

# Validity and Reliability of the Irish Survey of Student Engagement for Postgraduate Research Students

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## 1. Introduction and Background

This report examines the reliability and validity of the 2018 pilot national survey for the Irish Survey of Student Engagement (ISSE) of Postgraduate Research Students. Since 2013, there has been a regular national survey of first and final year undergraduate students, and taught postgraduates; this survey is the first of its kind in Ireland for postgraduate students undertaking a research degree. A total of 2,983 postgraduate research students responded to this survey, which represented a response rate of 32.5 percent.

This report provides a detailed statistical assessment of the questions and the responses obtained to this survey, to ensure that the survey instrument is performing the task it was designed for.

### 1.1. Initial Observations

The following observations are made about the structure of the data:

- The questionnaire categorises thematically linked questions into general aspects. The questions that constitute each of these aspects are the basis of the analysis contained in this report. Table 1.1 below outlines the overall aspects and the questions within them used in the analysis.
- Questions K1 and K4 are examined in two ways. First, they each can be viewed as capturing aspects of students' overall experiences, and a variable containing both of them has been created and examined in Sections 3 and 4 on this basis. However, in Section 6 of the analysis they are used as separate dependent variables to examine the key drivers behind students' evaluations of their experiences in higher education. As such, these questions have been examined together or separately depending on requirements of the analysis.
- All the scales used in the model are in the same direction from left to right with the left end indicating a negative response and the right end a positive response.
- With one exception (K1), 5-point ordinal scales were used. By ordinal, it is meant that the responses have an inherent order, for example, the strength of agreement with a

statement for which the responses run from 'definitely disagree' to 'definitely agree', but the distance between categories may be uneven.

- Because of the potential uneven distance between ordinal categories, it is important to note that the meaning and interpretation of the response categories may vary from person to person.
- The assumption underlying much of the analysis below, is that the distance between categories is not as variable as one may presume, and as such, the scales can be treated as interval where distances between categories are fixed, for example, the distance between 'agree' and 'strongly agree' is the same as the distance between 'agree' and 'neither agree nor disagree'. Analysis of interval variables has greater empirical weight than analysis of ordinal variables, so is often preferred. However, treating ordinal variables as if they are interval in the absence of evidence to support this can undermine the validity of the entire approach.
- As such, rather than take this assumption as a given, preliminary analysis was conducted on the assumption that the variables are ordinal, and then as interval-level. If the results for each approach differed significantly then it would have been highly likely that statistical techniques that necessitate interval-level variables would be unsuitable for use here. However, the ordinal-level analysis was extremely similar to that of the interval-level analysis. As such, the assumption of fixed distances between categories appears to be supported and meant that using interval-level statistical techniques has validity. This is discussed further below, and the results of these analyses are collected in Appendix F.
- Some outputs in this report are based on a transformed score instead of the original scale. This enables results across aspects to be compared on a common scale. The construction of the common scale is described in Appendix D.

Table 1.1: List of aspects with response categories

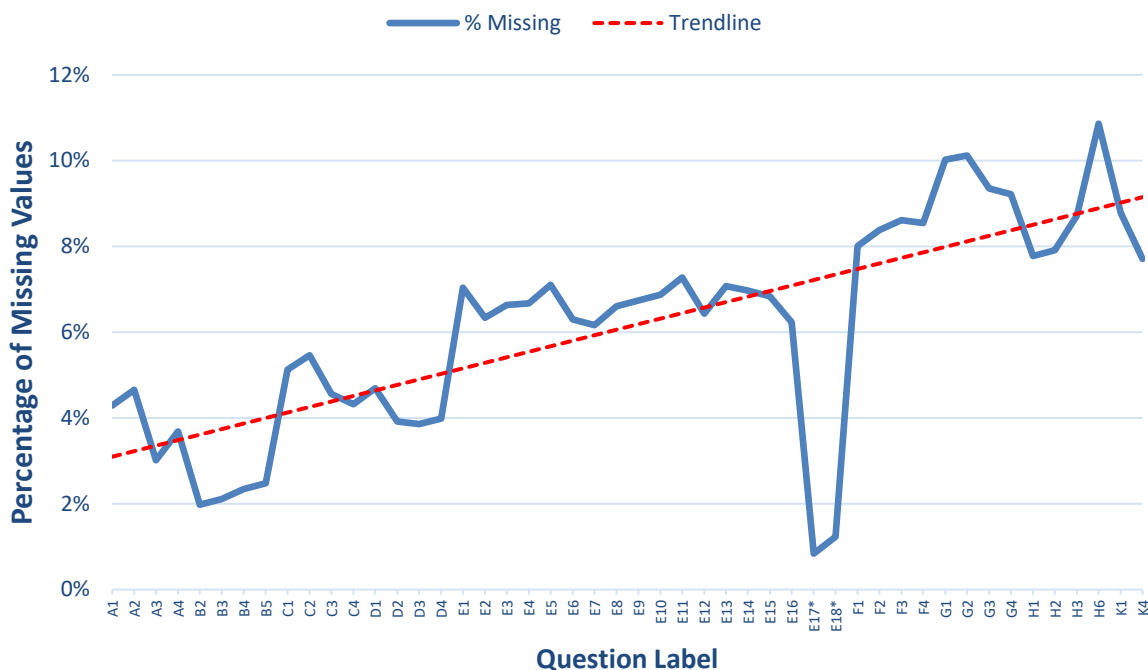
Code	Aspects	Questions	Response Categories
A	Research Infrastructure and Facilities	A1-A4	Definitely disagree, Disagree, Neither agree nor disagree, Agree, Definitely agree  (For K1 only: Poor, Fair, Good, Excellent)
B	Supervision	B2-B5	
C	Research Culture	C1-C4	
D	Progress and Assessment	D1-D4	
E	Development Opportunities	E17-E18	
F	Research Skills	F1-F4	
G	Other Transferable Skills	G1-G4	
H	Responsibilities and Supports	H1-H3, H6	
K	Overall Experience	K1, K4	

## 1.2. Meta-Level Analysis

Appendix A presents the frequencies of each item contained within each aspect. It also shows the percentage of students who did not provide a valid response to the item (termed ‘% missing’ in these tables). As much of the following analysis is based on correlations, it is important to examine the frequency of each item. Interestingly, the percentage of missing data ranges from 1 percent to 11 percent with the percentage of missing responses generally increasing from the beginning to the end of the questionnaire. Overall, the proportion of missing values is relatively low, with the average being 6 percent. The highest observed missing value is for Question H6 “My institution values and responds to feedback from research degree students” where 11 percent of respondents did not provide a response. The extent of missing data would have implications for the reliability analysis later in this report if the level of missing data was particularly high.

