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Why start a higher degree by research? An exploratory factor analysis of motivations to undertake doctoral studies

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Despite the increasing numbers of candidates embarking on higher degrees by research (e.g., PhD, Professional Doctorate, practice-based doctorate), we still have limited knowledge about why they are choosing this path. What are the factors that motivate students to embark on research degrees? Given that many of those who succeed in completing their doctorates will not go into academic positions, the motivations for choosing to undertake a research degree may not match the experience or outcomes (and hence, perhaps, contribute to incompletion rates). This article investigates the motivations of students in all faculties embarking on higher degrees by research at an Australian university. A survey of 405 students was subjected to a factor analysis. Five factors emerged: Family & Friends, Intrinsic Motivation, Lecturer Influence, Research Experience and Career Progression.

Keywords: doctoral education; factor analysis; motivations; quantitative research

Introduction

The nature of the PhD and doctoral education are undergoing profound changes at present, owing to a range of factors: different forms of study (professional and practice-based doctorates), new forms of thesis (thesis by publication, creative work plus exegesis) and new kinds of candidates from diverse educational backgrounds (Group of Eight, 2013). Given the vast variety of terms and expectations (and accompanying inconsistency of definitions internationally – see Kot & Hendel, 2012), here we will refer to 'Higher Degrees by Research' (HDRs) to cover the range of possibilities within contemporary universities. Within this diversity, institutions are finding ways to be flexible in responding to the changing needs and demands of HDR candidates and their

examiners, yet we are still faced with disappointingly low completion rates in many areas.

Alongside these considerations are discussions about the number of doctorates and other kinds of HDRs being undertaken at universities around the world. Just as the massification of higher education means that vastly increased numbers of undergraduates are entering universities, so too are numbers of doctoral students increasing—too many, some claim (Maslen, 2013; Sharma, 2012). Postgraduate numbers have more than doubled in the last decade in China (Sharma, 2012), and similar figures are reported in European countries (Siwinska, 2013), Australia (Group of Eight, 2013) and elsewhere. Around half of these doctoral students will not work in academic positions on completing their studies (Cyranoski et al., 2011; Group of Eight, 2013), and will put the skills learned during their candidature to many and varied uses in industry and government positions, leading to a focus on transferable skills in research training. There is some variation across disciplines, however: 'Natural scientists and engineers … are more likely to be engaged in research, while social scientists find more opportunities in non-research occupations' (Auriol et al., 2013).

Given the situation described above, we were interested in discovering what our current students say about their motivations for embarking on higher degrees by research. What are the drivers for individuals, and are these relevant and appropriate to the experience and outcomes they can expect? The Australian Postgraduate Research Experience Questionnaire (2010) indicates that 84% of graduates are satisfied with their research experience, but this does not take account of those who withdraw from their studies. It would seem likely that a mismatch between motivations for embarking on an HDR and discovery of the actual experience and likely outcomes might contribute to incompletion rates once this mismatch becomes apparent. Hence, a better understanding

of why individuals choose to undertake HDRs would help to manage those expectations, potentially avoiding disappointment and poor use of resources. We have reported elsewhere (Guerin & Ranasinghe, 2010) on the reasons Engineering students give for undertaking a PhD; here we extend the discussion to explore research degree candidates' motivations across all faculties. The aim of our study was to identify the factors that motivate students to undertake HDRs, and also to attempt to establish what role undergraduate experiences of research might play in this decision-making.

A handful of recent studies have focused on motivations to undertake HDRs in specific disciplines, with a particular emphasis in the areas of Education and Business (see Table 1).

