreneurial education, considered as part of one's learning experiences, provides individuals with the knowledge and skills needed to identify new opportunities and the ability to think creatively (Raposo & do Paco, 2011; Sanchez, 2011). Pedagogical practices in the university are designed such that students are encouraged to develop entrepreneurial efficacy and promote enactive mastery experiences; they are given simulated business cases to work with, asked to participate in entrepreneurial competitions, and made to study cases of successful entrepreneurs (Zhao et al., 2005). Past research has demonstrated that prior entrepreneurial experience and entrepreneurship education predict future entrepreneurial intention (Ellen, 2010; Sanchez, 2011; Wilson, Kickul, & Marlino, 2007). Individuals tend to apply the skills, strategies, and networks acquired from prior experiences to their new ventures. These tendencies account for another aspect of one's learning experiences and can be described as one's prior entrepreneurial experiences. Although Bandura (1986) argued that the success and failure of past experiences may affect the outcome of people's intentions quite differently, other studies suggest that past failures create opportunities for them to learn from their mistakes. Minniti and Bygrave's (2001) model on entrepreneurial learning theorised that entrepreneurs, when faced with high-risk-high-returns choices, may demonstrate a higher risk-taking propensity and dynamically shape their strategies based on the successes or failures of previous decisions (Minniti & Bygrave, 2001).

Another factor of interest in this current study is the influence of one's personal input to one's entrepreneurial intention and entrepreneurial efficacy. Risk aversion reflects an individual's tendency towards risk-taking that is stable across different

situations (Qualls & Puto, 1989). Studies have demonstrated the relationship between risk taking and self-efficacy (e.g., Krueger & Dickson, 1994), and individuals who were stronger risk-takers tend to have more positive views of their self-efficacy (Barbosa, Gerhardt, & Kickul, 2007). Individuals high in risk aversion tend to view highly risky situations as negative and avoid opportunities that are perceived as risky (Cable & Judge, 1994; Maehr & Videbeck, 1968). Entrepreneurial career goals are perceived as risky and low risk aversion individuals are more likely to start their own business (Barbosa, Gerhardt, & Kickul, 2007; Caliendo, Fossen, & Kritikos, 2009; Kihlstrom & Laffont, 1979).

In sum, the main goal of present study is to examine factors that shape choice goals based on the SCCT choice model and three additional factors (background contextual influences—family role models in the EPL career domains; learning experiences—one's past entrepreneurial experiences and education; and person inputs—one's risk aversion) which we hypothesize to have direct influences on choice goals (see Fig. 15.1 for the representation of the our proposed model for entrepreneurial intention based on the SCCT model, and Appendix 1 for the corresponding hypotheses to be tested). Our study also examined factors contributing to, or hindering, the further growth of entrepreneurial interest. We believe these factors are pertinent to our understanding of the development of entrepreneurial intention within a multidimensional (EPL) career space. While the focus of current paper is on entrepreneurial intention, intentions on pursuing professional and managerial/leadership career intent were also measured concurrently. The additional measures could allow us to have a better understanding of the specificity of the various factors on influencing the EPL aspirations.

Method

Participants

We recruited 396 undergraduate and graduate students of ages ranging from 18 to 33 years ($M = 22.60$, $SD = 2.55$) from a local university in Singapore; 245 participants were males, 150 were females, and one participant chose not to reveal his/her gender. The majority of the participants had past working experiences ($n = 329$), among whom 17 had been self-employed or reported being the owner of a small or medium-sized enterprise, for durations ranging from 1 month to 5 years. Participants who indicated their majors ($n = 387$) came from the following range of academic disciplines: 40.8% engineering; 37.5% science; 17.6% humanities; and 4.1% business. All participants were reimbursed with ten Singapore dollars each for their participation.

