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Innovating Women: Contributions to Technological Advancement.

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REVIEW

This volume is the first of the [Institute for Small Business and Entrepreneurship](#) (ISBE) series *Contemporary Issues in Entrepreneurship Research*, and the book focuses on an area that has received little attention in the past. It examines the contributions that women make, through innovative scientific activities, to entrepreneurship and thus to creating new jobs and sustaining the economy. As the book emphasises, the contribution of women to science and technology, generally but also more specifically in the context of entrepreneurship, has largely gone unrecognised. This volume makes an important contribution by providing valuable empirical data and contributing to theory development in that area. As an academic with an interest in gender, female entrepreneurship and the ICT sector, I found this compilation of work of these topics to be a great resource.

The book itself is a collection of papers presented at the ISBE conference 2010 and contributions from other invited experts. It is divided into a total of nine chapters whose context include topics related to the start-up phase (chapters 2, 3 and 5); the actual contributions made by women in science and technology (chapters 1, 4, 6, 7) and concrete illustrations of women's entrepreneurial contributions in science and technology (chapters 8, 9).

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Chapter 1 introduces the book and provides an overview of the issues related to the contribution of women to scientific advancement. It highlights the under-representation of women in SET, and asks why public policy has, thus far, been largely ineffective in increasing the participation of women. In it, Wynarczyk and Marlow argue that it is largely due to the masculinity inherent to the culture, both of SET itself, but also working practices and processes. The authors discuss the construction of gender identities, and how it relates at all stages of life to the leaky pipeline phenomenon, for example from childhood to education and careers. Wynarczyk and Marlow point to the lack of information on technological advancement and innovation, and discuss some of the shortcomings of current measures. Furthermore, they argue that the direct contribution of women to innovation has thus far been unrecognised, and propose to address this gap in the remainder of the book. The authors propose to do this both from a theoretical perspective examining the gender processes in STEM, but also by illustrating, and thus challenging, the notion that 'women are not inventors'.

In chapter 2, Henry et al. use a single case study of a UK woman veterinarian entrepreneur to discuss the innovation taking place in this rarely explored sector. Following a steep gender shift, with rapid feminisation of the sector and sectors of practice (e.g. farming vs. small animals; small operations vs. large practices), they argue that this sector provides huge entrepreneurial opportunities for women. The authors provide, sometimes in graphic detail, the story of a very successful vet-entrepreneur, and show how her story is similar to expectations of women entrepreneurs in other sectors which too are growing. Although they discuss both the masculinity and 'othering' prevalent in entrepreneurship and the veterinary world, as well as how these can hinder further female entrepreneurship, the authors fail to discuss the combined effect of these fully, although they call for further research in the area.

The exploratory stance is maintained in chapter 3, where Braun explores the practices of women entrepreneurs with/out sufficient ICT skills in Australia. Central to her argument is that to encourage female entrepreneurship, women need to acquire the technological skills inherent to the web revolution. Braun's review points out that despite some possible differences in learning and knowing between women and men, ICT skills and needs among entrepreneurs are similar. There are wide and varied learning opportunities for knowledge economy skill development, generally gender neutral in their design, although Braun reaches the conclusion that Australia is thus far not able to address women's training needs for business. Braun thus advocates the use of more women-friendly learning environments, firstly privileging the use of safe, supportive and interactive online networks and secondly environments that take into account family commitments. Her argument concludes with an outline of a 'Knowledge Economy (KE) Skilling Framework'. Although Braun's chapter provides a good account, and importantly ways forward, to increase KE skilling for women, it fails to question the factors affecting women's skills in the KE and how to challenge them. Some questions of interest arise from this paper: what are the effects of different ways of learning for KE skilling? How do these frameworks, as useful as they may be, contribute to identity construction among entrepreneurs, and thus different ways of performing entrepreneurship?

This aspect of identity construction work is elaborated on, not within the context of training frameworks, but in that of incubators¹ in chapter 4 by McAdam and

Marlow. In this chapter, incubation spaces, particularly those related to highly technological innovation are portrayed as highly masculine environments where feminine traits, needs and characteristics are largely suppressed. Furthermore, women are rightly positioned at the intersection of two further highly masculine domains: that of the SET sector and that of entrepreneurship. Based on two in-depth case studies in New-Zealand, McAdam and Marlow find that the two women studied negotiated their identities at the intersection of these three masculine spheres by 'dressing for success and talking the talk', particularly at the start-up phase of their business although this was not always a perfect disguise of femininity. Furthermore, in these two case studies, it appeared that this 'denial of femininity' led to conflict with domesticity, but provided women with a way into 'the boys' club', allowing them to learn the rules and play the game. The strength of this chapter is to illustrate, by focusing on extremes, the ideological clash between entrepreneurship and femininity. The highly masculine behaviour of the two women in question, however, calls into question the extent to which they are able to rebuild and negotiate their identities to challenge the status quo within these three highly masculinised contexts.

