
Introduction

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The word 'entrepreneur' is derived from the French verb *entreprendre* meaning 'to undertake'. Almost 80 years ago, Joseph Schumpeter described the entrepreneur as an innovator and a catalyst of change who continuously does things that have not been done before and do not fit established societal patterns (Schumpeter, 1934). Many other definitions have been offered since then, until it was suggested in the late 1980s that rather than trying to define an entrepreneur, effort should be invested in trying to differentiate different types of entrepreneurship (Gartner, 1989). The current volume focuses on high-technology entrepreneurs. High technology (high-tech) includes manufacturing and services industries that employ a high proportion of scientific, technical and engineering personnel (Chapple et al., 2004).

The Handbook brings together empirical and conceptual developments in the study of high-tech entrepreneurs from an interdisciplinary, multinational perspective. It includes chapters from such diverse paradigms as psychology, sociology, management, economics and ethnography and authors from the US, Canada, Australia, India, the UK, Ireland, Israel, Germany, Switzerland, Holland, Turkey, Poland and Hungary.

The 22 chapters, organized in six parts, offer different conceptual frameworks and definitions of high-tech entrepreneurs and of the entrepreneurial process based on studies in different settings and contexts. Contextual depth is also attained via cross-national and cross-sectoral studies of high-tech entrepreneurs. Contextual perspectives are supported by studies which examined the making of entrepreneurs in terms of antecedents, correlates and consequences of their career choices, resources and strategies from diverse contexts. Several chapters examine issues of equality, diversity and inclusion across faultlines of gender and other social category differences, documenting strategies of exclusion and inclusion in the career of high-tech entrepreneurs. The final part focuses on strategies for empowering high-tech entrepreneurs, ranging from structural conditions and mechanisms of support afforded by state and institutional actors all the way to individual mechanisms that serial entrepreneurs use to avoid burnout.

In order to ensure a transdisciplinary dialogue, the Handbook includes dissonant perspectives that offers a bridge between divergent perspectives.

2 *Handbook of research on high-technology entrepreneurs*

The Handbook includes chapters representing very wide perspectives of theory and research, together. The chapters make a real and novel contribution to our understanding of high-tech entrepreneurs and their careers in context.

Part I High-technology entrepreneurs

Chapter 1, by Dov Dvir, Arik Sadeh and Ayala Malach-Pines of Israel, addresses the impact of entrepreneurs' personality on their start-ups' performance. In the chapter the authors apply the notion of person-organization fit (the match between individuals and the organizations in which they work) to the case of entrepreneurs and the ventures they started. Israeli entrepreneurs responded to a questionnaire that assessed their ventures; assessed the entrepreneurs' personality traits and assessed the ventures' success. Findings suggested that high-tech entrepreneurs are more attracted to ventures that fit their personality. In addition, high-tech ventures were found to be significantly more successful than the low-tech ventures.

Chapter 2, by Agnieszka Postuła from Poland, addresses the question: how do IT professionals create their entrepreneurial posture? The chapter focuses on information technology professionals and on their social role in the organizations. The chapter is based on longitudinal, qualitative studies of software companies in Poland. The professional dimension is considered from two perspectives: that of co-workers in a project or an organization and that of the professional community.

Chapter 3, by Orenia Yaffe-Yanai, Tamar Milo and Gilat Kaplan from Israel, compares the family dynamic of high-tech entrepreneurs to traditional industry entrepreneurs. The chapter is based on a psychoanalytic perspective and on the experience of the three authors in long- and short-term counseling with entrepreneurs. It suggests that high-tech entrepreneurs share some similarities, with traditional industry entrepreneurs but also differ on several significant variables. The chapter ends with a discussion of the practical implications of the findings for consultation practices with each group.

Part II High-technology entrepreneurship: processes and stages

The second part starts with Chapter 4, by Björn Klocke of Switzerland and Hans Georg Gemünden of Germany. The chapter proposes that high-tech firms strive to exploit the potential of new technological knowledge while also needing to explore technology and markets in order to tailor their products, and asks what is the right balance between exploration and exploitation, and how does it shift over time. Klocke and Gemünden offer an empirically validated learning model of firm development that

describes exploration and exploitation cycles in technology and market functions, based on the results of a study of companies specializing in nanotechnology.