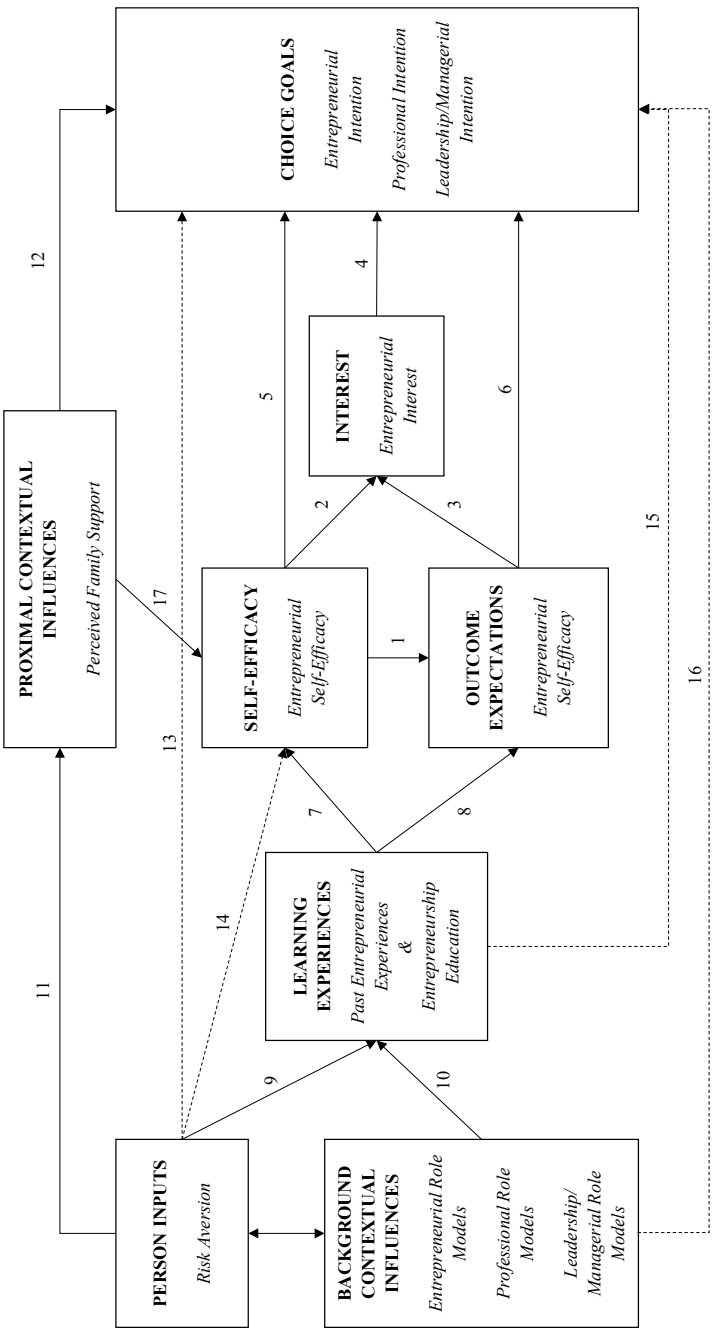

Fig. 15.1 Revised model. Solid lines (Paths 1–12, 17) represent the original SCCT choice model; paths unique to the model are indicated with dashed lines (Paths 13–16)

Measures

Entrepreneurial Efficacy (see Appendix 2). Chan, Chernyshenko, Ho, and Chew's (2011) 7-item entrepreneurial efficacy scale was used to measure participants' confidence in their ability to perform entrepreneurial tasks successfully. Responses were made on a 5-point Likert-type scale (*1 = not at all confident; 5 = extremely confident*) and sample items included: "Plan a business (including market analysis, pricing, finance/cost, marketing/sales)", "Build a network of contacts or partners who will support my business", and "Start a firm and keep it growing". An overall score was obtained by averaging the responses to each item, producing a possible score in the range of 0–5, with higher scores reflecting stronger entrepreneurial efficacy percept.

Entrepreneurial Outcome Expectations (see Appendix 3). Outcome expectations were measured with an 8-item self-devised scale. Participants were asked to indicate the extent to which the items described them, using on a 5-point Likert-type scale (*1 = strongly disagree; 5 = strongly agree*). The scale included items like: "Starting a business allows me to create more work opportunities for my friends and relatives", "Being an entrepreneur provides me with the satisfaction that I desire at work", and "Starting my own business allows me to provide work/service or a product that is uniquely mine". An overall score was obtained by averaging participants' responses to each item.

Entrepreneurial/Professional/Leadership (EPL) Career Intent (see Appendix 4). EPL career intent measure was extracted from Chan's et al. (2011) study. Entrepreneurial career intent was measured with 6 items and sample items are: "I will start my business in the next 5 years", "I have a viable business idea and intend to start my own business soon after graduation", and "When I have enough work experience and finances, I am certain to start my own business". Professional career intent was measured by 4 items and a sample item includes, "I'd much prefer a career as a specialized expert or professional in a large and stable organization". The Leadership career item was measured by 3 items and a sample item includes, "My main career goal is to rise up the ranks as a leader or manager, in charge of others, in organizations". Participants were asked to indicate their level of agreement with the statements concerning their intentions to start a business. Responses were made on a 5-point Likert-type scale (*1 = strongly disagree; 5 = strongly agree*). An overall score was obtained by averaging the responses to each item, producing a possible score in the range of 1–5, with higher scores reflecting stronger entrepreneurial intention. Reversed scoring was computed for negatively-worded items.

Entrepreneurial Interest (see Appendix 5). Participants' interests were measured by their responses towards participation in three activities related to entrepreneurship: "Get information about how to set up my own business", "Talk to potential partners or sponsors and get help from them to start my own business", and "Participate in any entrepreneurship-related seminars, workshops or training even though I need to pay for it". An overall score was obtained by averaging their responses to each item, where a possible score in the range of 1–3 was

produced, where higher scores implied a stronger interest towards participating in entrepreneurship activities.

Entrepreneurial Learning Experiences (see Appendix 6). Entrepreneurial learning experiences were measured using a 4-item self-devised scale where participants were asked to indicate past engagement in various entrepreneurship-related activities. The scale included items such as: "I have started or taken over a business that is still active today" and "I have taken some entrepreneurship-related courses in my studies". The score for this variable was computed by tallying their responses to each item, producing a possible score in the range of 1–4. Higher scores reflected more experiences in entrepreneurship-related activities.

Risk Aversion (see Appendix 7). Participants' aversion towards risk was measured by 6 items extracted from Judge and colleagues' 8-item risk aversion scale (Cable & Judge, 1994; Judge, Thoresen, Pucik, & Welbourne, 1999). They were asked to indicate the extent to which they agreed or disagreed with the statements that included items like: "I am a cautious person who generally avoids risk", "I always play it safe, even if it means occasionally losing out on a good opportunity", and "I view risk of losing a job to be avoided at all costs". Responses were made on a 5-point Likert-type scale (*1 = strongly disagree; 5 = strongly agree*). An overall score was obtained by averaging the responses to each item, producing a possible score in the range of 1–5. Higher scores reflect a higher aversion towards behaviours that were deemed risky.