Table 1: Literature summary

Discipline	**Author**	**Motivations identified**
History (Traditional PhD) New Zealand	Brailsford (2010)	• Improving career prospects • Personal development and intrinsic interest in the discipline • Third parties (friends, colleagues, family members, and academics)
Engineering (Traditional PhD) Malaysia	Mokhtar (2012)	Personal • Self-accomplishment • Environment • Love research • Fulfil responsibilities Professional • Requirement • Advancement • Recognition • Expertise
Education (Professional Doctorate) UK	Clark (2007)	Personal development • cognitive interest • enjoyment and love of learning • social stimulation at a professional level • academic pathways Professional development • gaining qualifications • skills • credibility • benefitting the profession • developments within information and communication technologies
Education (Professional Doctorate)	Wellington & Sikes (2006)	• Job security • Job renewal • Professional curiosity

UK		• Quest for knowledge and intellectual challenge • Personal satisfaction • Confirm or change personal identity
Education (Traditional PhD) UK	Leonard et al., (2005)	• Professional development and vocational requirements • Acquisition of research skills • Interest in the research area • Personal development • General intellectual interest, joy of study • Acquiring the named degree
Education (Professional Doctorate) USA	Jablonski (2001)	• To integrate professional experience • To make a career move • Location of programme • Type of programme • To realise personal goals • To meet requirements of current work
Business (Professional Doctorate) USA & Germany	Gill & Hoppe (2009)	• Entry to academia • Professional development • Professional advancement • Entry to new career • Self-enrichment
Business (Professional Doctorate) USA	Stiber (2000)	• Personal satisfaction • Preparation for teaching • Marketability for consulting • Advanced knowledge for entrepreneurship • Advancement within current organization • Job security

Thus, a broad range of motivations has been identified that emanate from personal intellectual satisfaction through to pragmatic career-oriented reasons. This is what we might expect to see, but the information available is from a limited range of disciplines (mostly Education and Business), with small numbers of participants (Leonard et al.'s (2005) research is the largest with data gathered from 89 survey respondents), and comes mostly from studies of Professional Doctorates in recent years. Is there a different story to be told by those who want to work in Science, Technology, Engineering and Mathematics (STEM) fields? Mokhtar (2012) begins to explore this question from the point of view of female lecturers in Engineering in a Malaysian university, but it is likely that there will also be other motivating factors for different subsets in the STEM fields. While we might think we know why students decide to embark on an HDR, there is little systematically gathered, empirical evidence to

determine whether or not these assumptions are in fact correct for students in recent years from a broader range of disciplines.

Unlike the studies listed above, our research was conducted across all faculties in a comprehensive Australian research-intensive university. The results of our study are reflective of the HDR candidate population across all faculties, rather than being focussed mainly on Education or Business as in existing studies. We did not distinguish between types of HDR in the current study.

The existing literature on motivations to undertake HDRs has worked mostly from qualitative data gathered in interviews, focus groups and open-ended questionnaires. However, there is insufficient statistical evidence to conclusively establish either the number or the nature of the latent variables underlying motivations to do an HDR. In contrast, our research employed statistical methods (Exploratory Factor Analysis—EFA) and evaluated responses measured from quantitative data gathered from a survey questionnaire to reduce the range of motivations (as identified in previous studies) to a smaller number of factors to establish underlying dimensions of variables and latent constructs (Williams et al., 2012). Furthermore, our study had a much larger number of participants (> 400) than others reported in the existing literature, thus adding to the strength and generalizability of our findings. Consequently, our EFA-based study enabled us to elicit the underlying construct of motivations to answer the question: Why start a higher degree by research? The following article analyses the quantitative data gathered by the questionnaire by subjecting it to an Exploratory Factor Analysis, then considers the resulting factors in light of the qualitative data gathered in the same questionnaire.

The Survey

Questionnaire Development

To the best of our knowledge, there is no relevant questionnaire readily available aimed at identifying motivations behind students pursuing postgraduate research. Therefore, we used a deductive approach, sometimes described as logical partitioning (Hinkin, 1998), to generate the initial set of questions. In a deductive approach it is assumed that the theoretical foundation provides enough information to generate the initial set of questions. For this, firstly a literature review (summarized in Table 1) was executed in order to identify the main domains which motivated postgraduate research students to become researchers, initially categorized as *general motivations* and *undergraduate experiences*. However, it was not expected that these domains would necessarily emerge as distinct factors in the data analysis. Questionnaire items were based primarily on the literature review; then, in order to assure content validity and face validity, items were refined according to the researchers' domain knowledge gained from extensive experience of the sector. This process resulted in a questionnaire with a set of 42 statements. Fifteen statements of the questionnaire inquired about general motivations and 27 statements focused on undergraduate experiences ranging from discussion of research being included in lectures, assessment that required some level of research, and involvement in the research culture of the School or Discipline. Participants were invited to indicate the strength of the influence of each element on a 7-point Likert scale, ranging from 1–not at all to 7–a lot.