Figure 1.1 shows the percentage of missing values as respondents progressed through the survey. As noted above, the percentage of missing responses generally increases from the beginning to the end of the questionnaire, and this chart shows that only Questions E17 and E18 are the exceptions to the general trend. Nevertheless, the low levels of missing values are understandable here, as these questions were only asked if students had indicated in the previous question E16, that they had taught or demonstrated at their institution during their research programme. As a result, because these questions were asked only to a subset of the sample about a development opportunity that they had specifically engaged in, we note very few respondents not engaging with these questions.

Figure 1.1: Chart showing the percentage of missing values through the survey



Missing data could also be a problem if it indicated an underlying problem with the structure of certain question. For example, if we saw particularly high levels of non-response for certain questions, then this could indicate that these questions were not being understood or were ambiguous. This does not appear to be the case here as the gradual upward trend is more symptomatic of a natural fatigue with the length of the survey than anything else.

This is reinforced when we look at the percentage of respondents that provided additional comments. At the end of each section of the survey, respondents were asked if they had anything else to add, and Table 1.2 shows that respondents throughout the survey contributed additional comments to a substantial degree. On average, 18.6 percent of respondents provided comments for each section. This, however, includes K2 and K3 for which respondents were asked which aspects of their programme were most valuable to them, and what could be improved about their research programme. For these questions a majority of respondents had additional comments. With these removed, the average for all other sections is still 10.8 percent which shows a strong positive engagement with the survey from respondents.

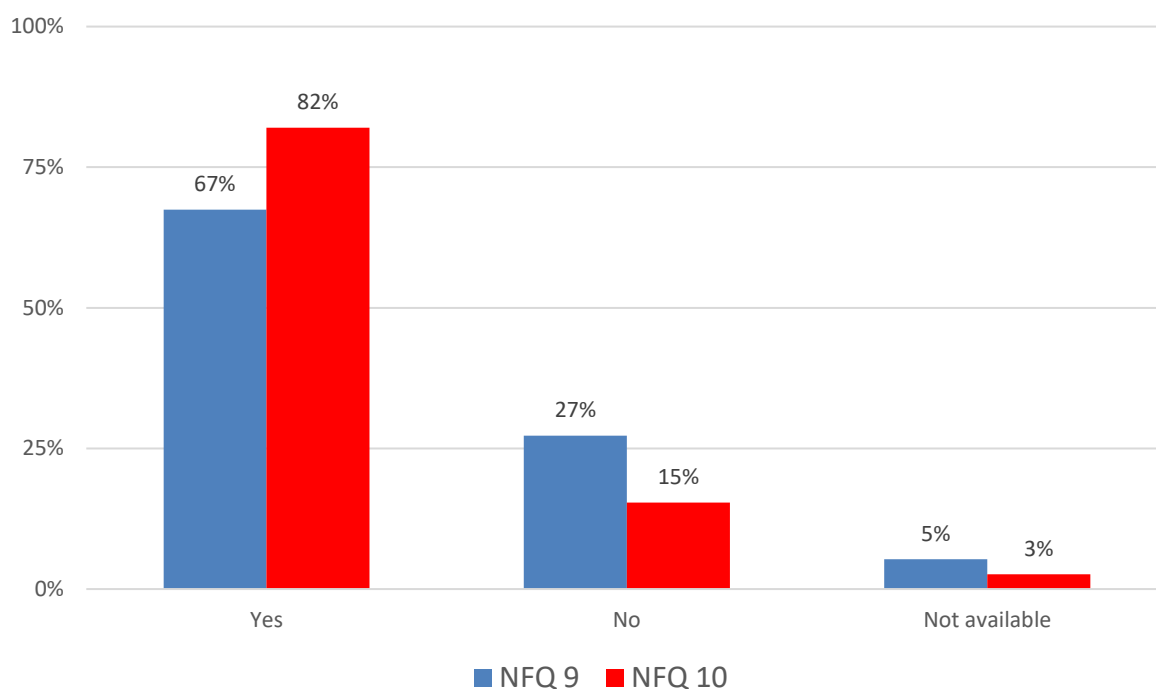
Table 1.2: The percentage of respondents providing additional comments for each section

Code	Aspects	Provided Comments
A	Research infrastructure and facilities	18.7%
B	Supervision	14.1%
C	Research culture	10.9%
D	Progress and assessment	9.2%
E	Development opportunities	13.8%
F	Research skills development	4.6%
G	Other transferable skills	3.3%
H	Responsibilities and supports	6.9%
K2	Aspects of research programme that are most valuable	53.8%
K3	Aspects of research experience that could be improved	53.2%
L	Comments about the survey itself	15.6%

There are two primary study groups in this analysis: students undertaking a Masters degree by research (labelled NFQ 9) and Doctoral students (labelled NFQ 10). Each item was examined by this grouping variable to see if the groups responded differently. Largely the difference across groups was negligible. However, some differences were found between the groups when differences would be expected, thereby providing corroborative evidence that the questions are capturing what we would want them to capture. Figures 1.2 and 1.3 show two examples of these expected differences.