Family Role Model in Entrepreneurial/Professional/Leadership (EPL) Career Domain. The E domain was measured by one item asking participants to indicate whether their parents had been self-employed or were the owners of an SME. P domain was measured by one item asking participants whether their parents hold professional careers. L domain was measured by one item asking participants whether their parents hold leadership/managerial jobs in work organizations. Three dummy variables were created with '0' if the response was 'no' and '1' if it was 'yes' for each of the EPL domains.

Perceived Family Support (see Appendix 8). Perceptions of family support were assessed using the Family of Origin Career Development Support scale, developed and modified by Way and Rossmann (1996) and Metheny (2009) respectively. There are ten items in the scale. However, for the purpose of the present study, only four items were adapted to assess family support within the context of career decision making. Participants were asked to identify on a 3-point scale (*1 = no support; 3 = considerable support*) the extent to which their family provided them support. The scale included items like: "To what extent has the family you grew up in given you information and contacts that helped you with your occupational choices", "To what extent has the family you grew up in encouraged you to pursue your goals and/or plans for the future", and "To what extent has the family you grew up in expressed pride in your educational or career-related accomplishments". An overall score was obtained by averaging the responses to each item, and higher scores reflected higher levels of perceived familial support.

Results

Prior to the computation of scale scores and testing of the proposed model in Fig. 15.1, a confirmatory factor analysis was conducted to check the dimensionality of the various scales. Next, we used path analysis to test the hypotheses concerning the various study variables. Goodness-of-fit of the proposed model was assessed. In evaluating the models, we were mindful of Iacobucci's (2010; see also Hu & Bentler, 1999) advice that absolute fit indices should not be the sole criterion for deciding whether a model is correct; instead, one should use a combination of relative fit indices, such as the comparative fit index (CFI), and absolute fit indices, such as the chi-squared (χ^2) test and root mean squared error of approximation, to evaluate whether the hypothesized model is a good fit to the observed data. However, because the χ^2 test is affected by sample size (large samples tend to produce larger chi-squares that are significant even with small discrepancies between observed and model-implied covariance matrices), we decided to focus on the CFI RMSEA and SRMR to assess relative data-model fit. Recent studies have found that measurement models with more indicators and factors (i.e., greater model complexity) such as the models tested in the current study are more likely to have a slightly lower CFI (Cheung & Rensvold, 2002; Kenny and McCoach, 2003; Marsh, Hau, Balla and Grayson, 1998; Porfeli, Lee, &Weigold, 2012). Marsh and his colleagues (1998) remarked that "this apparent decline in fit associated with large number of indicators per factor must reflect problems in the standards used to evaluate model fit rather than misspecification in the approximating model". In sum, fit indices tend to decrease as the number of indicators per construct increases, even when the model is properly specified. Instead of specifying explicit cut-offs, some methodologists addressed these complexities by providing descriptive anchors for various ranges of fit indexes. For example, Brown and Cudeck (1993) proposed that RMSEA less than 0.05 suggested a good/close fit, between 0.05 and 0.08 indicates fair/reasonable fit and between 0.08 and 0.1 indicates a mediocre fit. Model with RMSEA > 0.1 indicates poor fit. CFI in the range of 0.90–0.95 indicates acceptable model fit and > 0.95 indicates good fit (Bentler, 1990). SRMR values close to 0.08 or smaller may be taken as indicators of good model fit (West, Taylor, & Yu, 2012). We adopt these recommendations in evaluating the goodness-of-fit of the model here.

Confirmatory Factor Analyses

Our survey response scales consisted of a mix of binary and quantitative items (ordinal in nature). We observed minor skewness in the item-level distributions for those quantitative items; WLSMV (weighted least square mean and variance adjusted) method was used to estimate the parameters so to avoid issues related to the violation of multivariate normality (Beauducel & Herzberg, 2006; Liang & Yang, 2014).

All the analyses were conducted through Mplus version 8 (Muthén and Muthén, 1998–2017).

As our data were based on cross-sectional, self-reported surveys, we checked and attempted to control for the threat of common method bias, first by fitting a single common-factor to all 46 items from the 7 scales[1] mentioned in the previous section (i.e., Harman's test). We compared the fit of this model against that of the proposed 9-factor model.[2] The single factor model generated poor fit ($\chi^2 = 2496.300$, df = 989, p = 0.000, CFI = 0.608, RMSEA = 0.062, SRMR = 0.10), relative to the measurement model with 9 factors ($\chi^2 = 1413.135$, df = 953, p = 0.000, CFI = 0.90, RMSEA = 0.035, SRMR = 0.067). The result suggests that common method bias was not a major threat to our findings (Podsakoff et al., 2003). In contrast, the 9-factor model fits the data very well and each scale is dimensional as originally proposed. Cronbach's alpha for each respective scale was then computed to assess the reliability estimates of the variables.

Entrepreneurial efficacy. All seven items in this measure loaded adequately on one factor with Cronbach's alpha of 0.89.

Entrepreneurial outcome expectations. All eight items in this measure loaded adequately on one factor with Cronbach's alpha of 0.86.

EPL intent. The EPL intent items loaded adequately on three factors as reported in Chan et al. (2012) with Cronbach's alpha of 0.86, 0.75 and 0.76 for the E, P and L intent sub-scales respectively.

