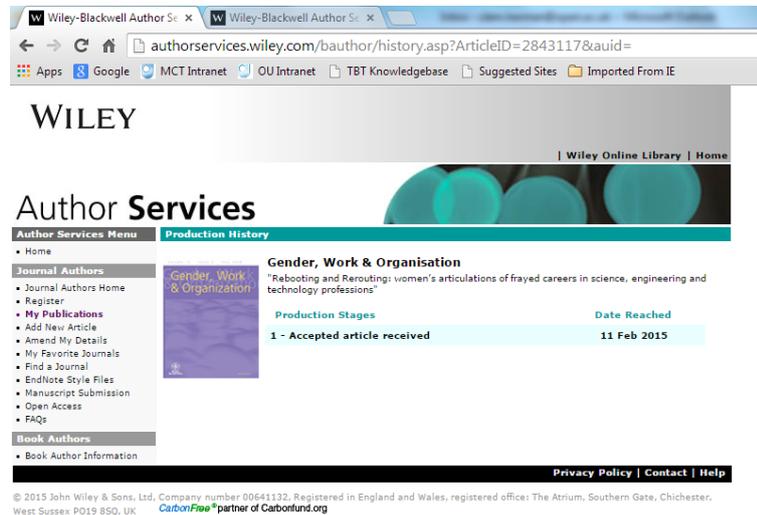


# Rebooting and Rerouting: women's articulations of frayed careers in science, engineering and technology professions

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## ABSTRACT

This paper expands on previous work about women's non-linear and frayed careers by examining the experiences of women who have attempted to return to science, engineering and technology (SET) professions in the UK and Republic of Ireland after taking a career break. These women potentially offer an important perspective on gender and career, because of the deep rooted gendered associations of science and technology with masculinity. Drawing on qualitative interviews with women SET professionals, the paper identifies three narratives – Rebooting, Rerouting and Retreating – which women use to talk about their careers. Some of these women present themselves as career changers having often made compromises and trade-offs, while others who have returned to their substantive professions, focus on continuity in their career narratives. The precarious nature of their careers is also apparent and in some cases leads to opting out or Retreating. The paper concludes by exploring how women's scientist and technical identities persist, even among those who had not returned to work, and are drawn on in narratives of return and career change.

## KEYWORDS

women returners, science, engineering, technology, career break, frayed careers, career identity

## **INTRODUCTION – Women in SET**

Women's non-linear careers continue to be depicted as deviating from the ideal worker norm and this is particularly true within the science, engineering and technology (SET) professions where women have been and continue to be under represented. Professional career pathways in SET organisations generally follow a linear hierarchical model, with the ideal worker being male and continuously available for full time employment (Acker, 1990) as well as being internationally mobile especially if they work in global companies or as scientific researchers in academia (Ackers, 2004). While this paper draws on the experiences of women in the UK and Republic of Ireland, this is considered to be a global problem (see for example Blickenstaff, 2005; Hill et al., 2010; European Commission, 2009). The reasons for this gender imbalance are complex and multiple, including the role of workplaces which perpetuate traditional male working patterns (Hewlett et al., 2008; Faulkner, 2009; Barnard et al., 2010) as well as more deep rooted cultural assumptions about gender and SET.

The gendered shaping of scientific knowledge and practice has been long recognised (Harding, 1991; Keller, 1985) yet popular cultural images of science continue to perpetuate gender stereotypes (Moreau and Mendick, 2012; O'Keeffe, 2013) and cultures within scientific training and knowledge production remain stubbornly resistant to change (Barrett and Barrett, 2011). As a consequence the conflicting identities of woman and scientist/engineer/technologist, create an 'in/visibility' paradox in which women are either assimilated as 'one of the boys', or defined by their otherness, becoming more pronounced if they become mothers (Ranson, 2005; Faulkner, 2009; Herman et al., 2013). Indeed for women, becoming a SET professional may even require 'undoing their gender' (Kelan, 2010; Jorgenson, 2002). This conflict between a 'scientist identity' and a 'woman identity' can also cause identity interference (Steinke, 2013; Settles, 2004; Settles et al., 2009). Nevertheless, many women develop and retain a passion for and a strong attachment to their identities as scientists, engineers or technologists (Hacker, 1989; Corneliussen, 2005; Corneliussen, 2014).