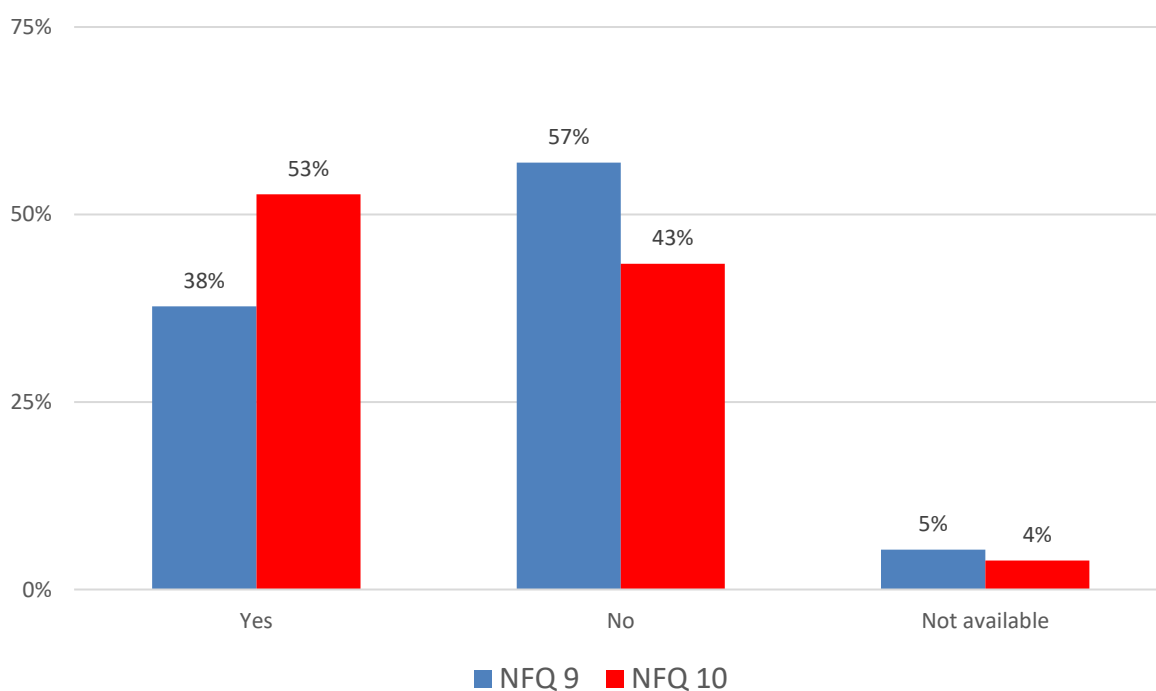


Figure 1.2: The percentage of postgraduate students who have attended an academic research conference



From Figure 1.2, Masters by research students are less likely to have attended an academic conference than doctoral students (67 percent of Masters by research students compared to 82 percent of doctoral students).

Figure 1.3: The percentage of postgraduate students who have submitted a paper for publication in an academic journal or book



From Figure 1.3, Masters by research students are less likely to have submitted a paper for publication to a journal or book than doctoral students (38 percent of Masters by research students compared to 53 percent of doctoral students).

Figure 1.2 and Figure 1.3 are examples of known group validity within the data as the results conform to prior expectations.

As discussed above, each of the questions are assigned within the questionnaire to one of nine aspects (as outlined in the appendices). The rest of this report detail the analysis conducted on the nine aspects through examination of:

- The correlation among the 32 individual items
- The reliability, when constituent questions are combined, of each of the aspects
- The distribution of the total median and mean scores of the aspects (and study groups)
- The correlation among the aspects
- Key influences on how students evaluate their research experience and their confidence in completing their degree within their institutions expected timescale.

These topics are covered individually in each of the next sections.

## 2. Correlation (Items)

Correlation is a method of bivariate analysis that measures the strength of linear association between two variables, and the direction of the relationship. In terms of the strength of relationship, the value of a correlation coefficient varies between +1 and -1. A value of 1 (or minus 1) indicates a perfect degree of association between the two variables. As the correlation coefficient value goes towards 0, the relationship between the two variables is weaker.

The correlations between all 32 items were computed at an overall level. Correlation coefficients can be calculated in a variety of ways based upon the structure of the data and the assumptions underpinning the analysis. As discussed in Section 1.1, although the variables in question are ordinal, they have been examined *as if* they were interval-level. The Pearson R correlation statistic is the most widely used method of measuring association between two interval-level variables, and the correlation matrix presented in Appendix B shows these results.

The second correlation matrix, presented in Appendix F, shows the correlation coefficients calculated using Spearman's Rho. This method is non-parametric, in that it does not carry any assumptions about the structure or distribution of the data, and is an appropriate method when variables are at least ordinal. As discussed in Section 1.1, the high degree of similarity between these two correlation matrices lends support to the assumption that the variables can be examined as if they were interval-level.

Colours were used to indicate the strength of the correlations with high values indicated by green and low values by red. Ideally, items within an aspect should be highly correlated, while items should not be correlated with items in other aspects. This appears to be the case here, as in each of the matrices as the steps where items within each aspect meet are green. Conversely, where items meet items from other aspects the rest of each matrix is predominantly orange, yellow, or red.

The notable exceptions are the items contained in F and G, where the correlation between these items is positive, strong and consistent across the items. Though as these items relate

to Research Skills and Other Transferable Skills, the overarching thematic similarity between these aspects mean that we should not be too surprised that they are strongly correlated.

Questions within D and H are also highly correlated with each other. These questions ask respondents about their Progress and Assessment, and their Responsibilities and Supports, and there is thematic overlap here, as their central concern is about students' understanding what is required of them as research students. As such, these sections could perhaps be combined and further refined.

### 3. Reliability (Aspects)

The reliability of each aspect was assessed by calculating Cronbach's Alpha, which is a measure of internal consistency of all items within a group of questions, i.e. how well items *hang* together. Cronbach's Alpha was computed for the overall group for each aspect and also for each study group. The results are displayed in Table 3.1.

Table 3.1: Cronbach's Alpha for each aspect overall and by study group

Code	No. of Items	Aspect	Overall	NFQ 9	NFQ 10
A	4	Research Infrastructure and Facilities	0.78	0.79	0.78
B	4	Supervision	0.93	0.94	0.93
C	4	Research Culture	0.81	0.79	0.81
D	4	Progress and Assessment	0.84	0.88	0.83
E	2	Development Opportunities	0.64	0.69	0.63
F	4	Research Skills	0.86	0.85	0.86
G	4	Other Transferable Skills	0.80	0.75	0.81
H	4	Responsibilities and Supports	0.72	0.75	0.71
K	2	Overall Experience	0.42	0.54	0.40

The value of Cronbach's Alpha was similar for all aspects across the groups. Although the Cronbach's Alpha values were generally high, the values for E: Development Opportunities and K: Overall Experience were somewhat lower than the other aspects (0.64 and 0.42 respectively). Cronbach's Alpha is affected by the number of items and the strength of the inter-correlations between them. For these two scales, the aspects consisted of only 2 items thus the inter-item correlations are relatively low.