Survey Administration and Participants

After approval by the Human Research Ethics Committee at the University, all currently enrolled HDR students were sent an email invitation to participate in the online survey. We received 405 responses. The percentage of responses from each

faculty roughly mirrors the percentage of HDR students enrolled in each of those faculties. At the time there were approximately 1800 HDRs in the University, so the response rate was around 23%. There were 67 respondents who were eliminated from further analysis as they had completed less than 75% of the questionnaire. For the data from 338 participants who completed more than 75% of the survey, missing scale items were imputed by determining each mean for the items on the scale. Because less than 2.5% of data were missing, mean imputation is considered an appropriate data replacement strategy (Tabachnick & Fidell, 2007). Checks for linearity and outliers were carried out and ten outliers were identified and eliminated from further analysis. Descriptive statistics of the remaining sample (n=328) are presented in Table 2.

Table 2. Descriptive statistics of the sample (n=328)

Variable	n(%)
Gender	
Female	56%
Male	44%
Nationality	
Australian	64%
Foreign National	36%
Age	
21-25	31%
25-30	32%
31-35	11%
36-40	6%
41-50	11%
51-60	8%
Over 61	1%
Field of Study	
Engineering	11%
Health Sciences	33%
Humanities	18%
Professions	9%
Sciences	29%

Statistical Analysis

We used Exploratory Factor Analysis to uncover the underlying structure and dimensions of what motivated current HDR students to embark on research degrees. As the name suggests, EFA is exploratory in nature and has no expectations of the number or the nature of the variables. EFA involves a series of sequential steps (e.g., selection of the number of factors, selection of the factor rotation method) that also involves evaluating multiple options. This procedure and the decisions taken are explained in detail below.

Preliminary Analyses

Statisticians have argued about the minimum sample size needed for exploratory factor analysis for decades, some looking at total sample size (e.g., 100, 200, 300), some at the ratio of subjects to items (e.g., 3:1, 4:1, 5:1). For the total sample size, there are various opinions and several guiding norms that are cited in the literature. General guides include Tabachnick's rule of thumb (Tabachnick & Fidell, 2007), which states that at least 300 cases are needed for factor analysis, while Comrey and Lee (1992) agree that 300 or more cases is a good sample. Therefore, our sample size of 328 cases is adequate for factor analysis. Even so, some studies argue that smaller sample sizes can be justified when higher correlation coefficients (Guadagnoli & Velicer, 1988) or higher communalities are present (Henson, 2006).

Although the ratio of subject-to-variable is an important factor to be considered before conducting an EFA, when total sample size increases, this ratio becomes less important (Osborne & Costello, 2004). In our study, a significant case-to-variable ratio of approximately 8:1 was present, allowing us to make strong claims from the data.

The correlation matrix was inspected for correlations in excess of 0.3. The literature warns that, if no correlation exceeds the threshold, the applicability of factor

analysis should be reconsidered (Tabachnick & Fidell, 2007). The Kaiser-Meyer-Olkin measure of sampling adequacy was 0.9, well above the recommended value of 0.6 (Hair et al., 2009). The Bartlett's test of Sphericity was also significant ($p<0.05$)($\chi^2 = 7519$, df=861, Sig.=0.000).

Exploratory Factor Analysis

For the 42 items used in the questionnaire, a Principal Component Analysis (PCA) was conducted, as this process is best suited to establish preliminary solutions in EFA (Pett et al., 2003). This was followed by an oblique rotation. A recognized challenge faced in conducting an EFA is the decision regarding how many factors to retain. Some of the better-known methods of addressing this are the Scree test (Cattell, 1966), Kaiser's rule (Kaiser, 1960) and Parallel Analysis (PA) (Horn, 1965). More recently, Comparison Data (CD) has been introduced as an alternative way of addressing the same problem (Ruscio & Roche, 2012).