Entrepreneurial interests. The three items loaded adequately on one factor with Cronbach's alpha of 0.64.

Risk aversion. All six items in this measure loaded adequately on one factor with Cronbach's alpha of 0.80.

Perceived family support. The four items in this measure loaded adequately on one factor with Cronbach's alpha of 0.69.

Path Analyses

Based on the confirmatory factor analyses results, scale scores were formed and a path analysis was performed to test the hypotheses outlined in Fig. 15.1. Means, standard deviations, and correlations of the study variables are shown in Table 15.1. Examination of skewness and kurtosis statistics suggest that a normal distribution assumption on the study variables to be suitable. All the variables fall within the threshold values of ±3.00 for skewness and ±10.00 for kurtosis as identified by Kline (1998).

Path analyses results indicated that the revised model produced indices consistent with good model fit: χ^2 (20) = 53.306, $p < 0.01$, CFI = 0.96, RMSEA = 0.065,

[1]The 3 single items for role model in EPL career domain were not included in the CFA analysis.

[2]The EPL intent scale was represented by a 3 factors model whereas, the rest of the scales are unidimensional as proposed by the original developers.

Table 15.1 Means, standard deviations and Pearson correlations of study variables

	Variables	1	2	3	4	5	6	7	8	9	10	11	12
1	Entrepreneurial efficacy	2.92 (0.87)											
2	Entrepreneurial outcome expectations	0.52**	3.38 (0.72)										
3	Entrepreneurial intention	0.59**	0.67**	2.86 (0.82)									
4	Entrepreneurial interest	0.43**	0.52**	0.59**	0.45 (0.36)								
5	Risk aversion	−0.37**	−0.28**	−0.37**	−0.26**	3.27 (0.69)							
6	Entrepreneurial learning experiences	0.17**	0.06	0.12*	−0.11*	−0.06	0.18 (0.21)						
7	Entrepreneurial role models	0.18**	0.13*	0.18**	0.12*	−0.11*	0.07	0.42 (0.49)					
8	Perceived family support	0.17**	0.13*	0.15**	0.11*	0.05	−0.05	−0.03	2.34 (0.45)				
9	Professional role models	0.14**	0.06	0.02	0.05	0.03	0.09	−0.02	0.16**	0.53 (0.50)			
10	Leadership role models	0.11*	0.0.5	0.06	0.12*	−0.04	0.05	0.12*	0.18**	0.47**	0.60 (0.49)		
11	Professional intent	−0.09	−0.22**	−0.27**	−0.18**	0.25**	−0.03	−0.12*	0.04	0.16**	0.07	3.92 (0.71)	
12	Leadership intent	0.37**	0.14**	0.21**	0.15**	−0.17**	0.11*	0.02	0.12*	0.08	0.18**	0.22**	3.67 (0.80)

Note Means and standard deviations (in parentheses) are on the diagonal. *$p < 0.05$, **$p < 0.01$

SRMR = 0.055. The standardized parameter estimates of the current model are summarized in Table 15.2 and the specific path findings are reviewed more closely as explained in the following sections.

Social cognitive variables. Consistent with SCCT predictions and our hypotheses, H1, H2, H3, and H4, path analysis found significant relations among entrepreneurial efficacy, entrepreneurial outcome expectations, entrepreneurial interest, and entrepreneurial intent.

Learning experiences. SCCT predicts that learning experiences are related to one's self-efficacy beliefs and outcome expectations (H5a). Path analysis indicated that entrepreneurial learning experience was significantly and positively related to entrepreneurial efficacy, but not significantly related to entrepreneurial outcome expectations; H5a was only partially supported. A direct path from entrepreneurial learning experiences to entrepreneurial intent was proposed in the present study (H5b). Path analysis showed no significant association between entrepreneurial learning experiences and entrepreneurial intent, and therefore, H5b was not supported.

Person inputs. SCCT posits that person inputs are related to one's learning experiences, and based on this view, risk aversion is expected to relate to learning experiences (H6a). Path analysis indicated that risk aversion was not significantly related to entrepreneurial learning experiences. We expected risk aversion to be negatively related to perceived family support (H6b). However, path analysis of the association between risk aversion and perceived family support was not significant; H6b was not supported. We expected risk aversion to be negatively related to entrepreneurial intention (H6c). Path analysis indicated a significant negative association between risk aversion and entrepreneurial intention; H6c was supported. We hypothesized that risk aversion is negatively related to entrepreneurial efficacy (H6d). Path analysis revealed significant negative association between risk aversion and entrepreneurial efficacy; H6d was supported.

Contextual influences. SCCT predicts that background contextual affordances are related to one's learning experiences and we expected entrepreneurial role models to relate positively with learning experiences (H7a). However, path analysis did not provide support for this relation; H7a was not supported. Unique to the SCCT choice model is the prediction that background contextual affordances are related to one's choice goal and we expected entrepreneurial role models to relate to entrepreneurial intention (H7b). Path analysis revealed a significant positive association between role models and entrepreneurial intention.

According to the SCCT model, proximal contextual influences and choice goals are directly related. Hence, we expected perceived family support to relate to entrepreneurial intention (H8a). However, path analysis did not provide support for this relation; H8a was not supported. The SCCT choice model uniquely posits that proximal contextual influences are related to one's self-efficacy beliefs and based on this model, we expected perceived family support to be positively related to entrepreneurial efficacy (H8b). Path analysis revealed significant positive association between perceived family support and entrepreneurial efficacy; H8b was fully supported.