In addition to there only being two items in each of these aspects, the low Cronbach's Alphas are understandable as the individual items are asking different things, not about components of the same thing. For example, E17 asks if teaching has enhanced the respondents overall research experience, whereas E18 asks if the respondent thought they received an appropriate level of support and guidance in their teaching. It is quite feasible for a respondent to think that teaching enhanced their research experience but also feel that their institution could have done more to assist them, and vice versa.

The same is the case for K1 and K4, where K1 asks respondents to evaluate their overall research experience, and K4 asks for the confidence respondents have in finishing their degree within the expected timescale of their institution. Again, the questions contained in these aspects are examining subtly different things rather than components of a larger thing, as is the case in the other aspects, which hold together much more substantially.

Appendix C provides further information on the reliability analysis for the overall group, in particular, it shows what happens to the Cronbach's Alpha when an item is deleted. For the vast majority (26 out of 28) of cases, the value for Cronbach's Alpha decreases for each aspect indicating that the item concerned is making a positive contribution to the measure.

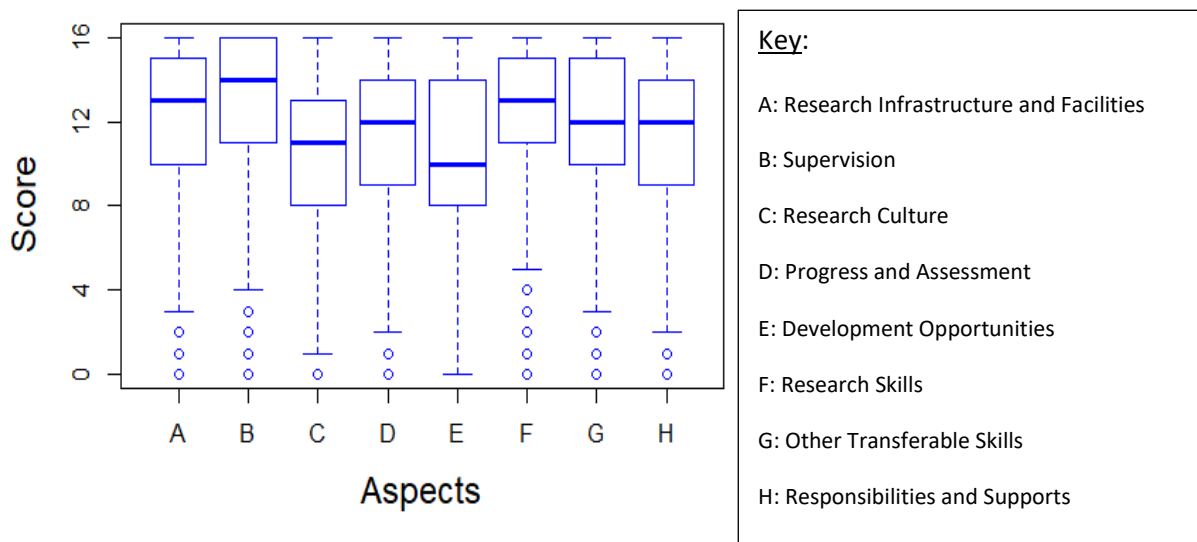
While the majority of items each contribute to their aspects, further modifications could be made to the wording of some questions to remove ambiguity and reduce the likelihood of respondents misinterpreting some of the questions. For example, question A2 asks respondents if there is adequate provision of computing resources/facilities, and A3 asks if there is adequate provision of library facilities (including physical/online resources). At first glance, one could argue that these questions are enquiring about two separate areas. However, the inclusion of *online resources* into A3 breaks down the division between the library and physical resources, and computing and online resources. As such, questions could be raised about how would a respondent answer A3 if they felt that the library was well-stocked with books, but the online availability of journals was poor?

A similar problem is evident in H6 where respondents were asked if their institution values *and responds* to their feedback. The double-barrelled nature of this question means that respondents could have opposing responses to different sections of the question, thus respondents could feel like their feedback is not valued by their institution, but they do respond to it, and vice versa.

## 4. Median and Mean Scores (Aspects)

A score was computed for each student for each of the nine aspects. The responses were transformed to a common scale enabling comparisons to be quickly and easily made across aspects. Appendix D provides a description of how scores were transformed. Figure 4.1 shows the distribution of the median score for each aspect (apart from K: Overall Experience, cf. Section 1.1).

Figure 4.1: Distribution of the median scores across aspects [range 0 to 16]



The boxplots in Figure 4.1 illustrate that the level of agreement with statements contained in each aspect is very high. This is shown through the median value for each aspect, and the interquartile range. As the median is the central value across the distribution of responses, it is evident that the general level of agreement is quite high as no median value is below eight on this scale. The boxes around the median show the interquartile range and illustrate where fifty percent of all responses are located along the scale. As these boxes are relatively narrow, and again do not go below eight on the scale, we can see that the distribution of most responses cluster around the median.