The focus of this paper is on women who have explicitly desired to return to SET following a career break. Within SET professions, taking a career break that severs ties with an employing organisation, results in increasing difficulty to resume traditionally defined career paths (Moore et al., 2013; Mavriplis et al., 2010; Panteli, 2006). Indeed in the UK it has been estimated that two thirds of women qualified in SET subjects do not return to working in these sectors after taking a career break (People, Science and Policy, 2002). Maternity is one but not necessarily the only trigger for women to leave SET employment; it is often the result of complex interactions between pull factors (those connected with family) and push factors (work related issues) that lead women to opt out (Stone, 2007; Hewlett, 2007). Women who are returning to SET fields find themselves moving between

private and public lives, as they negotiate and reclaim their contested identities as women in masculine-defined careers. However, although their careers have been interrupted and non-linear, the paper will show how women's scientist and technical identities persist and are drawn on during periods of transition in their narratives of return and career change.

## **THEORETICAL PERSPECTIVES ON WOMEN'S CAREERS**

Conceptualisations of the so-called 'new' career, such as the boundaryless career, were developed to describe working lives that do not map easily onto a traditional organisational structure and where individuals move across boundaries and between employers and locations (Arthur and Rousseau, 1996; Defillippi and Arthur, 1994). The notion of a protean career also challenged the dominant model of an organisationally led career by stressing the importance of self-direction, subjective career success as well as the cyclical nature of career progression (Hall, 2002, Valcour and Ladge, 2008). Other scholars have developed models that have specifically addressed women's careers such as 'kaleidoscope' (Mainiero and Sullivan, 2005) and 'careerscape' (McKie et al., 2013). These new career models present alternatives through which to analyse the experiences of women's working lives in the SET professions where the linear career has not lost its normative status (Schilling, 2012).

While these new models were initially welcomed as breaking with the dominant view of careers as continuous unbroken and organisational, the idea of the boundaryless career has increasingly come under criticism, accused of being too loosely defined, inaccurately labelled and with little empirical support for its ubiquity (Tams and Arthur, 2010; Inkson et al., 2012). An over emphasis on individual agency is also problematic, in that most studies of boundaryless careers fail to recognise constraints imposed by cultural, economic and other contextual factors (Tams and Arthur, 2010; LaPointe, 2013), and this is therefore of particular concern when analysing women's careers. Moreover, the precariousness of non-typical careers has differently gendered implications, and 'marginalizes lower-skilled workers, women and minorities for whom boundarylessness simply means unemployment, insecurity and anxiety' (Inkson et al., 2012, p328).

Recent work on women's careers has made use of the term 'frayed career' to challenge the normative linear trajectory that is implied even in the so called new career models (Sabelis and Schilling, 2013). It has been argued that it is the liminal stages and on the boundaries marking transition periods that we can see the limitations of the linear career perspective and where new opportunities for interpretation present themselves. The term frayed career thus implies a rhythmic view of career across the life course, which encompasses a range of non-typical career patterns including multiple career identities and career change. In particular, and of interest in this paper, it can be helpful in analysing and understanding the impact of career breaks..

Women who lose ties with their employers by taking an extended career break are often omitted from organisationally focused analyses – it is tempting to depict them as pursuing the archetypal boundaryless career with responsibility for their own career agency, moving between employers rather than following an organisational career (Cabrera, 2007). Indeed, returners from career breaks may arguably have increased psychological mobility compared to those who remain in organisational careers, as a period of time away from employment can be a positive experience, providing the opportunity to re-evaluate career direction in the light of other priorities (Sullivan and Arthur, 2006; Forret et al., 2010; Lovejoy and Stone, 2012). However, although such women might well have unconventional or interrupted career paths, they are likely to face negative consequences in terms of career outcomes such as pay and status. Moreover, in many cases their peripatetic work patterns are not driven by their own career agency, but rather in response to external factors such as family care or their partner or spouses career move (Ackers, 2004; Eby, 2001; Evetts, 2000). Economic factors can also be overlooked in theoretical models of career and yet recession and lack of employment opportunities clearly play a major part in career outcomes (Herman, 2014).

Sullivan and Baruch (2009), in their review of research on new careers, identified the need for more research about gender differences in career patterns and especially mid-life career changes, suggesting that ‘career patterns characterized by voluntary and involuntary multiple movements cycling in and out of the workforce are worthy of further examination’ (p.1562). In particular, women who return to work after taking career breaks often make a career change (Cabrera, 2007; Hewlett and Luce, 2005; Shaw et al., 1999; Lovejoy and Stone, 2012). However, transitions are rarely a one off event and the iterative nature of women’s interrupted careers, where women tend to move in and out of the labour market including periods of reduced hours working, mean that returns to work are articulated and experienced differently across the life course (Herman, 2010; Castaño and Webster, 2011; Sabelis and Schilling, 2013). The importance of seeing such transitions as a holistic and life-long process is emphasised by McKie et al. (2013) who propose the concept of ‘careerscape’ to characterise women’s movements in and out of work over the life course, while Maher (2013) argues that ‘disruption is normal’ for women in her study of nursing careers.