Table 15.2 Standardized parameter estimates of revised SCCT model

Path no.	Hypothesis	Path			Standardized parameter estimates
1	H1	Ent. outcome expectations	←	Ent. efficacy	0.52**
2	H2	Ent. interest	←	Ent. efficacy	0.22**
3	H2	Ent. interest	←	Ent. outcome expectations	0.41**
4	H3	Ent. intent	←	Ent. interest	0.26**
5	H4	Ent. intent	←	Ent. Efficacy	0.23**
6	H4	Ent. intent	←	Ent. outcome expectations	0. 37**
		Prof. intent	←	Ent. outcome expectations	−0.17**
		Lead. intent	←	Ent. outcome expectations	−0.07
7	H5a	Ent. efficacy	←	Ent. learning experiences	0.16**
8	H5a	Ent. outcome expectations	←	Ent. learning experiences	−0.03
9	H6a	Ent. learning experiences	←	Risk aversion	−0.05
10	H7a	Ent. learning experiences	←	Ent. role models	0.06
11	H6b	Perceived family support	←	Risk aversion	0.05
12	H8a	Ent. intent	←	Perceived family support	0.05
		Prof. intent	←	Perceived family support	0.02
		Lead. intent	←	Perceived family support	0.05
13	H6c	Ent. intent	←	Risk aversion	−0.11**
		Prof. intent	←	Risk aversion	0.21**
		Lead. intent	←	Risk aversion	−0.05
14	H6d	Ent. efficacy	←	Risk aversion	−0.38**
15	H5b	Ent. intent	←	Ent. learning experiences	0.03
		Prof. intent	←	Ent. learning experiences	−0.02
		Lead. intent	←	Ent. learning experiences	0.04

(continued)

Table 15.2 (continued)

Path no.	Hypothesis	Path			Standardized parameter estimates
16	H7b	Ent. intent	←	Ent. role models	0.06
		Prof. intent	←	Ent. role models	−0.08
		Lead. intent	←	Ent. role models	−0.07
		Ent. intent	←	Prof. role models	−0.05
		Prof. intent	←	Prof. role models	0.13*
		Lead. intent	←	Prof. role models	−0.05
		Ent. intent	←	Lead. role models	−0.01
		Prof. intent	←	Lead. role models	0.04
		Lead. intent	←	Lead. role models	0.16**
17	H8b	Ent. efficacy	←	Perceived family support	0.19**

Note Ent. entrepreneurial; *Prof.* professional; *Lead.* leadership/managerial
*p < 0.05, **p < 0.01

Discussion

The present study sought to address an area in SCCT research that we believe to be pertinent but has yet to be fully investigated. Specifically, we examined the influence of individual, social cognitive, and environmental factors on students' entrepreneurial intention, and set out to explore the possibility of extending the SCCT choice model in the entrepreneurial domain. Given the current nature of work, we also sought to understand factors that shape entrepreneurial interest within a multidimensional (EPL) framework.

A Revised SCCT Model

Consistent with existing findings, hypotheses concerning SCCT core variables (self-efficacy, outcome expectations, goals, and interest) were supported in the present study, demonstrating that our current findings from an Asian sample are fairly consistent with results from previous studies that utilized the SCCT choice model in their research (Lent & Brown, 2013; Lent et al., 2003a; Lent, Paixao, Silva, & Leitao, 2010; Segal et al., 2002). In addition, the present findings validated and extended earlier research on SCCT choice model by showing that a person input factor—one's level of risk aversion in the current study—is directly related to entrepreneurial intention and one's self-efficacy (paths 13 and 14). There was also partial demonstration of the relationship between background contextual affordance and subsequent career

intention (for professional and leadership intentions, path 16), suggesting a possibility that certain paths in the original SCCT choice model can be further addressed and the model can be refined.

Although good fit indices were obtained from the revised SCCT model, some non-significant paths were observed specifically in the paths from (a) entrepreneurial role models to learning experiences (path 10; H7a) and to entrepreneurial intention (path 16; H7b), (b) perceived family support to entrepreneurial intention (path 12; H8a), (c) risk aversion to learning experiences (path 9; H6a) and to perceived family support (path 11, H6b), and (d) learning experiences to outcome expectations (path 8, H5a). It is interesting to note that while our study found that professional and leadership role models did contribute to the development of professional and leadership role models, respectively, hypotheses concerning entrepreneurial role models were found to be non-significant (H7a and H7b), despite evidence suggesting that the presence of entrepreneurial role models contribute to the development of entrepreneurial intention. These results may reflect a limitation due to the instrument used to measure the construct. The present study did not address the influence of entrepreneurial role models in depth, and assumed that all participants regarded their parents as role models; participants were asked to indicate whether their parents have been self-employed, but not the extent to which they regarded parents as their role models, or the nature of their relationship with their parents.

Family support is a factor found to be consistently associated with entrepreneurial interest. One possible explanation for the non-significant results observed in our current study on the influence of perceived family support upon entrepreneurial intention could be that, as opposed to what was hypothesized by SCCT, perceived family support shares an indirect relation to entrepreneurial intention through entrepreneurial efficacy. In line with this suggestion, perceived family support was found to be significantly related to entrepreneurial efficacy. Past empirical studies have reported similar findings of a reciprocal relationship between self-efficacy and contextual variables (Lent et al., 2003b, 2001). Individuals with stronger efficacy beliefs appeared to perceive greater support in their environment and hence, were more likely to pursue their goals (Lent et al., 2000).