Interpreting the Scree plot is subjective; for example, researchers may be tempted to set the cut-off at the number of factors desired by their research agenda (Ruscio & Roche, 2012). The eigenvalue-greater-than-1 rule tends to over-extract, or to identify too many factors (Fabrigar et al., 1999). In recent research, PA is often recommended as the best method to assess the number of factors (Lance, 2006; O'Connor, 2000). PA takes into account the sampling error and retains factors when actual eigenvalues surpass random ordered eigenvalues. CD is a variant of PA that goes even further by reproducing the observed correlation matrix rather than generating random data. Figure 1 illustrates the actual eigenvalues from PCA and the random order eigenvalues from parallel analysis. In this case, PA indicated that five factors should be retained and the same results were returned by CD. Initially, the five factors accounted for approximately 52% of the total variance; this is in line with the heuristic

recommended by Hair et al. (2009), which states that more than 50% of the variance should be explained by the retained factors.

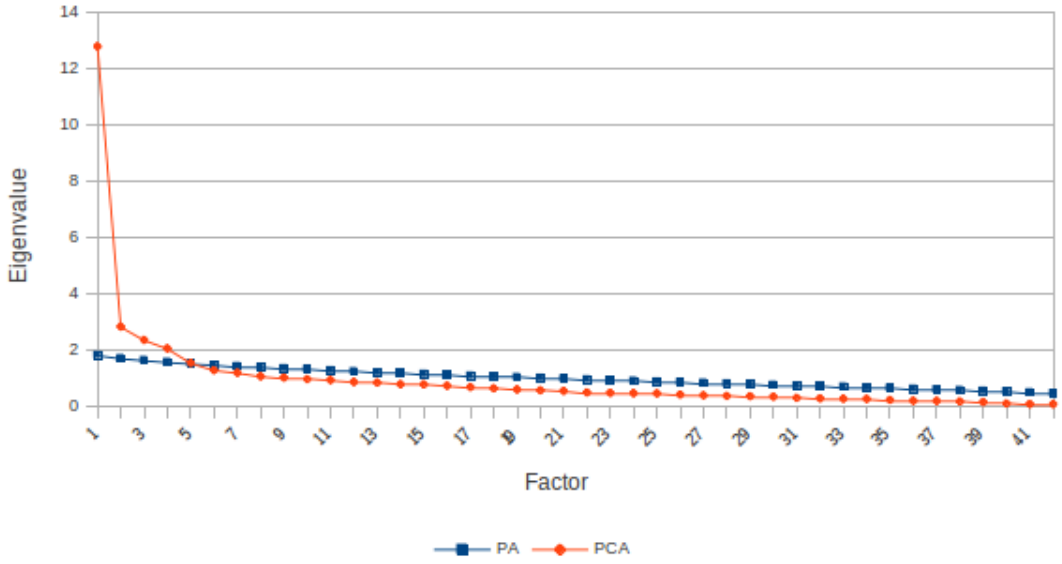

Figure 1. Eigenvalues for parallel analysis (PA) and principal component analysis (PCA)

Factor rotation allows us to obtain a simpler, more interpretable solution in EFA. The recommended method is firstly to conduct an oblique rotation in situations where there is a choice between oblique rotation or varimax rotation (Tabachnick & Fidell, 2007). Therefore, we used oblimin rotation with Kaiser normalization (a form of oblique rotation) for factor rotation. To further simplify interpretation and develop an efficient measure, only those items that loaded highly and uniquely on each factor were retained. Thus, we omitted items that loaded less than 0.3 on all the factors and the items that cross-loaded on more than one factor. Item 4 (*I wanted to be an academic*) and item 33 (*I enjoyed critically analyzing a work created by my lecturer*) failed to load highly on any of the factors. The following items cross-loaded on more than one factor:

- Item 5: *I was encouraged by my lecturer*.
- Item 29: *I was encouraged to read cutting edge research for assignments*.