In their Kaleidoscope career model Mainiero and Sullivan (2005), conceptualise the relational nature of women’s careers and take account of different priorities at different points in the life course. They argue that ‘women shift the pattern of their careers, by rotating different aspects of their lives to arrange their roles and relationships in new ways.’ (p.111), using a dynamic model that takes into account priority changes over the life-course using three parameters - Authenticity, Balance and Challenge. They suggest that women tend to move from an early career focus on challenge to a mid-career centred on balance and finally a late career emphasis on authenticity (Mainiero and Sullivan,

2005; Sullivan et al., 2009; August, 2011). O'Neil and Bilimoria (2005) identify a similar pattern of change across age cohorts in their study of professional women with three phases (idealism, endurance and reinvention) that tend to correlate with the same three stages of early, mid and late career. Gender also intersects with age when women position themselves as career changers and women themselves may themselves reproduce ageism through their assumptions about career patterns and decision making (August, 2011; LaPointe, 2013).

While these life course and iterative perspectives are illuminating, they are not unproblematic in that there is a risk of assuming individual agency, which, as in the boundaryless career model, does not take account of external constraints. Within highly masculine sectors such as science, engineering and technology, structural gender inequalities are often implicated in women's careers being stalled and derailed, so any analysis of women's career orientations must be seen in this context (Herman, 2014). So for instance it is little wonder that women appear to be most concerned with 'balance' (Mainiero and Sullivan, 2005), at a stage in their lives when this is difficult to achieve due to continuation of gendered organisational structures and work practices. Moreover while women's choices and priorities may be expressed as personal and individual preferences (Hakim, 2000), these are informed and constrained by gendered norms within their own lives and relationships as well as within their professional sphere (Tomlinson, 2006). Heteronormative gender role expectations about the division of domestic labour mean that well intentioned 'work-life balance' policies do not necessarily make a difference (Burnett et al., 2010). Thus 'choices' about working reduced hours or taking a career break are in fact often constrained by structural and cultural factors, leaving women feeling a low sense of entitlement to successfully combining career and family care (Lewis and Smithson, 2001; Herman, 2012). Moreover, cultures within SET careers mean that at every step of the way women are disadvantaged and therefore the differential access by men and women to career enhancing experiences accumulates gender disparities, especially in science careers (Duberley and Cohen, 2010).

How then can the experiences of women in SET professions potentially advance our understanding of frayed careers in the light of the unique position they occupy in highly gendered occupations? In particular women who have taken career breaks find themselves further marginalised and need to seek ways to reconcile the normative expectations of the ideal scientific career with their own experiences of disruption and discontinuity. The study outlined below explores how women who had returned to work after a career break articulate their career stories of continuity and change in the context of male dominated professions and in particular how different narrative positions are used to make sense of careers and identify possibilities for action.

# METHODOLOGY

## Context

This paper draws on interview data from women who had taken part in a short online course (Return to SET) which, between 2005 and 2011, had more than 1000 participants from the UK and the Republic of Ireland. The course was targeted at mature women who were already graduates in STEM subjects and had been out of work for at least two years, and was part of a national government funded initiative to increase the numbers of women in SET employment<sup>1</sup>. During the Return to SET course participants reflected on previous achievements, updated their knowledge about potential employment opportunities in relevant industry sectors and developed their employability and job seeking skills. They were also encouraged to consider issues such as gender in SET employment and work-life balance. As well as collaborating in online activities, the participants took part in local face to face networking events. A detailed account of the course content has been reported elsewhere and is beyond the scope of this paper (see Herman, 2010; Herman et al., 2011).

## Data collection and analysis

The data reported here are from a follow up study conducted in 2011/2012 with women who had participated in the course 5 years previously and who had consented to be part of a longitudinal cohort for further research. Members of this longitudinal study group [n=167] were sent a postal survey asking them to indicate their current employment situation. There were 66 respondents to this postal survey of whom 7 were Black or Minority Ethnic (BME) and 59 white, with a mean age of 48. Nearly two thirds of these (59%) had returned to SET employment (see Table 1).

Telephone interviews were then carried out with a sample of 23 of the women, who were selected because they reflected a diversity of outcomes. The intention of this purposive sampling was to understand what factors had influenced or prevented 'successful' returns to SET work so the interviewees included 12 who had returned to SET employment and 11 who reported working in non-SET jobs or not working at all. The majority (n=14) had school-age children (one had a preschool child), five had adult children and three had never been mothers (see Table 2). Three were BME and 20 white.