Figure 4.2: Mean (transformed) scores for each aspect by study group

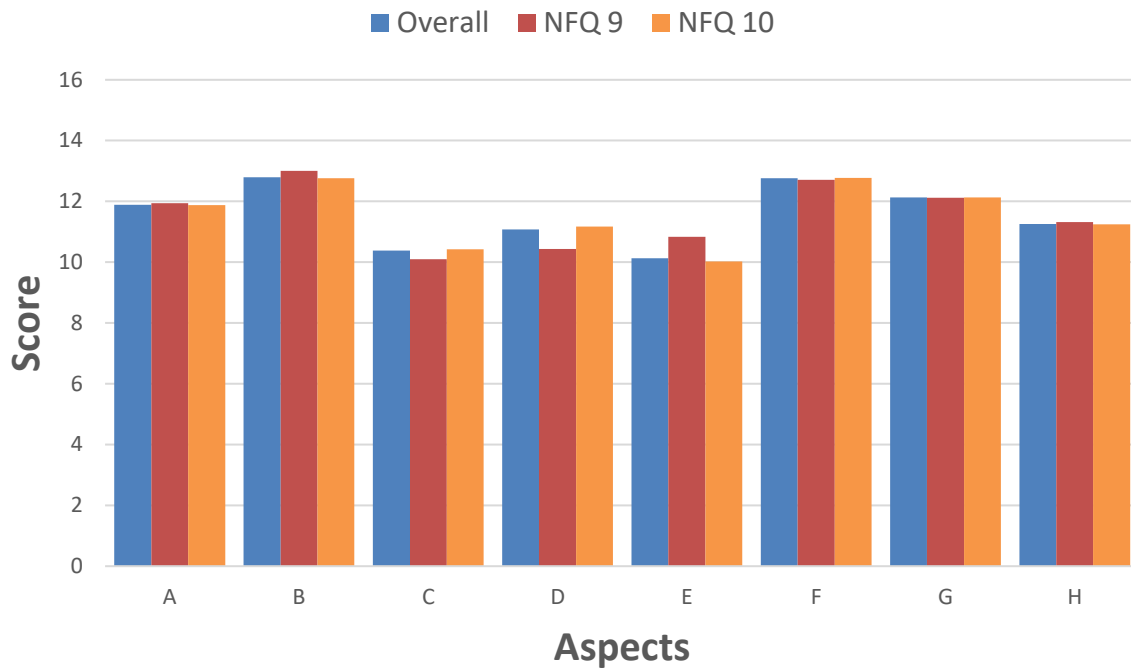


Figure 4.2 presents the transformed mean scores for each aspect for all respondents and by study group. This chart shows that like Figure 4.1, the average score across each aspect is quite high - in that no average score is below the midpoint of eight on the scale. Furthermore, when we examine the average score across study group we see that there is not much variation across groups which suggests that levels of agreement within aspects are very similar when we compare across study groups.



## 5. Correlation (Aspects)

Figure 5.1 presents the Pearson's R correlations among the 9 aspects when the constituent questions are combined into a single scale. The correlation for each of the study groups (Masters by research NFQ 9, and doctoral students NFQ 10) are shown in Appendix E.

Again, as discussed in Section 1.1, two methods of examining correlations were conducted and the similarity between both shows that the assumption of interval-level data is supported. In addition, the correlations are coloured by size with green indicating higher positive correlations and red indicating lower correlations. The Spearman's Rho versions of each of these matrices are presented in Appendix F.

Figure 5.1: Correlation between the aspects [Pearson's R]

		A	B	C	D	E	F	G
A	Research Infrastructure and Facilities							
B	Supervision	0.33						
C	Research Culture	0.45	0.45					
D	Progress and Assessment	0.35	0.45	0.46				
E	Development Opportunities	0.20	0.24	0.25	0.26			
F	Research Skills	0.29	0.42	0.38	0.42	0.26		
G	Other Transferable Skills	0.28	0.33	0.40	0.38	0.24	0.67	
H	Responsibilities and Supports	0.38	0.48	0.49	0.61	0.32	0.53	0.50

Looking at these figures, the correlations are all positive and the correlation matrices for each study group (including those in Appendix E and F) are quite similar. With regard to the matrix presented above, the correlations range between 0.20 for A: Research Infrastructure and Facilities and E: Development Opportunities, and 0.67 for F: Research Skills and G: Other Transferable Skills. The strength and direction of these correlations is largely what would be expected. The weak correlation between A: Research Infrastructure and Facilities and E: Development Opportunities is understandable as these are disparate areas. Likewise, as noted in Section 2, it would have been surprising if there was not a strong correlation between F: Research Skills and G: Other Transferable Skills, as these areas overlap quite considerably.

The high correlation between D: Progress and Assessment and H: Responsibilities and Supports noted in Section 2 is also present here, and again suggests that these sections could be merged and further refined in future studies.

## 6. Influences on Overall Evaluations and Likelihood to Complete

### Degree

This final section examines the effect of each of the aspects has upon respondents' evaluations of their research experience (K1) and their confidence in completing their research programme within their institutions' expected timeframe (K4). As discussed in Section 1.1, the responses to these questions are ordinal scales which for K1 run from poor, to fair, to good, to excellent, and for K4 run from definitely disagree, to disagree, to neither disagree or agree, to agree, to definitely agree. The structure of these questions means that they are more suited towards being analysed using ordered logistic regression models.

Ordered logistic regression operates under the assumption that each of our dependent variables are continuous latent variables which have a natural ordering but the distances between adjacent levels are unknown<sup>1</sup>. This section will not go into excessive detail but will provide enough to illuminate the results presented in Tables 6.1 and 6.2.

Our key variables of interest are the aspects that have been used throughout this report, and what we are trying to see is if these aspects have an effect (positive or negative) upon respondents' evaluations of their research experience (K1) and their confidence in completing their research programme within their institutions' expected timeframe (K4). These aspects can be treated as if they were interval-level variables with low values meaning respondents largely disagree with constituents of the aspect, and higher values meaning respondents largely agree with constituents of the aspect. The coefficients in the Estimate columns for the Interval Variables and Aspects section of Table 6.1 provide the ordered log-odds estimate for a one-unit increase in each aspect on our dependent variables given that the other variables in the model are held constant.

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<sup>1</sup> Liao, TF. *Interpreting Probability Models: Logit, Probit, and Other Generalized Linear Models*. (Sage Publishing, 1994).

Table 6.1: Ordinal Logistic Regression Models

	Evaluation of research experience			Confidence in Completing within Timescale		
	Estimate	Odds Ratio	(SE)	Estimate	Odds Ratio	(SE)
<b>Dummy Variables</b>						
Female	-0.02	0.98	(0.09)	-0.10	0.90	(0.08)
University	0.15	1.16	(0.12)	0.31	1.36	(0.11) ***
NFQ 10	-0.33	0.72	(0.14)**	-0.21	0.81	(0.13)
Non-Irish	-0.28	0.76	(0.10)***	-0.12	0.89	(0.09)
Taught as part of Programme	0.02	1.02	(0.11)	-0.31	0.73	(0.10) ***
<b>Interval Variables and Aspects</b>						
Age	0.01	1.01	(0.01)*	-0.00	1.00	(0.01)
Research Infrastructure and Facilities	0.12	1.13	(0.02)***	0.02	1.02	(0.01)
Supervision	0.18	1.20	(0.02)***	0.10	1.11	(0.01)***
Research Culture	0.17	1.19	(0.02)***	-0.04	0.96	(0.01)**
Progress and Assessment	0.05	1.05	(0.02)**	0.04	1.04	(0.01)*
Development Opportunities †	0.08	1.08	(0.02)***	-0.01	0.99	(0.02)
Research Skills	0.11	1.12	(0.02)***	0.05	1.05	(0.02)*
Other Transferable Skills	0.01	1.01	(0.02)	0.06	1.06	(0.02)**
Responsibilities and Supports	0.10	1.11	(0.02)***	0.09	1.09	(0.02)***
Observations	2,121			2,102		
Pseudo R <sup>2</sup> (Nagelkerke)	0.505			0.179		
Model $\chi^2$	1287.9 ***			384.4 ***		

Standard errors in parentheses.