- Item 30: *I enjoyed reading articles written by my lecturer*.
- Item 31: *I enjoyed reading books written by my lecturer*.
- Item 32: *I enjoyed reading extra materials recommended by my lecturer*.

As a result of following this procedure, seven items were finally eliminated.

Five factors emerged from the analysis: 1) Family and Friends; 2) Intrinsic Motivation; 3) Lecturer Influence; 4) Research Experience; and 5) Career Progression. Factor 1 contained five items and was labeled 'Family and Friends' because all items that highly loaded on this factor described the influences of these people. Factor 2, also comprising five items, was named 'Intrinsic Motivation' to capture both the internal desire to undertake higher studies and related issues of identity. Factor 3, 'Lecturer Influence', contained ten items relating to situations resulting from initiatives and pedagogy employed by lecturers. Factor 4, comprising ten items, was titled 'Research Experience' to reflect the influence of direct involvement in research prior to the HDR. Finally, Factor 5, 'Career Progression', contained five items relating to the career pathways expected to result from the higher qualification.

In the final solution, the five factors altogether accounted for approximately 54% of the total variance. Pattern matrix and the communality values are presented in Table 3. The intercorrelations among factors are presented in Table 4.

Internal consistency was measured using Cronbach's alpha (Cronbach, 1951). The alpha values for the factors were 0.8, 0.7, 0.9, 0.9 and 0.5, respectively. Even though there is no lower bound for the alpha value, the norm is to accept it at 0.7 (Gliem, 2003; Nunnally & Bernstein, 1994). However, lower alpha values should be interpreted cautiously (Tavakol & Dennick, 2011).

Cronbach's alpha is grounded on the theory of the 'tau equivalent model' which assumes that each test item measures the same latent trait on the same scale (Tavakol &

Dennick, 2011). If the test length (number of questions) is small, the reliability will be underestimated (Graham, 2006; Tavakol & Dennick, 2011). On the other hand, a longer test increases the reliability of the test regardless of its homogeneity (Tavakol & Dennick, 2011). Therefore, a high alpha value (> 0.90) may suggest redundancies and show that the test should be shortened (Tavakol & Dennick, 2011). Conversely, a low value of alpha could also be due to poor interrelatedness of the items (Tavakol & Dennick, 2011).

In our study, Factor 5 reports a low (0.5) Cronbach's alpha value with regard to the norm (0.7). There are several ways to improve low Cronbach's alpha value. One such approach is the 'what if analysis' which looks again at the alpha levels after an item is removed. In our study, this analysis revealed that elimination of items will further reduce the alpha value. This can be expected, as removal of items also further reduces the test length.

Loewenthal (2001) has stated that a high alpha level is unlikely with a small number of items (test length of Factor 5 is five); nevertheless, we can consider accepting lower alpha values if there are good theoretical and/or practical reasons for all items in a given dimension, and the number of items in that dimension is small (less than about ten items). Our knowledge of the domain plus findings from all previous studies (see Table 1) indicate that the items included in Factor 5 play a compelling role in decision-making and are therefore an informative element in the survey. Therefore, we can conclude that the Cronbach's alpha values obtained for the factors are acceptable.

Table 3. Factor loadings (EFA through the principal component analysis with oblimin rotation)