Findings regarding the non-significant relationships between entrepreneurial learning experiences to entrepreneurial outcome expectations were noteworthy. In the current study, entrepreneurial learning experiences encompassed one's past entrepreneurial experiences as well as the entrepreneurship education received. Research has shown that the nature of prior experiences can shape one's subsequent attitudes and behaviour (Ucbasaran, Westhead, Wright, & Flores, 2010). One possible explanation for the non-significant relation between entrepreneurial learning experiences and entrepreneurial outcome expectations could be due to the nature of prior entrepreneurial experiences. Bandura (1986) stated that outcome expectations can be derived from outcomes resulting from one's previous actions. In other words, prior experiences can affect how an individual develops expectations about particular behaviours. This implies that people who experience negative events are likely to rate their chances of success lower and hence, achieve poorer performance subsequently. Failures in past entrepreneurial attempts may cause individuals to experience some

form of distress, and subsequently affect how they acquire accurate outcome expectations and engage in certain behaviours. The current study only required participants to indicate their current entrepreneurial status and may not indicate impact of past entrepreneurial attempts on their outcome expectations.

Another aspect of entrepreneurial learning experiences—entrepreneurship education—encompasses the influence of entrepreneurship training on one's outcome expectations. Research has consistently established positive associations between entrepreneurial education and subsequent entrepreneurial trajectories. For example, a recent study by Ho and colleagues (2018) demonstrated that entrepreneurship training enhanced entrepreneurial competencies and boosted attitudes towards entrepreneurship among youths. In Singapore, where the present study was conducted, the government has been actively fostering entrepreneurial interests. Bhasin's (2007) review highlighted several Singaporean government initiatives to promote not only a pro-business environment and open discussion/networking platforms for local entrepreneurs (e.g., Singapore Productivity Innovation and Growth, SGentrepreneurs, Action Community for Entrepreneurship) but also the provision of financial schemes to aid local businesses (in the form of tax exemptions, tax incentive schemes).

In spite of the solid infrastructure in place, a corresponding growth of entrepreneurship in Singapore has yet to be observed. Xavier and colleagues' (2012) report noted that very few young Singaporean adults expressed the intention to become entrepreneurs despite being in what can be considered a highly conducive environment for entrepreneurs. One's education has the potential to shape one's career choice goals and while the present study did not manage to study Singapore's entrepreneurial education in greater depth, it may also be pertinent to consider the nature of Singapore's culture in future assessments of its entrepreneurial education. A recent study by Retna and Jones (2013) on learning organization in the Singapore culture concluded that many learners in Singapore viewed mistakes as costly. Participants in their study adhered to traditional cultural obedience. The authors described Singapore as "an epitome of a disciplined society" (p. 346), hence, while the nation actively promotes creativity and innovation, tensions between experimentation and a fear of mistakes puts a damper on one's efforts to innovate. This may be better understood in our subsequent discussion of the person input factor, risk aversion.

Another point to note is that although past studies have established that entrepreneurial education encouraged students to seek entrepreneurship, most of these findings came from exploratory research where no repeated measures were conducted nor control groups included (Clark, Davis, & Harnish, 1984; Ellen, 2010). Likewise in the present study, no control groups were included and we were unable to assess the effectiveness of entrepreneurial education.

Of particular interest in the current study were our findings regarding risk aversion. Consistent with previous studies (Caliendo et al., 2009; Kihlstrom & Laffont, 1979), risk aversion was found to be negatively associated with entrepreneurial intention and positively related to professional intention. In the present study, it was also found that risk aversion has negative influences on one's entrepreneurial efficacy. These significant findings provide evidence that risk aversion plays both direct and indirect

role in influencing one's decision to start a new business venture, and is reflected in the impact of risk aversion on one's decisions, from becoming an entrepreneur to the type of firm one sets up (Herranz, Krasa, & Villamil, 2019; Kan & Tsai, 2006; Lanchimba, Windsperger, & Fadairo, 2018).

As discussed previously, risk aversion is understood as an individual's tendency towards risk-taking. An underlying concept related to risk aversion is the fear of failure. Construed as an indicator of risk aversion (e.g., Wagner & Stenberg, 2004), fear of failure has been found to be negatively associated with entrepreneurship (Bosma et al., 2008; Hessels, Grilo, Thurik, & van der Zwan, 2011). This concept appears to be relevant within the current context—one that is a primarily collectivistic culture that values familial responsibilities, where failures or loss of face are genuine concerns to be avoided (Retna & Jones, 2013) and which could account for why high risk aversion is related to the pursuit of professionalism. Chua and Bedford's (2016) study on factors which deterred Singaporeans from considering entrepreneurship as a career revealed that the psychological construct of fear and failure deters young Singaporeans from cultivating entrepreneurial intentions. Many view entrepreneurship as risky and expressed most concerns about providing financial support to families and parents and the impact of entrepreneurial failure on family. These concerns suggest that young Singaporeans prioritise their family over entrepreneurial career choices. This sentiment echoes Conroy, Metzler and Willow's (2002) multidimensional conceptualisation of fear of failure, which includes upsetting important others, having an uncertain future, and embarrassing self-presentational failure as part of key dimensions.