Chapter 5, on stages and processes in high-tech entrepreneurship, is by Eli Gimmon from Israel, and Eyal Benjamin and Liora Katzenstein from Australia, and focuses on radical strategic change (RSC) in high-tech new ventures from the investors' perspective. RSC is a common event in such ventures, presenting a conflict between a planned opportunity and departing from the approved strategy. The chapter compares private investors in Israel, the US, Europe, Singapore, Korea and Taiwan regarding their perspective of RSC in their portfolio companies. Based on interviews with 13 venture capitalists and business angels in various high-tech new ventures, the authors found that RSC is common in high-technology new ventures, but there are cultural differences in its frequency and in the investors' responses to it.

Chapter 6, on stages and processes in high technology, is by Preeta M. Banerjee from the US. It addresses the role played in entrepreneurial firm transition by recognition of the stage in which the firm is considered 'established'. Using institutional theory, the author proposes that this transition occurs through environmental recognition of firm-level routines. By conducting an exploratory analysis of three entrepreneurial biotech firms, she was able to isolate the relationship between recognition of firm-level routines and transition (or lack thereof). Her findings have practical implication for empowering entrepreneurs and investors in taking strategic action as well as theoretical implications for academics in furthering the entrepreneurship theory and research.

Part III Contextual perspectives to high-technology entrepreneurs

The third part addresses contextual perspectives, including *national perspectives* (Section A: Ireland, India and Hungary), and *comparative perspectives* (Section B: a comparative study of technology transfer in US, European and Australian universities, a comparative study of start-ups as compared to established firms and a comparative study of high-tech employees in economically stable as compared to unstable environments).

Section A on national perspectives starts with a chapter on Ireland (Chapter 7) by Anne Laure Humbert of the UK, Eileen Drew of Ireland and Elisabeth Kelan of the UK and addresses information and communication technology (ICT), entrepreneurship and gender. The chapter could have been placed in Part IV, which deals with issues related to gender ethnicity and class, but was put in this section on national perspectives because of its focus on the Irish context. After describing the Irish context,

the authors present data based on a national survey of Irish ICT entrepreneurs, showing that most respondents (men and women) conformed to a masculine model of entrepreneurship: they work very long hours and display high levels of commitment. The authors argue that despite a need to recognize the heterogeneous nature of high-tech entrepreneurship, categorization or classifications are nearly impossible.

Chapter 8, by the Indian scholar Radha R. Sharma, focuses on information technology (IT) entrepreneurs (or technopreneurs) in India. The author reviews the history of entrepreneurship in India from its independence in 1947 through the liberalization of the economy in the 1990s, which paved the way for widespread entrepreneurship in a number of fields such as IT where India has the advantage of having a burgeoning youth population in the working age group. The chapter presents the case studies of two Indian IT technopreneurs, who have not only founded IT firms, but have developed them into highly successful global firms.

After the chapters on Ireland and India, Chapter 9 focuses on Hungary. Written by Hungarian sociologist Ágnes Utasi, the chapter addresses the attitudes (mostly negative) towards high-tech entrepreneurs and company heads in post-communist Hungary. The author notes that in the new capitalist society, wealthy entrepreneurs had come into their fortunes primarily by participating in the privatization of state assets or by taking part in government-funded projects. Thus, in the eyes of the general public, the capital in the hands of these entrepreneurs actually 'belongs to us' and 'had been taken away from us'.

Section B on comparative perspectives starts with a comparative study of US, European and Australian universities. Chapter 10, by Tsvi Vinig and Paul van Rijsbergen from the Netherlands, focuses on the determinants of university technology transfer. The authors studied the factors that influence university knowledge commercialization. They analyzed the resources associated with commercialization performance in a sample of 124 Australian, European and US universities. Their most significant finding is the differences in the resources associated with high commercialization output which are positively associated with the commercial resources of the universities. Another interesting finding is that no relationship was found between an entrepreneurial university culture and the success of commercialization initiatives.

Chapter 11, by Sharon Barkan of Israel, presents a comparative perspective on start-ups as compared to established firms, and uses regulatory focus theory to compare workers in high-tech start-ups versus established firms. Regulatory focus theory is based on the notion that people have two basic self-regulation systems: prevention (characterized by a need for belonging and security) and promotion (characterized by a need for

achievement, autonomy and self-actualization). Barkan's study demonstrated that start-ups activate a promotion focus in workers while established firms activate a prevention focus.