Items	1	2	3	4	5	h^2

	Items	1	2	3	4	5	h^2
6	I was encouraged by my parents	0.739					0.57
7	I was encouraged by other family members	0.761					0.58
8	I was encouraged by friends	0.840					0.71
9	I was encouraged by fellow students	0.738					0.56
10	I was inspired by media coverage of research in my field	0.488					0.32
1	I wanted to do my own research		0.753				0.59
2	I am driven by a desire to invent/create/discover new things		0.726				0.54
3	I wanted to find out more about the topic I am studying		0.605				0.42
27	I enjoyed doing project work (e.g., lab-based, data-based, field-based, literature-based research projects).		0.310				0.21
28	I enjoyed reading current journals for essays.		0.596				0.41
16	Lecturers referred to current research on the topic being taught.			0.829			0.70
17	Lecturers cited their own research.			0.887			0.80
18	Lecturers discussed details of their own research.			0.895			0.81
19	Lecturers referred to cutting-edge research in the field.			0.850			0.73
20	Lecturers were passionate about their own research.			0.903			0.84
21	Lecturers had an international reputation for their research.			0.820			0.68
22	Lecturers published in the top journals in the field.			0.771			0.61
23	Lecturers demonstrated the relevance of research to real life.			0.754			0.58
24	Lecturers explained public impact of research.			0.692			0.50
25	Guest lecturers came in to discuss their research.			0.582			0.38
26	Postgraduate students gave guest lectures on their research projects in a subject I studied.				0.336		0.27
34	I enjoyed working on a vacation research scholarship				0.494		0.27
35	I enjoyed attending special/extra lectures or seminars put on by the discipline/department.				0.453		0.33
36	I enjoyed attending the disciplinary seminar series.				0.557		0.41
37	I enjoyed attending conferences put on by the discipline.				0.809		0.67

	Items	1	2	3	4	5	h^2
38	I enjoyed reading research posters displayed in the discipline.				0.528		0.33
39	I enjoyed participating in a journal club.				0.572		0.37
40	I enjoyed being a participant in my lecturer's research project.				0.657		0.44
41	I enjoyed contributing to a conference paper.				0.763		0.59
42	I enjoyed working as a research assistant.				0.720		0.59
11	I needed a research degree to practice in my profession					0.339	0.19
12	I wanted to enhance my existing career					0.610	0.40
13	I wanted a change of career					0.584	0.39
14	My employer provided the opportunity					0.630	0.43
15	My government provided the opportunity					0.557	0.38

Notes: values < 0.3 are suppressed; Abbreviations: h^2 = Communality;
Factor 1=Family and Friends; Factor 2=Intrinsic Motivation; Factor 3=Lecturer Motivation; Factor 4=Research Experience; Factor 5=Career Progression

Table 4. Intercorrelations among factors

Factor	1	2	3	4	5
1	-				
2	0.14	-			
3	0.30	0.28	-		
4	0.252	0.133	0.43	-	
5	0.17	-0.004	0.10	0.180	-

Discussion

Analysis of the survey results revealed five broad areas of motivation: Family and Friends; Intrinsic Motivation; Lecturer Influence; Research Experience; and Career Progression. Respondents had the opportunity to add further reasons through their qualitative comments, but these responses did not present different motivations from those we had already identified. We interpret this as further evidence that the questionnaire has an adequate scope to indicate the influences on decision-making.

Nevertheless, the qualitative comments do provide a richer, more nuanced picture of that decision-making and are used here to inform our understanding of the factors.

Factor 1: Family and Friends

An important motivation for undertaking an HDR is the encouragement of friends and family, including peers who are already engaged in doctoral study or who are in the process of applying for scholarships and places in doctoral programs, as also reported in Brailsford (2010). While the 'encouragement' of family might be interpreted as family expectations of high levels of educational achievement, this was not stated explicitly in the current research. It is reasonable to assume, too, that HDRs are likely to require some measure of emotional, practical and perhaps financial support from family and friends during this lengthy undertaking, so that the decision occurs in a social context (Johnson et al., 2000; Mewburn, 2011). There will probably be a significant impact on one's spouse and dependent children, for example. Hence, advice and encouragement from the people around students can be expected to play an important role in making decisions about study choices at this level. It must also be remembered that there are sometimes pragmatic reasons for embarking on HDRs; one student responded in the qualitative comments: '*My boyfriend is studying in Australia'*.

Factor 2: Intrinsic Motivation

A major factor motivating individuals to undertake HDRs is a genuine interest in the research topic and a desire to contribute to knowledge in the field. This applied to both recent graduates from Bachelor programs and to those with extensive experience in the workforce beyond the university system, as the following comments from the qualitative data indicate:

‘I wanted to gather research evidence of the outcomes of a product that has been created by a high tech start up company that I am involved with. I also wanted to find out why this class of products, which many researchers and commentators in the field say is desperately needed, has been so difficult to implement within the particular industry sector. I want both our company and the sector to benefit by a successful implementation.’