The interviews, which took an average of one hour each, were carried out by telephone (with the interviewee at home rather than at work), recorded and then transcribed.

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<sup>1</sup> Women were recruited through press and other advertisements as part of a national campaign to support returners to SET organised by the UK Resource Centre for Women in SET (UKRC), in response to a UK government report concerned about the numbers of women leaving and not returning to scientific and technical careers (People, Science & Policy 2002).

Table 1: Employment outcomes 5 years after completion of Return to SET module

Outcome	No of respondents	%
<b>Working</b>	<b>47</b>	<b>71</b>
In SET	39	59
Not in SET	8	12
<b>Not working</b>	<b>19</b>	<b>29</b>
Caring full time	9	11
Full time study	4	6
Unemployed looking for work	4	6
Not in work/not looking for work	4	6
<b>TOTAL</b>	<b>66</b>	<b>100</b>

A semi structured approach was used for the interviews to enable flexibility and adaptation of interview questions. While initial questions focused on career changes and transitions since participating in the Return to SET course, the interviews also incorporated reflection on previous career history leading up to their career break, and their future career plans and ambitions. The interview context enabled these women to create meaning and make sense of their experiences, empowering them in the production of their own narratives (Mischler, 1991). Such a narrative approach is particularly potent in career research as it ‘re-conceptualizes individuals as storied, rather than viewing them as possessing static traits’ (Del Corso and Reh fuss, 2011 p.334). The articulation of career identity draws on narratives and discourses through which particular identity positions are constructed (LaPointe, 2010). Biographical interviews can also reveal how ‘available meanings are taken up or resisted and (re-) negotiated thereby resourcing the construction of a personal identity which accommodates the particular biographical events and life situation of the speaker’ (Taylor and Littleton, 2006, p. 23). In the case of women in SET, such available meanings run counter to dominant discourses about SET careers and so women’s identities in SET are framed against a cultural narrative of exclusion or otherness and this also informs their articulation of future possibilities. As Ozbeck and Nersessian note, ‘different positions are understood to *make possible* different forms of practice and *require* some forms of practice: positions serve to establish the possibilities for action’ (Osbeck and Nersessian, 2010 p.138).

Following transcription of the 23 interviews, coding and thematic analysis were carried out by the author within the environment of Nvivo9, a qualitative data analysis software tool. The thematic

analysis, followed an iterative cycle with open coding leading to the development of emergent themes during close reading of interview transcripts, and these were then formulated into a coding framework for a further round of analysis. The data presented in this paper focuses on the narratives employed by women about their career transitions which were made in the context of dominant discourses of normative career success in SET professions. While the analysis did not employ a formal discourse analysis methodology, the interview data analysis explored the range of narrative positions or perspectives that the women used to explain their career actions, decisions, choices and predicaments (Davies and Harre, 1990).

*Table 2 – Demographic details and outcomes of women returners interviewed*

Number	Age at	No of	Age of		
Ref	Interview	children	youngest	Previous career/training	Current job
P1	41	2	5 to 11	Environmental researcher	Adult education tutor
P2	58	2	over 18	Computer scientist	Technical author
P3	54	2	over 18	Software Engineer	Unemployed
P4	53	1	12 to 18	Biochemical researcher	Teaching Fellow
P5	48	0	N/A	IT support	Business analyst
P6	42	2	12 to 18	Sales assistant	Maths teacher
P7	49	0	N/A	Biochemist	Innovation Manager
P8	43	3	5 to 11	Senior mechanical engineer	Engineering researcher
P9	68	3	over 18	Science teacher	Retired
P10	51	2	12 to 18	Nursing/ health promotion	Research nurse
P11	35	1	under 5	Research chemist	Hotelier
P12	43	3	5 to 11	Biologist	Science technician
P13	47	2	5 to 11	Food technologist	Scientific data checker
P14	49	0	N/A	Engineer/ designer	Unemployed
P15	55	2	over 18	Hotel worker	IT tutor
P16	49	1	5 to 11	Computer programmer	IT Project Manager
P17	47	2	12 to 18	Biochemist	Midwife
P18	49	3	12 to 18	Biochemical researcher	Lab technician/chemistry teacher
P19	48	1	5 to 11	Local government worker	Full time carer
P20	48	2	5 to 11	Scientific publisher	Biomedical Scientist
P21	58	2	12 to 18	Maths teacher	Unemployed
P22	49	4	over 18	Molecular Biologist	Research Fellow
P23	51	2	5 to 11	Forensic scientist	Full time carer

## FINDINGS

Three distinct but related career narratives emerged during the thematic analysis of the interview data, which have been named as Rebooting, Rerouting and Retreating. Within the sample of 23 interviewees, 7 had returned to their original careers or Rebooted, 10 described their situation in terms of career change (Rerouting) while the remaining 6 were no longer working and told their stories from the point of view of Retreating. However it is important to stress that these three ‘types’ are narrative positions rather than categories into which individuals neatly fit –recognising that there is overlap between them and that individuals may move between them in articulating their career stories at different times.