Chapter 12, on comparative perspectives by Shira Milshtein from Israel, compares economically stable and unstable environments in the high-tech industry from the perspective of person–environment fit (P–E fit) in values and regulatory focus and its relationship to stress, burnout and meaning. Regulatory focus fit refers to the fit between personal regulatory focus (prevention versus promotion) and external situations, in this case economically stable versus unstable environments. Her study involved high-tech employees in an economically stable or economically unstable environment. Findings revealed that in an economically stable environment, employees reported lower levels of stress and burnout and a higher level of meaning than employees in an economically unstable environment. In addition, in an economically stable environment, employees with high P–E fit in values, reported lower level of burnout and higher level of meaning compared to those with low P–E fit in values.

Part IV Antecedents, correlates and consequences of entrepreneurial careers in high technology

Chapter 13, by Sigalit Ronen of Canada, examines the determinants of intrapreneurship among high-tech engineers. The chapter introduces the term 'intrapreneurship', defined as the practice of entrepreneurial skills and approaches by employees while being employed at entrepreneurial firms they do not own. Ronen presents a measure of intrapreneurial tendencies she tested among high-tech engineers. Her findings revealed that intrapreneurial tendencies that were predicted over a year earlier by traits such as openness, conscientiousness, agentic tendencies, self-esteem, internal locus of control and extroversion, were related to higher perceived and appraised (by the supervisor) performance, lower burnout, higher work engagement, and autonomy.

Chapter 14, by Sara Connolly and Susan Long of the UK, focuses on career aspirations and progression in science of men and women, based on a large-scale dataset which surveys over 1,000 employees in a major high-tech UK-based company (86 percent of them men and 14 percent women) working in science. The data provided evidence on career histories and aspirations, allowing an insight into the factors which may lead to a change in direction within or outside science, engineering and technology (SET), including setting up a business. The chapter also addresses gender issues, noting that women make up a much smaller proportion of the scientific workforce, are more likely to be employed at more junior levels, and be paid less.

Chapter 15, by Nilusha De Alwis and Helen Watt of Australia concerns the motivations influencing the choice of an engineering career. The chapter is based on data collected from first-year engineering students in Melbourne, using the new Motivations for Career Choice (MCC) scale. The findings highlight abilities and interests, salary, cognitive challenges, personal mobility, climbing the career ladder and travel as important factors that influence career choice.

Chapter 16, by Mine Karataş-Özkan and Katerina Nicolopoulou of the UK addresses the role of universities in technology transfer and commercialization activities. It presents as a case study the business venturing experience of a nascent student entrepreneur who set up a technology business in Malaysia. The student built on the knowledge and skills gained through participation in an entrepreneurship program at the university. The chapter focuses on the process through which he identified the business opportunity and engaged in commercialization activities by deploying his cultural, social and economic capitals.

Part V Gender, ethnicity, class and high-technology entrepreneurs

The fifth part starts with Chapter 17, by Olca Sürgevil from Turkey and Mustafa F. Özbilgin from the UK, on equality, diversity inclusion and exclusion of high-tech entrepreneurs. The chapter examines the way these entrepreneurs are hailed as self-made heroes and argues that they should also be considered in relation to institutional structures (such as family, education, business law, social culture, economic system and political structures) that promote or hinder the success which is often attributed to the individual. Different forms of privilege and disadvantage (such as those that are based on gender, class and ethnicity) are suggested as having great explanatory power in the career success of high-tech entrepreneurs. In other words, the way such entrepreneurs are framed as autonomous agents should be changed and they should be viewed at the same time as situated in institutional systems, contexts and processes which present them with opportunities to realize their entrepreneurial ambitions.