‘I was enrolled in B.Biotech and major in Genetics. During my undergraduate study, I felt that whatever we learn from uni was just a tip of an iceberg. In order to truly understand Genetics, the only way is to further your study. Once I obtained Honours degree, it turned out the more I studied, the more I knew how little I know, that’s probably the main reason for me to pursue Ph.D.’

‘Research is my third career. I am a mature age research student who has done research in various cooperative research centres attached to the university for the past 12 years but until now had not been able to afford to take the time off to do a PhD. For me it is the realisation of the last 12 years work.’

‘I wanted to make a contribution to society....’

Alongside this genuine interest in the research topic are deeply personal motivations relating to one’s identity, as encapsulated in Leonard et al.’s (2005) ‘To prove myself at the highest level’ and in the findings of Burgess et al. (2011). The comments added to our survey included: ‘*Personal goal to gain a PhD*’; ‘*I also liked the cachet of Dr as a title...*’ Such intrinsic motivations relating to personal identity are also tied to a desire to contribute to society more broadly, and in some cases a desire for recognition from others:

‘I believe through research is where real changes can be made! I wanted to do something that would make a difference for the greater good! A bit naive but we all have to start from somewhere.’

‘*I wanted to publish papers on climate change policy so that we can have reforms and policies that work. As an individual, my opinion is not recognised. As an author of a peer reviewed paper, I may have some success.’*

‘This is the culmination of a life of learning: a PhD provides the chance to synthesise all I’ve learned in my career and gives me the incentive to read all the theorists I’ve dabbled in over the past decade.’

There is a great deal at stake for the majority of candidates undertaking HDRs, and the published literature explores the complexities of identities that are formed during this intellectual work (see, for example, Baker & Lattuca, 2010; Barnacle & Mewburn, 2010; Brew et al., 2011; Guerin, 2013; Petersen, 2007).

Factor 3: Lecturer Influence

An important factor in motivations is the behaviour and encouragement offered by lecturers. Jepsen and Neumann (2010) report that lecturers briefly mentioning postgraduate studies appears to have little effect on persuading Honours students to take up this possibility. However, our study, in accord with Brailsford (2010), has shown that lecturers do have a valuable role in influencing the decision-making of potential HDR students when this occurs at a personal level:

‘My supervisor provided the opportunity by noticing I already had a BSc and Honours and was getting good marks in my second Bachelor degree, so offered me a scholarship.’

Lecturers can adopt a mentoring role in demonstrating their enthusiasm for the topic and explaining the realities involved in doing research in a given field. The lecturers who

encourage students to continue into research degrees often supervise those students, and their motivations in taking on this long-term responsibility overlap with the students' motivations (Hean & Matthews, 2007). This Factor also confirms to some degree that lecturers can broadly influence students' choices through implementing pedagogical approaches based on discovery processes. Lecturers also influence students as role models who are passionate about their research and share that excitement during lectures (Guerin & Ranasinghe, 2010).

Factor 4: Research Experience

Although previous research experience did not emerge as an influence in the literature on motivations outlined earlier in this article (see Table 1), we would argue that it is an important factor in the decision-making to undertake research degrees that should not be overlooked. Indeed, the extensive literature on the teaching–research nexus points to the significance of such undergraduate experiences of research as a means of engaging students with the potential excitement of advanced research (Bauer & Bennett, 2003; Guerin & Ranasinghe, 2010; Sweeney et al., 2006; Zydney et al., 2002). We do, however, acknowledge that this might be more relevant to recent graduates from Bachelor programs than for mature-aged students who had completed their degrees a considerable time ago. This accords with the comments accompanying the survey:

> *'Basically, I enjoyed the practical work I did in my undergraduate degree, then continued one of the projects I worked on in third year into honours and PhD projects.'*
>
> *'I did a summer scholarship after 2nd year and thought I'd hate research but really enjoyed it so decided that I'd probably do honours and enjoyed that year. Also, the time I finished honours was not great for looking for a job, GFC etc. so doing a PhD seemed like a sensible thing to do.'*