Nonetheless, results for paths related to risk aversion within the model were inconclusive; the non-significant path from risk aversion to perceived family support may be reflective of a poor construct or lack of content validity. Items used in the current study to measure perceived family support construct were presented within the context of general career decision making and did not specifically measure family support with regards to pursuing a career as an entrepreneur.

Other Applications, Limitations, and Suggestions for Future Research

Our findings can be used by career counsellors and educators to develop career development interventions. Entrepreneurial efficacy and entrepreneurial outcome were central to the development of entrepreneurial interest and intention. Educators and career counsellors can develop skills programs that enhance entrepreneurial efficacy beliefs and acquisition of accurate outcome expectations so as to facilitate students' interest in pursuing entrepreneurial paths. In addition, they could explore students' perceptions of contextual barriers versus the support available, relative to their career choice (Lent et al., 2001) and adopt appropriate strategies to assist students in their career decisions.

We also attempted to explore these issues within a multidimensional space. Given that career aspirations are developmental in nature, changes to students' career choices may occur over the few years of study in university. Hirschi's (2018) review underscores the implications of the fourth industrial revolution or industry 4.0 on the development of careers—individuals now find themselves having to take greater charge of their own career development as digitization and the new economy continues to reshape occupations and industries. In support of Hirschi's review, Lent (2018) suggests that a good approach to adopt would be to create workers with a certain level of career-life preparedness. This notion is reflected by the holistic person-centered framework which focuses on three dimensions in the career space—Entrepreneurship (E), Professionalism (P), and Leadership (L). Chan et al. (2012) highlight how the 21st century work environment almost requires workers to have heightened career adaptability and take on a boundaryless attitude. Their research has found that entrepreneurial alertness does indeed contribute to one's career adaptability and boundaryless career mindsets (Uy et al., 2015). In addition to the adoption of longitudinal studies to investigate the evolution of careers, subsequent studies may wish to further examine the development of one's career choices within the EPL framework. To that end, the current study has provided preliminary explorations within the EPL context.

We did not consider the effects of gender in our analyses even though existing research suggests the presence of gender differences in entrepreneurial behaviours. Entrepreneurs are typically perceived as possessing predominately masculine characteristics such as assertiveness and achievement motivation (Baron, Markman, & Hirsa, 2001; Gupta, Turban, Wasti, & Sikdar, 2009) and women were perceived as unsuitable for entrepreneurial roles due to these stereotypical beliefs. As such, Dyer (1994) highlighted that women who seek entrepreneurship are likely to have fewer career experiences, social support, and role models, and women were expected to have lower entrepreneurial career intentions compared to their male counterparts (Zhao et al., 2005). We suggest exploring gender differences as a potential factor in subsequent research.

In the present paper, measures on professional and leadership efficiency, outcome expectations and interest were not available. Future studies could include these measures to allow a more comprehensive analysis of how these factors may jointly influence the development of EPL career goals. A final limitation concerns the construct validity of the measures. Earlier, we mentioned that measures on entrepreneurial outcome expectations and entrepreneurial role models lacked content validity as they failed to account for other facets of the construct. The present study focused only on the positive dimension of outcome expectations and did not consider accounting for negative ones. As both positive and negative outcome expectations may differentially influence goals and intentions (Fouad & Guillen, 2006), future investigations could evaluate both positive and negative outcomes. Subsequent studies may also wish to examine the nature of role models, specifically the manner in which one's career decisions may be influenced by role models, in order to gain a better understanding of how role models influence the career choice-making process.

Conclusion

The present study explored the application of a revised SCCT choice model that was extended to include additional constructs within a multidimensional career (EPL) framework. Our results suggest the possibility of refining the original model. Present findings indicate a need to conduct more in-depth assessments of both individual and contextual factors within students' career development process. The present study also contributes to current SCCT and entrepreneurship research by providing a more comprehensive view of the factors that may contribute to the development of entrepreneurial intentions among students. As discussed, the construction of several factors like family support, entrepreneurial role models, and learning experiences can be further refined so as to fit the entrepreneurial domain. We also presented the implications of our current findings to an Asian context where entrepreneurship is fostered, and demonstrated the outcomes of preliminary explorations within the EPL framework. We suggest that subsequent research on the application of SCCT within the entrepreneurial domain expand upon the current results for a more comprehensive understanding of factors that contribute to the development of entrepreneurial intention.

Appendix 1

List of Hypotheses Examined in Present Study

The present study aims to validate and extend earlier findings on the SCCT choice model by applying them within the entrepreneurship domain. The following hypotheses were formulated and tested:

H1 Entrepreneurial efficacy is positively related to entrepreneurial outcome expectations (path 1 in Fig. 15.1).
H2 Entrepreneurial efficacy and outcome expectations are positively related to entrepreneurial interest (paths 2 and 3).
H3 Entrepreneurial interest is positively related to entrepreneurial intention (path 4).
H4 Entrepreneurial efficacy and outcome expectations are positively related to entrepreneurial intention (paths 5 and 6).
H5a Learning experiences is positively related to entrepreneurial efficacy and entrepreneurial outcome expectations (paths 7 and 8).
H5b Learning experiences is positively related to entrepreneurial intention (path 15).
H6a. Risk aversion is negatively related to learning experiences (path 9).
H6b Risk aversion is negatively related to perceived family support (path 11).