Chapter 18, by Elizabeth Chell, Mine Karataş-Özkan and Rosie Read of the UK, explores women academics' involvement in science entrepreneurship from a structural perspective starting with the observation that despite an increase in women's representation, women continued to be under-represented in entrepreneurial activities in SET. Conceptualizing academic cultures and SET departments, in particular, as gendered allows the authors an analysis of the entrepreneurial process through which academic structures, identities of academic entrepreneurs, and those of new ventures created, are shaped and reshaped. Drawing on a qualitative empirical study with female and male academics, findings presented in the

chapter illustrate that gender is implicated in structuring entrepreneurial activities within physics and engineering. Structuration of entrepreneurial careers for women academics in SET departments, suggests a shift from a linear to a protean or portfolio view of careers. The authors propose a multi-layered approach: at the micro-individual level – how people view the development of their own career; at the meso-organizational level – how academic institutions and research departments operate in terms of support for women scientists; at the macro level – the dynamics of the SET labor market, and the institutions in which such activities are embedded.

Chapter 19, by Gilat Kaplan and Ayala Malach-Pines from Israel, focuses on women serial high-tech entrepreneurs. It starts with the observation that while the research interest and the number of women entrepreneurs have accelerated rapidly in recent years, the level of women's entrepreneurship is still significantly lower than that of men. The chapter goes on to discuss studies on women entrepreneurs focusing on a very unusual group of highly successful Israeli serial high-tech entrepreneurs, only 9 percent of whom are women. Four of these women were interviewed about their career choice and history, the factors that helped it and the obstacles they faced. One of these interviews is presented in detail and its implications for women high-tech entrepreneurs are discussed.

Part VI Empowering high-technology entrepreneurs: mechanisms of structural and individual support

The sixth and last part focuses on mechanisms of support that can empower high-tech entrepreneurs. It includes three chapters that address various support mechanisms. Chapter 20, by Yossi Dashti of Israel, addresses the power of social networks and how high-tech entrepreneurs can put it to use. The chapter describes a study of Israeli high-tech ventures operating in the US. It starts with the observation that due to Israel's small market size, it is essential that Israeli high-tech ventures operate in global markets. As a result, many ventures opt to move their operation to the US. As the venture goes through the process aimed at achieving success – from conception through venture creation, expansion and reward realization – social networks play an important role in providing support and assistance in multiple aspects. In the study on which the chapter is based, Dashti analyzed the attributes of social networks of highly successful Israeli ventures operating in the US. His findings revealed that the social networks of these successful Israeli high-tech entrepreneurs were well established and maintained, and highly valued as a key success factor. Network attributes such as size, diversity, contact accessibility and contacts' power to influence, were considered important factors among entrepreneurs of successful ventures. The findings offer high-tech entrepreneurs as well as policy

makers, inventors, investors, management and practitioners a set of practical implications for improving entrepreneurial activities and outcomes through the building and maintenance of social networks.

Chapter 21, by William J. Lekse from the US, addresses ways of assisting the growth of small technology firms from an educator's perspective. The chapter focuses on the challenges entrepreneurial educators face in developing programs to prepare successful start-up technology entrepreneurs for their early growth decisions. When entrepreneurs seeking growth assemble resources to enter the marketplace, their recently used start-up skills may need to be adapted or even discarded. They need to develop internal and external reaching processes capable of satisfying market potential. Entry into new markets requires technology entrepreneurs to rapidly gain knowledge and become experts in the management of their supply chain, adapting their technology to new applications, prototyping to create new knowledge, and marketing new ideas to prospective customers. High potential markets are volatile, requiring entrepreneurial firms to rapidly master transformation of limited resources into efficient and effective processes that rivals more mature firms. These processes need to be effective and efficient while being flexible to survive market retractions.

Finally, Chapter 22, by Ayala Malach-Pines and Gilat Kaplan of Israel, addresses a question that has important practical implication for empowering high-tech entrepreneurs: why serial high-technology entrepreneurs don't burn out. 'Serial' entrepreneurs, who go from one entrepreneurial venture to the next seemingly challenged by stress and immune to burnout, inspire great curiosity. In the study on which the chapter is based, in-depth interviews were conducted with 43 highly successful Israeli serial high-tech entrepreneurs. Findings revealed an unusually low level of burnout among the high-tech entrepreneurs compared to a national sample and other professional groups (including managers, nurses and teachers), despite the high levels of stress characterizing work in the high-tech industry. Quotes from the interviews help explain this finding and point to the high levels of energy characterizing high-tech entrepreneurship and the sense of significance they derive from their ventures which serves as a buffer against burnout.

References

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PART I

HIGH-TECHNOLOGY
ENTREPRENEURS