Factor 5: Career Progression

A strong motivation for many individuals undertaking an HDR is to progress one's career, as indicated in the literature outlined earlier in Table 1. There are a number of career pathways for which a doctorate is a necessary entry point; for example, clinical psychologists in Australia are required to complete a doctorate before they can practice, and research projects in government laboratories are generally run by staff with doctorates. One of our respondents explained: *'I wanted to become a specialist dentist, and the training involves a degree by research (Doctor of Clinical Dentistry).'* For some, the necessity of completing an HDR was part of a stark reality: *'I face the prospect of losing my current job without a higher degree.'*

The qualitative comments supported career progression as a strong motivator for individuals at the beginning of their working lives, and also for those already in more senior positions:

> *'I didn't think I could get a very good job with just an undergrad degree of a BA.'*
>
> *'I needed a PhD to get to where I wanted to get, which is in science and technology commercialisation field. If you don't have a PhD no one takes you seriously no matter how good you are.'*

The decision to embark on an HDR can be motivated by the particular economic conditions and opportunities in different fields at specific historical times. One respondent explained that *'It was easier than getting a job.'*

Conclusion

This study investigated the perceived motivations for starting research degrees in an environment of increasing numbers of students opting to undertake higher degrees. The results reported here provide an understanding of key drivers for HDR candidates and

insight into their decisions to undertake research degrees, while also providing information for universities' recruitment processes and policies.

The analysis confirmed a number of motivations reported in qualitative studies in specific disciplines but more significantly revealed the important influence of embedding research into the undergraduate curriculum, as well as the strong links between teaching and research. Clearly, motivations for undertaking an HDR are complex and attempts to establish the underlying structure of the factors at play here will not be straightforward. Nevertheless, our aim is to begin to systematically explore these motivations through a statistical analysis to strengthen the current understanding of this decision-making that, until now, has largely been informed by qualitative, discipline-specific research. Further qualitative comments gathered in the survey then provide a more nuanced understanding of what might be meant by those factors.

There are a number of reasons we need to know more about the factors motivating individuals to undertake higher degrees by research. Firstly, institutions have a responsibility to make sure that those choosing HDRs have a realistic idea of where this is likely to lead them. Given the increasing number of people now graduating with HDRs and the changing opportunities for them on completion, motivations that were perfectly reasonable in the past may no longer be so relevant. Secondly, knowing more about what these students hope to gain from their studies will enlighten discussions about the changing nature of the PhD as new kinds of doctorates are in the process of being developed. And finally, a more accurate understanding of all these issues will result in more effective recruitment and marketing of doctoral opportunities. Overall, a good match between motivations for undertaking a doctorate, choices about what type of doctorate, and the likely outcomes must surely be part of a responsible higher education sector.

The current study provides a snapshot in time of a single university. Students responding to this questionnaire were making their decisions within particular economic, political and social contexts. Hence, our conclusions must at this stage be confined to making statements about this particular situation.

Our intention was to explore the factors that motivated postgraduate research students in their decisions to become researchers. Therefore, EFA was deemed as the most appropriate method as an initial evaluation without making any assumptions about the number or the nature of factors. We acknowledge that lengthy questionnaires can be a burden on respondents, hence resulting in a low response rate (Foster Page et al., 2008); therefore, we plan to derive a shorter version of the questionnaire based on results reported here. Future work will include factor analysis on a shorter version of the survey to confirm the factor structure and establish the construct validity. We also plan to use the revised survey with a more diverse population, both nationally and internationally. This will further enable us to establish the factor structure and analyze results based on gender, ethnicity, etc., where the generalizability of the results can be further discussed. We also plan to explore the motivations relating to undertaking different types of HDRs (e.g., traditional PhD or Professional Doctorate). It is expected that this information can then be used to inform recruitment policies and to ensure that motivations and expectations are appropriately aligned to likely outcomes of higher degrees by research.

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