### **Rebooting: Continuity and re-inclusion**

The ‘Rebooting’ narrative was characterised by a sense of continuity with a lifelong career identity, even if this included a history of short term contracts, intermittent jobs, periods of unemployment or family care. These continuity stories were told from the perspective of previous careers that were reignited and expressed aspirations for re-inclusion into the professional SET community.

Janet (P2) had returned to her original computer science roots after a career break and some years of working in a non IT role in the public sector. Now in her late 50s, without dependent children, her strong attachment to IT and computing is evident when she speaks of her two jobs as professional and non-professional.

*I've had a career in Computer Science since I graduated and worked full-time for some years afterwards. However, due to ... recession.. and two small children to bring up I cleared out of that, and although I continued working it wasn't in computer science, it was in a job which I could expect wasn't going to fold up on me unexpectedly, [...] having a mortgage to pay and paranoia about bills and that sort of thing I have carried on working part-time in the - shall I say - non-professional job, but I'm working part-time in the professional one at the sort of level of intellectual difficulties - if I can put it like that - which I should be at.*

*[In my ] professional job I'm self-employed status by and large. I work for a small company ... that develops software tools for producing approvable correct software. I'm not seriously technical, I deal with the documentation, customer liaison and ancillary matters such as the websites, online tutorials, exhibitions, authoring, that type of thing....that's what I call my professional work. If it's computing I'm calling it professional you see.*

Thus through her career, Janet has retained a strong affiliation with her identity as a SET professional. Her passion and pleasure in technology had not been dampened by her period of time in another job, in fact it had been strengthened by her absence. Her career narrative stresses the continuity rather than disruptions she experienced, incorporating her 'non-professional' role as secondary to her primary career. And indeed as she heads towards retirement she envisages maintaining this – her sense of entitlement and confidence at belonging expressed as being 'another in that gang'.

*It's also very common at this level of computing that people leave the industry or keep it on part-time on a self-employed basis and write, and communicate amongst themselves, and I would just be another in that gang.*

Betty's story of continuity (P8) also draws a connecting thread between different stages of her career in mechanical engineering despite several interruptions. Having worked as a post doc after her PhD, she then left her own career to follow her husband abroad, which she explained in terms of heteronormative and gendered role expectations

*my husband decided we were going to the Middle-East so I worked as an engineer in Saudi Arabia for a short time while we were over there, and then we had the [3] children so then I was on a career break*

She enrolled for the course after a 7 year career break, afterwards applying for and winning a funded research fellowship at a prestigious university, and since then has had a number of short term consultancy contracts doing engineering related research. Even though her present employment situation is precarious (she has a six week consultancy job), in her view she has made a successful return to engineering work and expresses a strong determination to continue this.

*This consultancy work I'm doing at the moment may lead further which would be good.... During that time I will also at least finish off one academic paper and one proposal, and beyond that I'm crossing my fingers that something comes back up. As I say I've got other irons in the fire, and ... just don't know what the funding situation will bring, but 'no' I won't be just shelving it if things don't work out now. No, I will pursue things and find something that will fit in.*

Yet although her chosen narrative is one of continuity and return, Betty is aware of the precariousness of her employment as she reflects on her non-conventional career to date.

*I don't have a career, I've just got a series of generally unrelated things that I've managed to do over the years...[...] You sell yourself on your versatility, or your ability to adapt when you're thrown into the deep end yet again.*

Neither of these women had followed conventional career paths. Both had left substantive careers to fit work in around family life and both had experienced precariousness of employment in their SET professions with intermittent contracts. Yet, although at different career stages, both their narratives emphasised their sense of attachment to their professional identities and aspirations for continuity and re-inclusion.

In these two cases it seems that each was able to rework her narrative into one of rebooting or return, telling a continuity story about a non-linear career. Having transferable skills and professional autonomy rather than relying on a single employer for career progression was thus portrayed an important part of their career strategy.