†This variable is created from Questions E1 to E15. See Appendix D for further details.

\*p<0.05; \*\*p<0.01; \*\*\*p<0.001

Outside of the aspects, a host of other variables could feasibly affect a respondent's view of their research experience and confidence in completing their degree on-time. As such, to control for the influence of these, a battery of additional independent variables has been added to the models. These control variables include the age of the respondent, their gender, whether they are studying at a university or an Institute of Technology, the level of the degree being undertaken (NFQ9 or NFQ10), whether students are Irish or Non-Irish, and whether they have taught as part of their programme. However, outside of age, these variables are all binary dummy variables. This means that they are variables for which one response has been coded zero, and the other response one. The names of the dummy variables in Table 6.1 show which response has been coded one, and the coefficient in each column should be read as its effect compared against the other category in the variable.

For example, in Table 6.1, when we look at the first column, we can see that being a female student has a log-odds estimate of -0.02 compared against male students. However, this coefficient is not statistically significant, as shown by the absence of asterisks after the standard error. If this coefficient was significant, we would be able to say (with a certain degree of confidence) that female students are more likely to have negative evaluations of their research experience than male students. Ultimately, the table shows that gender does not appear to have an effect on students' evaluations of their research experience.

The asterisks in Table 6.1 indicate statistically significant effects, and rather than discussing Table 6.1 in its entirety, the statistically significant coefficients have been summarised in Table 6.2 ordered by their relative strength, and these merit further discussion. One aspect of ordinal logistic regression modelling is that the coefficients it produces are logged odds, which makes them particularly difficult to interpret at first glance, as such this table presents the odds ratio form of these coefficients taken from the second column of each model.

Before discussing this table further, it is first of all, worth outlining what odds ratios are telling us. For example, if the probability of success of some event is 80 percent, then the probability of failure is 100 percent minus 80 percent, which is 20 percent. The odds of success are defined as the ratio of the probability of success over the probability of failure. In our example, the odds of success are 80%/20% which equals 4. That is to say that the odds of success are 4 to 1. If the probability of success is 50 percent, the odds of success is 1 (i.e. 50%/50%). Odds ratios lower than 1 indicate a negative likelihood.

Secondly, one could assume that all significant coefficients have a large effect on our outcome variables of interest, but it is necessary to disentangle statistical significance from substantive significance. Age is an example of this in Table 6.1 where for a one-unit increase (i.e. a one-year increase) in a respondents' age, the logged odds of them having a higher evaluation of their research experience increases by 0.01, however this effect is marginal at best as we can see from Table 6.2 as the odds ratio is very close to one. However, its cumulative impact would be more substantive as older students (over the age of 50) would be more likely to have higher evaluations of their research experience than younger (21 to 30) students.

The main takeaway from Table 6.2 is the size of the odds ratio values, all of these are close to one, thus indicate significant, but not especially substantive effects. As such, the table shows that in general, students doing a doctoral degree (NFQ 10) are more likely to have a negative evaluation of their research experience than Masters by research students. Though this could be a function of time rather than degree type. For example, doctoral students are more likely to have spent more time at their institution than Masters by research students thus have a longer time to notice its flaws. Non-Irish students are also more likely to have a negative evaluation of their research experience. On the positive side, having good supervision, a good departmental research culture and research infrastructure such as library facilities and computing resources have a large effect on overall evaluations of respondents' research experiences.

Table 6.2: Key drivers by size of coefficient

Evaluation of research experience		Confidence in Completing within Timescale	
NFQ 10	0.72	Taught as part of Programme	0.73
Non-Irish	0.76	Research Culture	0.96
Age	1.01	Progress and Assessment	1.04
Progress and Assessment	1.05	Research Skills	1.05
Development Opportunities †	1.08	Other Transferable Skills	1.06
Responsibilities and Supports	1.11	Responsibilities and Supports	1.09
Research Skills	1.12	Supervision	1.11
Research Infrastructure and Facilities	1.13	University	1.36
Research Culture	1.19		
Supervision	1.20		
†This variable is created from Questions E1 to E15. See Appendix D for further details.			

With regard to respondents' confidence in completing their programme within their institutions' expected timescale, students at university are more likely to feel confident of completing on-time than students at Institutes of Technology. Furthermore, students who teach feel that they are less likely to complete on time, presumably due to the fact that teaching takes up some of their time which could have been used for their research. So there appears to be a trade-off here, as students theoretically would not undertake this activity unless they saw some benefit, such as greater employability at the end of their degree because of their teaching experience, but also see that it impacts on the amount of time they

have for their own research. Again, having good supervision and a clear understanding of the requirements to undertake a postgraduate degree also have a strong positive influence on respondents' confidence in completing their degree on-time.

Counter-intuitively, while having a strong research culture positively affects students' evaluations of their research experience, it also appears to negatively affect students' confidence in finishing on-time. It may be the case that having a strong research culture means that students enjoy participating in this aspect of their degrees, but this participation has knock-on effects on their own work. For example, students can gain from participating in the research culture by attending seminars and discussing research papers outside their own field of study, but this participation also requires time spent preparing for this, when this time could also be spent on their own research.

To briefly summarise the above, Table 6.2 shows key drivers behind respondents' evaluations of their research experience and their confidence in completing their research degree on-time. From these tables, certain aspects have statistically significant effects on both of these variables of interest, for example, having good supervision. However, it is also worth bearing in mind the size of the coefficients and the values of the odds ratios which indicate significant effects, but also show that these key drivers only marginally increase (or decrease) the probabilities of being in a higher category of the dependent variables. As such, certain effects, for example, the effect of being at university has upon respondents' confidence in completing their degree on-time should not be overemphasised.

## 7. Conclusion

This report has provided a detailed statistical assessment of the questions and the responses obtained to the ISSE for Postgraduate Research Students survey and this section summarises our findings.