The highly masculine environment of SET was also identified by the 15 women entrepreneurs in Martin's chapter. Adopting a social constructionist perspective, she uses the concept of 'possible selves' to explore the impact of internal and external factors on the women's future (imagined) selves as entrepreneurs. Although her participants see the SET environment as 'normal' or gender neutral, their strategies of defeminising echo those of the women presented in McAdam and Marlow's chapter, that is in behaving as honorary men. Three narratives of business start-up emerge from this chapter: 'natural pathway' where women entrepreneurs conceptualise their activity as the only way (akin to a narrowing of the range of possible selves in their life history); 'heroic tales' where the women entrepreneurs combat and conquer; and finally 'companions on the road' exploring conceptions of selves in relation to others in order to create and grow a business venture. These narratives are interwoven with strategies of acceptance, adaptation and allowances in terms of gender relations in SET, although the chapter fails to reconcile how the narratives and strategies may be linked. The chapter concludes with a discussion of some of the policy measures that could be adopted to stop the leaky pipeline phenomenon in higher education and SET employment. The participation of women in this very domain, and policy measures to support it, is in turn the object of the following chapter.

In chapter 6, Wynarczyk argues that innovation is now increasingly carried out within organisations, with growing reliance on collaborations from other organisations in industry or higher education, and thereby removing many constraints such as information or technology. However, as Wynarczyk argues, while this seems to become an even more conducive environment for women in SET, their under-representation remains. She attributes the potential for increased participation of women in SET to better spatial organisation (presumably, potential for homeworking etc), greater flexibility in working hours and generally information technologies providing a more congenial environment in terms of work-life balance. However, this argument disregards the potential this has for work intensification (e.g. 24h access to work through emails) or life (e.g. increasing need for two incomes among households). Although it may be questionable to say that women are now in a stronger position, it is clear the low level and lack of information on patents and R&D employment by gender is

problematic, replicating expectations of masculinity in the sector. Wynarczyk calls for detailed studies of the contributions of women in this field and argues that some positive forces, such as the establishment of UKRC for women in SET and the GED (Gender Equality Duty) legislation, have been countered by masculine institutional and organisational cultures, as early as in childhood. She uses the results of a survey of 84 SET based SMEs in the UK to illustrate that women are under-represented as employees particularly in R&D; are more likely to work on a part-time basis; are greatly under-represented at management level (again particularly in R&D as opposed to HR). This has important repercussions, Wynarczyk argues, on the level of patenting among women, an aspect examined in greater details by the following chapter.

Kugele, in chapter 7, looks at the factors affecting the patenting behaviour of women and men, where women account for only eight percent of patents. Kugele shows that, as Wynarczyk also argues, not only are women under-represented in R&D, they are also subsequently under-represented in patenting activities and that this is the case throughout the EU. She also notes high levels of sectoral segregation. Even in highly feminised sectors such as pharmacy or chemistry women are disproportionately less represented as inventors. Kugele suggests that this gap can be explained by women's greater propensity for part-time work, career interruptions (short and long) or networking time leading to decreased levels of 'creative time', but also importantly, because of the timing at which innovation takes place, usually after 45 years of age, when many women may have already 'leaked out'. She concludes with case studies highlighting the successful factors that contribute to women's innovation at the organisational, team and individual levels.

The final two chapters of the book move away from academic analyses of gender, entrepreneurship and innovation to provide illustrations of innovating women. In chapter 8, Jaffé adopts a historical perspective to show that since the first known patent attributed to a woman in 1637, there have been numerous female inventors and entrepreneurs. Jaffé emphasises that it is not desirable to see these women as exceptional, but instead to recognise that these women were more often than not 'getting on with their own lives'. In parallel with progress made in transport, education and legislation, the reality of women's lives evolved leading to the increasing number of patents that were found in archives. Jaffé points out that the patents found in her research concerned a variety of areas and sectors, and on a wide spectrum of scale. The production of patents as described are often arising from personal need and thus rooted in domesticity (e.g. the gym bed; toys; or the washing machine) but also provide innovations in less stereotypical areas (e.g. sea flares) or 'second-wave' innovation, such as the use of merchandising in the case of Beatrix Potter. The patents presented become more dramatic throughout the course of the chapter with examples ranging from self-defence gloves that can also be used for mountain climbing; gold mining; Meccano; Spitfire's valves or Kevlar. The historical perspectives provided by Jaffé is expanded upon by Wynarczyk and Marlow in chapter 9 where they provide some case studies of contemporary innovating women, and thus bring the debate full circle back to entrepreneurship. They provide four case studies of women at different stages of their lives and from different backgrounds, however, some of the self-descriptions of these women remain strongly embedded within narratives of marriage and/or motherhood.

This volume provides a powerful account of innovating women, but it is sometimes hard to disentangle the concepts of innovation and entrepreneurship. The same issues arise in the context of gender. Generally, throughout the book, the gendered account is slanted towards women's accounts. While it is true that it is important to think about the factors impeding further growth in the rate of female entrepreneurship and to examine how gender affects innovation, it would be beneficial to expand the analysis to how the highly masculine/feminine divide in cultures also affects men. The book also remains uncritical of the conflation of the idea of women and mothers. Wynarczyk, for example, presents family responsibilities as the main cause of patterns of difference in R&D, but does not dig any deeper. Kugele showcases woman patenter Ada Lovelace (p 128) as the "mother of all computer nerds" or entitles her section of best practice examples "the mothers of Patents". As such, the book does not sufficiently challenge the myth of motherhood in my opinion. Overall, however, this book is excellent at dispelling quite a few other myths, that of the 'male' entrepreneur, scientist, innovator and/or inventor. As such, it provides a solid step further in breaking away from stereotype and discrimination.

ENDNOTE

¹The format of **business incubators** can be very varied, but they usually consist of programmes that provide a combination of business support services, resources, contacts, networks and physical space. The aim of business incubator is usually to strengthen the business at start-up and improve the chances of its medium to long term survival.