### **Rerouting – career change and hybrid identity**

A second narrative was that of career change or 'Rerouting', in which retraining and acquisition of new qualifications played a central role. In most cases these new careers had some connection to previous scientific and technical roles rather than taking a new direction altogether, but they were framed within a story of change and transition rather than as a return to a previous profession. Becoming a 'proper' scientist was considered to be out of their reach, often as a result of having become mothers, reiterating the difficulty of maintaining the two seemingly incompatible identities of scientist/engineer and woman/mother.

Hilary (P20) had retrained as a Biomedical Scientist following the Return to SET course and was now working in a pathology lab.

*Well, I've got quite a chequered, a mongrel CV really. I did my Bio-chemistry degree, I worked for about a year in a lab and then I went into scientific publishing ... and I was taking a career break looking after the kids, when I realised that actually I wanted to go back to work so that's when I did your course...I realised I wanted to sort of almost come full circle, I wanted to go back to sort of Science, proper Science if you know what I mean.*

In Hilary's view it had been necessary to switch careers and 'start from the beginning again' due to lack of opportunities to resume her previous career after her 8 year break. She describes her career as

‘chequered’ implying its non-linearity and unconventionality. Her desire to go back to ‘proper science’ was apparent despite years of absence and her identity as a scientist was still strong, leading her to retrain

*I went right back to basics. I wasn't necessarily planning to do that but to be quite honest there weren't that many options for me to get back into Science so I had to start from the beginning again.*

But unlike in the Rebooting narrative, Hilary's rerouting was motivated by the desire for a more conventional career trajectory and her new role presented an alternative career trajectory which gave her a strong sense of professional status.

*I think it's got a definite career path to it. You know I couldn't jump into the level that I wanted to be in so I had to start back at the beginning but there's a definite career path that I can now go on to do a postgraduate. Research doors are open to me now. I can go and do a professional doctorate if I chose, if I go to a big teaching hospital, so there are definite career paths that I can follow now.*

Fiona (P12) echoed Hilary's view about the difficulty of returning to a traditional SET career as a reason for seeking a career change.

*I felt that if you've been out of work in a professional field unless you kept your toes in the water it's actually very, very difficult to go back. They claim you can but it's not that easy.*

After completing the Return to SET course she started working at her local school as a science technician which she saw as a stepping stone to retraining in another science related career once her three children were older. With a husband who frequently works abroad, her choices and expectations are constrained by gendered and heteronormative assumptions about domestic work and childcare.

*I opted for technician work ... it fits round my family life.... It's flexible in the sense that I'm working part-time, although the hours are semi-flexible I can make up the time for any work commitments or any family commitments I've had to make...I think as a woman in science there are certain jobs which do attract more women but then they probably don't attract more pay..I mean the role that I play at the moment being a science technician is generally geared to women simply because it fits round the children, therefore unfortunately they don't pay.*

However her new role has meant a trade-off both in terms of career status and earnings and Fiona's acceptance of the inevitability of low wages due to her gender is revealed in this last sentence where she describes this as normative. Technician work is 'generally geared to women' with low pay simply being 'unfortunate'. This trade off, in fact reveals the constrained choices available to Fiona in her situation.

Career change and rerouting did not always happen immediately or as a result of the attending the Return to SET course. Tracey (P17) succeeded in going back into research as a cell biologist albeit in a series of temporary positions.

*I got a part-time temporary position for about 4 months working with a small bio-chemistry start-up,, and then I got back into research it was in a lab that was working on cancer, and so I did some technical support there, and then there were lots of short-term contracts because of the way the grants works..*

The culture of precarious and short term contracts in academic and research work was one of the drivers for Tracey to seek a more stable and predictable career path as a health professional. After three years she took a decision to make a career change and began training to be a midwife, a transition she describes arising from a serendipitous encounter which led to her 'sliding across'

*I was working with research midwives who were actually collecting [tissue] samples from women and recruiting them to the study, and it was through talking to the midwives there that I thought 'this is the direction I want to go in', so that's how I sort of slid across*

Yet she was keen to stress the retention of her core identity describing herself as

*still a scientist inside, with the outer shell of a midwife...a scientist – that's what I am*

In some respects the rerouting narrative presents a journey and similar reflections to the careerscapes that women turning to self-employment in mid-career have articulated (McKie et al., 2013). However, central to these accounts is the sense of inability to resume the career of their choice due to perceived constraints of SET career expectations, and thus their careerscapes have been shaped by the terrain in which they find themselves professionally. In particular the difficulties of reconciling motherhood with the continuation of a scientist identity can be seen in all three of these accounts, and it is noteworthy that all had moved into new careers in the more feminised sectors of health and education where those duals identities are more acceptable and accommodated.