At an overall level, the degree of non-responses to questions follows what we would expect to see from a survey of this length, and although the general trend was to see higher levels of non-response, as the survey progressed there was no question that had a markedly higher level of non-response. High levels of non-response or missing data would have indicated potential problems with the wording, or that respondents are unable to comprehend the question. The percentage of additional comments provided after each section of the survey also indicates that respondents were engaged with the subject of the study and were willing to spend further time providing more detailed answers than was required at a base-level.

The correlation between items within aspects is generally high, indicating their suitability for being joined together in their respective sections, and this corresponds to lower levels of correlation between items across aspects. Though the strength of correlation between items contained within Sections F and G, Research Skills and Other Transferable Skills, suggests that these could potentially be grouped together into a section on Skills in General rather than making this distinction between types of skills. The same could be implemented for Section D and H, Progress and Assessment and Responsibilities and Supports as there is thematic correspondence across these aspects about students knowing what is required of them as research students.

The reliability of the aspects is also generally very high as demonstrated by the consistent Cronbach's Alpha values. These show that individual items are positively contributing to the overall aspect, and as such these aspects are holding together very well. However, we would recommend some adjustment be made to the wording of a small number of questions, to remove any potential causes of misunderstandings or ambiguities.

The final section examined how the aspects impact on two measures of students' overall experience in postgraduate research; their evaluations of their research experiences at their institution, and the confidence they had in completing their degree within their institutions'



expected timescale. This section showed that some aspects have a consistently positive influence on both measures. These aspects included the quality of students' supervision, developing good research skills, having adequate supports and understanding the responsibilities of research students. Other aspects such as the quality of the research culture had a cross-cutting influence in that they had a positive impact on students' evaluations of their research experience but had a negative influence on students' confidence in completing their degree on time. This section also emphasised that the strength of the coefficients should not be overstated.

In sum, the survey appears to be a good instrument for measuring postgraduate research students' opinions about their research experiences; though there is some scope, when this survey is repeated, for the removal of ambiguity from a small number of questions and some sections being combined and refined. These minor adjustments would increase the validity of these questions and the overall structure of the survey without undermining the validity of any longitudinal aspect.

## Appendix A – Item Profiles

A total of 2,983 students participated in the survey and the distribution of valid responses to each item within each aspect is shown below. Not all students answered all items and the percentage of missing values is also provided.

### Section A: Research Infrastructure and Facilities

		Definitely disagree	Mostly disagree	Neither agree nor disagree	Mostly agree	Definitely agree	Valid N	% Missing
A1	I have a suitable working space	4%	8%	5%	35%	47%	2855	4%
A2	There is adequate provision of computing resources/facilities	5%	12%	10%	35%	38%	2844	5%
A3	There is adequate provision of library facilities (including physical / online resources)	3%	8%	8%	39%	42%	2893	3%
A4	I have access to the specialist resources and facilities necessary for my research	4%	10%	14%	43%	29%	2873	4%

### Section B: Supervision

		Definitely disagree	Mostly disagree	Neither agree nor disagree	Mostly agree	Definitely agree	Valid N	% Missing
B2	My supervisor(s) provides the appropriate level of support for my research	3%	7%	7%	28%	55%	2924	2%
B3	I have regular contact with my supervisor(s), appropriate for my needs	3%	6%	7%	24%	60%	2920	2%
B4	My supervisor(s) provides feedback that helps me to direct my research activities	3%	5%	8%	28%	56%	2913	2%
B5	My supervisor(s) help me to identify my training and development needs as a researcher	5%	10%	13%	29%	43%	2909	2%

## Section C: Research Culture

		Definitely disagree	Mostly disagree	Neither agree nor disagree	Mostly agree	Definitely agree	Valid N	% Missing
C1	My department provides access to a relevant seminar programme	6%	12%	16%	37%	30%	2830	5%
C2	The research ambience in my department stimulates my work	6%	13%	21%	34%	25%	2820	5%
C3	I have frequent opportunities to discuss my research with other research students	7%	15%	16%	33%	29%	2847	5%
C4	I have opportunities to become involved in the wider research community, beyond my department	7%	18%	22%	32%	21%	2854	4%

## Section D: Progress and Assessment

		Definitely disagree	Mostly disagree	Neither agree nor disagree	Mostly agree	Definitely agree	Valid N	% Missing
D1	I received an appropriate induction / orientation to my research degree programme	10%	16%	15%	34%	25%	2843	5%
D2	I understand the requirements and deadlines for formal monitoring of my progress	3%	10%	11%	41%	35%	2866	4%
D3	I understand the required standard for my thesis	4%	10%	12%	43%	32%	2868	4%
D4	The final assessment procedures for my research degree are clear to me	4%	12%	14%	41%	29%	2864	4%

## Section E: Development Opportunities

		Yes	No	Not available	Valid N	% Missing
E1	Agreeing a personal training or development plan	42%	41%	17%	2773	7%
E2	Receiving training to develop my research skills	76%	19%	5%	2794	6%
E3	Receiving training to develop my other transferable skills	59%	33%	8%	2785	7%
E4	Receiving advice on career options	30%	59%	11%	2784	7%
E5	Taking part in a placement or internship	18%	61%	21%	2771	7%
E6	Attending an academic research conference	80%	17%	3%	2795	6%
E7	Presenting a paper or poster at an academic research conference	70%	26%	3%	2799	6%
E8	Submitting a paper for publication in an academic journal or book	51%	45%	4%	2786	7%
E9	Communicating your research to a non-academic audience	46%	48%	6%	2782	7%
E10	Receiving training in entrepreneurship and innovation	17%	69%	14%	2778	7%
E11	Putting training in entrepreneurship and innovation into practice	7%	76%	16%	2766	7%
E12	Working as part of a team	64%	29%	7%	2791	6%
E13	Working collaboratively with industry	26%	60%	14%	2772	7%
E14	Working collaboratively with a civil society organisation or public organisation	23%	63%	14%	2775	7%
E15	Spending time abroad as part of your research degree	22%	66%	13%	2779	7%
E16	Please indicate whether you have taught (or demonstrated) at your institution during your research degree programme	72%	28%	0%	2797	6%

**Note: Only students who indicated that they have taught or demonstrated at their institution during their research programme**