H6c Risk aversion is negatively related to entrepreneurial intention (path 13).
H6d Risk aversion is negatively related to entrepreneurial efficacy (path 14).
H7a Exposure to entrepreneurial role models is positively related to learning experiences (path 10).
H7b Exposure to entrepreneurial role models is positively related to entrepreneurial intention (path 16).
H8a Perceived family support is positively related to entrepreneurial intention (path 12).
H8b Perceived family support is positively related to entrepreneurial efficacy (path 17).

Appendix 2

Entrepreneurial Efficacy Scale

Instructions: Please use the scale below and rate how confident you are to perform the following tasks successfully. Indicate your answer on the right of each statement.

Scale:

1	2	3	4	5
Not at all confident	A little confident	Moderately confident	Fairly confident	Extremely confident

1	Come up with ideas for products and services that may be needed in a market	1	2	3	4	5
2	Plan a business (including market analysis, pricing, finances/costs, marketing/sales)	1	2	3	4	5
3	Build a network of contacts or partners who will support my business	1	2	3	4	5
4	Manage the financial assets and performance of a company or firm	1	2	3	4	5
5	Start a firm and keep it growing	1	2	3	4	5
6	Identify opportunities to start-up viable businesses	1	2	3	4	5
7	Design an effective campaign for market new product or service	1	2	3	4	5

Appendix 3

Entrepreneurial Outcome Expectations Scale

Instructions: Please read each statement carefully and choose the one answer that best describes your agreement or disagreement using the scale below. There are no "right or wrong" answers. Please answer honestly and frankly. Indicate your answer on the right of each statement.

Scale:

1	2	3	4	5
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

1	Starting my own business allows me to provide work/service or a product that is uniquely mine	1	2	3	4	5
2	Starting a business allows me to create more work opportunities for my friends and relatives	1	2	3	4	5
3	Founding a business allows me to create more work opportunities for people in society	1	2	3	4	5
4	Being an entrepreneur provides me with the satisfaction that I desire at work	1	2	3	4	5
5	Being an entrepreneur allows me to meet with successful businessmen with whom I main gain valuable opportunities and experience	1	2	3	4	5
6	"Being my own boss" allow me to have the kind of working hours that I desire	1	2	3	4	5
7	Pursuing entrepreneurship allows me to pursue those leisure time activities and interests that I like	1	2	3	4	5
8	Being an entrepreneur provides me with the kind of lifestyle that I desire	1	2	3	4	5

Appendix 4

Entrepreneurial Intention Scale

Instructions: Please read each statement carefully and choose the one option that best describes your current feelings. There are no "right or wrong" answers. Please answer honestly and frankly. Indicate your answer on the right of each statement.

Scale:

1	2	3	4	5
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

1	I am definitely going to be an entrepreneur after my studies and am prepared to do anything to achieve that goal	1	2	3	4	5
2	I will start my business in the next 5 years	1	2	3	4	5
3	I do not see myself taking over any business or buying any franchise in the future	1	2	3	4	5
4	I have a viable business idea and intend to start my own business soon after graduation	1	2	3	4	5
5	I will start my business in the next 10 years	1	2	3	4	5
6	When I have enough work experience and finances, I am certain to start my own business	1	2	3	4	5

Appendix 5

Entrepreneurial Interest Scale

Do you have any interests in any of the following entrepreneurship activities?
Check (√) all that apply:

a. I am interested to get information about how to setup my own business
b. I am keen to talk to the potential partners/sponsors and get help from them to start my own business.
c. I am interest to participate in any entrepreneurship-related seminars/workshops/trainings even though I need to pay for it.

Appendix 6

Learning Experiences Scale

Have you ever engaged in any of the following entrepreneurship activities?
Check (√) all that apply:

- I have started or taken over a business that is still active today.
- I have taken some entrepreneurship-related courses in my studies.

- I have participated/enrolled in entrepreneurship training program(s)/workshop(s)/seminar(s) before.
- I have participated in entrepreneurship-related contest(s) before. (e.g. Ideas.Inc business competition or any other contests).

Appendix 7

Risk Aversion Scale

Instructions: Please read each statement carefully and choose the one option that best describes your current feelings. There are no "right or wrong" answers. Please answer honestly and frankly. Indicate your answer on the right of each statement.

Scale:

1	2	3	4	5
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

1	I am a cautious person who generally avoids risks	1	2	3	4	5
2	I prefer to remain on a job that has problems that I know about rather than take the risks of working at a new job	1	2	3	4	5
3	I am not willing to take risks when choosing a job or a company to work for	1	2	3	4	5
4	I prefer a low risk/high security job with a steady salary over a job that offers high risks and high rewards	1	2	3	4	5
5	I always play it safe, even if it means occasionally losing out on a good opportunity	1	2	3	4	5
6	I view risk of losing a job to be avoided at all costs	1	2	3	4	5

Appendix 8

Perceived Family Support Scale

Instructions: Please answer the following questions about the family you grew up in.

1. To what extent has the family you grew up in given you information and contacts that helped you with your occupational choices?

a. No information and/or contacts	b. A little information and/or a few contacts	c. Considerable information and/or many contacts

2. To what extent has the family you grew up in encouraged you to pursue your goals and/or plans for the future?

a. No encouragement	b. A little encouragement	c. Considerable encouragement

3. To what extent has the family you grew up in been helpful when you have questions about educational or career-related issues?

a. No help with questions	b. A little help with questions	c. Considerable help with questions

4. To what extent has the family you grew up in expressed pride in your educational or career-related accomplishments

a. No expressed pride	b. A little expressed pride	c. Considerable expressed pride

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