## Retreating – opting out or exclusion

In the third narrative, Retreating, there were variations according to life stage and circumstances. For some, this had meant a return to full time caring role after initially having returned to a work role. In these stories, the logistics of combining care and paid work had been too difficult to sustain, leading to ‘giving up’ or ‘opting out’, but they had not turned to new careers as in the Re-routing narrative. For others without dependent children, their retreat had been due variously to redundancy, retirement, or in a couple of cases illness or disability that had prevented them from working. These narratives often included accounts that interlinked age with gender, illustrating not only that conventional linear career model was not applicable, but also that life-course stages are also mutable and cyclical.

Since completing the Return to SET course Holly (P23), a forensic scientist, had moved in and then out of work again. She had tried to set up her own consultancy business following the course but this had not succeeded. Moreover her employment sector was deeply affected by the economic environment and in particular public sector cuts which had affected her possibilities

*I was hoping to do more work in my field but my field is Forensic Science, that you're aware that the government has closed the Forensic Science Service. All the policing budgets have been cut and obviously at the age of 52 [I am someone] who has a wealth of experience and I did command a reasonable salary but the prospects are not that great at the moment for me.*

With two young children, both of whom have additional health needs, she felt her caring responsibilities meant it was not feasible to return to work

*I'm an older mother so I had my children somewhat later in life than most so ...at the moment I'm still at home caring for them... I do keep a watching brief of what's happening and I did apply for a number of roles, but obviously with my children I need flexible roles, and I've never quite managed to sort of get the right role with the right flexibility... I have to recognize now that I have sort of family responsibilities and I won't be able to work to the capacity as I worked before*

Her positioning as an older mother confounds the usual assumptions about life-course and career stages with her career break taking place towards the latter end of her expected working life.

Katrina (P3), a 54 year old software developer, had been unable to find a job since completing the course. Her original career break had come about after becoming a single parent:

*Well I had to resign because family commitment, because my husband passed away ... and I carried on working for another year and it came to the point that I know that I wasn't sleeping properly, and also I wasn't enjoying my work, and the two put together and I have to travel one hour each way every day spending 2 hours travelling, plus the home duties picking up my children and doing everything. It came to the point that I felt I needed a break, and that's the reason I resigned from my job.*

Following the Return to SET course, with her children no longer dependent on her, she undertook further training to update her technical skills and gained a Masters degree. But her attempts at finding work were now frustrated by what she perceived to be age discrimination

*I haven't been able to get a job, this is 3 years now things are getting even more difficult. ... age definitely is a problem, there's a barrier because. . . you don't even need to tell them how old you are, immediately they can figure out what sort of age bracket you are in. I think that is a drawback*

In her view, the normative expectations for IT professionals as being young, male and mobile, have meant she has not been able to return to her career despite her continued efforts at retraining and upskilling. In these Retreating narratives, the difficulties of reconciling the demands of family and career were prominent, but rather than seeking a career change as the Rerouting women had done, they both spoke of trying to Reboot their original careers to no avail.

## **DISCUSSION**

The three narratives identified above illustrate how women have made sense of and articulated their non-conventional careers in SET, with examples of re-inclusion, reconfiguration and also separation from mainstream SET careers. For these women, their experiences of being out of SET employment were deeply dissonant with the normative career paths in these sectors. The task of telling the story of a frayed career is challenging and the notion of a 'proper' career in a SET profession, where full time continuous commitment is expected, appeared in many of the narratives as a backdrop to their experiences, meaning that the women framed their stories within dominant discourses about normative science or technical careers. Within their biographical narratives these women either drew on or resisted and renegotiated existing available meanings of SET careers (LaPointe, 2010; Taylor and Littleton, 2006). Moreover as women's identities as SET professionals are framed against a cultural narrative of exclusion or otherness, this also informed their articulation of future possibilities for action. (Osbeck and Nersessian, 2010).

For some, the stability and predictability of a conventional career was something they strongly desired and influenced their decision making. Hilary's career change and Rerouting narrative for example was motivated by the desire for a more defined and linear career route, in contrast to her previous 'chequered' career, although others like Betty preferred to portray herself as Rebooting, stressing career continuity despite the many interruptions and changes of direction.

The narratives discussed above represent different interpretations of the lived experience of a frayed career, yet all the examples continue to reiterate the gendered career norms of SET professions. In the Rebooting narrative, women articulate their story as having returned to their substantive careers and present a sense of continuity despite set-backs and discontinuities. While this is similar to Maher's themes of connection and resilience in integrating family care with career (Maher 2013), it is differently articulated by women in SET because they are in male professions where gendered expectations of career success are not considered to be compatible with caring roles. In other words their Rebooting narratives differ from those of female dominated professions such as health or education in that their disruptions are not considered normal within the context of SET career structures. In contrast, in the Re-routing narrative, normative SET career patterns are explicitly rejected. In some cases there is an acceptance of an inevitable trade-off, leading to a lower status job. The Retreating narrative is told from the position of exclusion and inability to resume a normative career with an emphasis on the structural barriers to re-inclusion such as lack of childcare, unavailability of local or part time work, or cultural norms within the sector including perceived age discrimination, as in Katrina's case.

The importance of a life-course perspective was also apparent as a cross cutting theme. In each of the three narratives it is clear that returning is not a one off event but is often an intermittent and iterative process that has different resonances and complexions at different life-course stages much like the 'careerscapes' that McKie et al. have proposed (2013). It has already been suggested that different priorities may appear and predominate at various stages of the life course (Mainiero and Sullivan, 2005), but this study shows that these may not always appear in a linear format and that such stages may differ for women who have taken career breaks at different ages. Periods out of work in later life either for caring as in Holly's case, or because of inability to find employment as in Katrina's situation, confound the stereotypical notion of a career break occurring in early/mid-career, which is the focus of many company based initiatives to support their women employees. Similarly, renewed career motivation may happen at mid-life (as in the Rebooting and Rerouting narratives) with the challenge of a new career being just as important then as it is for younger women who are just starting out (Mainiero and Sullivan, 2005; August, 2011). Moreover career identities can persist beyond paid employment, or carry on in parallel to other income generating work, as was the case for Janet who was nearing retirement.

The women who took part in this study had high level qualifications and professional experience in SET jobs, but by having exited from the workforce, this human capital had often diminished in value and their lack of confidence had often reduced their sense of entitlement to a scientific career. However new and positive interpretations of frayed careers were also achieved within the Rebooting and Rerouting narratives. It was clear that the tenacity of professional identity whether as scientist, engineer or technologist was significant, even among these women who had precarious positions and tenuous peripheral connections to the professions they had left. Perhaps it is precisely because such identities are still considered culturally incongruous, that these women scientists, engineers and technologists were reluctant to give them up entirely. Like Tracey who is 'still a scientist inside' there remains an unwillingness to let go of such identities altogether, having invested so much in their SET education and training, and further research could be useful on the persistence of women's SET identities outside of and beyond paid employment.

## **CONCLUSION**

This study adds new insight on gender and career and in particular the notion of the frayed career, by focusing on the experiences of women who work in sectors that continue to be resistant to change because of the deep rooted gendered associations of science and technology with masculinity. The experience of women returning to SET professions brings further nuances to the notion of the frayed career, including the importance of occupational sector, and the tenacity of professional identity even in the face of exclusion. The findings also suggest that the articulation of career narratives by women who are undergoing transition back into work forms an important part of their identity work and is in itself a strategy for coping with discontinuity and change.

The hierarchical and linear trajectories of traditional scientific and technical careers mean that women returning to these sectors after a career break face additional barriers to those in many other sectors. This suggests that that the cultural context of different occupational sectors is an important and gendered variable in career trajectories. Motherhood in SET has been shown to be problematic (Ranson, 2005; Herman et al., 2013) and thus is also an important factor in how SET careers are narrated with the incompatibility of being a mother and having a 'proper' scientific career internalised and repeated in these career stories. Prevailing cultural norms within SET work mean that conventional career paths in these sectors are more difficult to come back into with fewer re-entry points. Unlike in some other occupational sectors, non-linear careers are still an anomaly. Indeed, the common strategy of rerouting to more female sectors such as education and health, reinforces the

need for SET industries to do more to accommodate women's non-linear career patterns, if they wish to retain talented and skilled women.

The tenacity of SET identities within these personal career narratives, despite deviation from normative career paths, suggests that a frayed career can be mended or rewoven in the process of telling. Using different narratives such as rebooting, rerouting or retreating, women make sense of their career successes and failures against a common backdrop of difficulty in returning to SET careers. The large numbers of women who participated in the Return to SET course indicates that getting back into a conventional career in these professions continues to be difficult to achieve after a career break. Yet there is optimism too about reconciling the seemingly incompatible identities of scientist/engineer and woman/mother in their narratives. To extend the metaphor, the women in this study have articulated different strategies for coping with their frayed careers. Some have patched them up and mended them, others have chosen to re-stitch them into a new design, and some have stored them away as something to look at with nostalgia.

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