		Definitely disagree	Mostly disagree	Neither agree nor disagree	Mostly agree	Definitely agree	Valid N	% Missing
E17	Do you agree or disagree that the teaching / demonstration you delivered enhanced your overall research experience?	8%	12%	13%	26%	41%	2010	1%
E18	Do you agree or disagree that you have been given appropriate support and guidance for your teaching/ demonstration?	10%	21%	18%	31%	20%	2002	1%

## Section F: Research Skills

		Definitely disagree	Mostly disagree	Neither agree nor disagree	Mostly agree	Definitely agree	Valid N	% Missing
F1	My skills in applying appropriate research methodologies, tools and techniques have developed during my programme	1%	3%	8%	41%	47%	2744	8%
F2	My skills in critically analysing and evaluating findings and results have developed during my programme	1%	3%	9%	40%	47%	2733	8%
F3	My confidence to be creative or innovative has developed during my programme	3%	8%	17%	39%	33%	2726	9%
F4	My understanding of 'research integrity' (e.g. rigour, ethics, transparency, attributing the contribution of others) has developed during my programme	1%	3%	12%	37%	46%	2728	9%

## Section G: Other Transferable Skills

		Definitely disagree	Mostly disagree	Neither agree nor disagree	Mostly agree	Definitely agree	Valid N	% Missing
G1	My ability to manage projects has developed during my programme	1%	6%	15%	41%	37%	2684	10%
G2	My ability to communicate information effectively to diverse audiences has developed during my programme	1%	6%	15%	42%	36%	2681	10%
G3	I have developed contacts or professional networks during my programme	3%	10%	17%	38%	33%	2704	9%
G4	I have increasingly managed my own professional development during my programme	1%	5%	14%	41%	39%	2708	9%

## Section H: Responsibilities and Supports

		Definitely disagree	Mostly disagree	Neither agree nor disagree	Mostly agree	Definitely agree	Valid N	% Missing
H1	I understand my responsibilities as a research degree student	1%	4%	6%	42%	46%	2751	8%
H2	I am aware of my supervisor(s)' responsibilities towards me as a research degree student	2%	7%	10%	40%	41%	2747	8%
H3	Other than my supervisor(s), I know who to approach if I am concerned about any academic aspect of my research degree programme	7%	15%	14%	31%	32%	2723	9%
H4	My institution values and responds to feedback from research degree students	8%	14%	39%	27%	12%	2659	11%

## Section K: Overall Experience

		Poor	Fair	Good	Excellent	Valid N	% Missing
K1	How would you evaluate your entire research experience at this institution?	5%	19%	51%	24%	2721	9%

		Poor	Fair	Good	Excellent	Valid N	% Missing
K4	I am confident that I will complete my research degree programme within my institutions expected timescale	6%	10%	11%	38%	35%	2693

## Appendix B – Inter-Item Correlation Matrix

### Pearson's R

	A1	A2	A3	A4	B2	B3	B4	B5	C1	C2	C3	C4	D1	D2	D3	D4	E17	E18	F1	F2	F3	F4	G1	G2	G3	G4	H1	H2	H3	H6	K1	K2
A1																																
A2	0.54																															
A3	0.35	0.42																														
A4	0.44	0.48	0.55																													
B2	0.24	0.26	0.19	0.30																												
B3	0.21	0.23	0.19	0.27	0.82																											
B4	0.22	0.22	0.18	0.28	0.83	0.76																										
B5	0.21	0.23	0.18	0.29	0.76	0.69	0.77																									
C1	0.25	0.27	0.29	0.38	0.31	0.29	0.29	0.36																								
C2	0.33	0.31	0.27	0.36	0.39	0.35	0.38	0.44	0.57																							
C3	0.28	0.21	0.20	0.27	0.27	0.25	0.26	0.31	0.44	0.56																						
C4	0.25	0.25	0.23	0.30	0.30	0.28	0.28	0.36	0.44	0.51	0.56																					
D1	0.20	0.23	0.21	0.28	0.35	0.31	0.33	0.37	0.37	0.38	0.30	0.35																				
D2	0.19	0.24	0.22	0.27	0.35	0.34	0.34	0.36	0.32	0.33	0.27	0.28	0.55																			
D3	0.18	0.23	0.17	0.25	0.35	0.31	0.35	0.37	0.28	0.30	0.25	0.28	0.46	0.67																		
D4	0.18	0.21	0.20	0.27	0.31	0.29	0.32	0.33	0.28	0.29	0.24	0.27	0.44	0.63	0.75																	
E17	0.10	0.09	0.07	0.08	0.13	0.12	0.12	0.14	0.14	0.14	0.10	0.09	0.09	0.11	0.13	0.12																
E18	0.17	0.22	0.16	0.19	0.25	0.21	0.24	0.27	0.25	0.28	0.17	0.19	0.27	0.25	0.25	0.25	0.47															
F1	0.18	0.20	0.17	0.23	0.32	0.28	0.33	0.32	0.21	0.30	0.26	0.25	0.24	0.30	0.32	0.32	0.16	0.19														
F2	0.17	0.18	0.17	0.23	0.33	0.28	0.34	0.32	0.22	0.28	0.25	0.25	0.22	0.28	0.32	0.30	0.15	0.17	0.78													
F3	0.17	0.19	0.15	0.21	0.36	0.30	0.37	0.37	0.23	0.35	0.28	0.30	0.28	0.29	0.33	0.33	0.16	0.23	0.57	0.62												
F4	0.16	0.19	0.17	0.19	0.29	0.27	0.30	0.29	0.23	0.29	0.21	0.23	0.24	0.31	0.32	0.33	0.18	0.22	0.60	0.61	0.57											
G1	0.20	0.18	0.18	0.19	0.26	0.24	0.27	0.29	0.20	0.29	0.27	0.28	0.22	0.27	0.28	0.28	0.16	0.18	0.52	0.54	0.52	0.49										
G2	0.18	0.16	0.15	0.18	0.23	0.22	0.24	0.27	0.19	0.28	0.29	0.29	0.22	0.27	0.28	0.27	0.16	0.18	0.45	0.51	0.50	0.47	0.63									
G3	0.19	0.19	0.13	0.21	0.25	0.24	0.26	0.30	0.24	0.32	0.29	0.38	0.25	0.24	0.28	0.28	0.17	0.15	0.37	0.39	0.42	0.37	0.43	0.49								
G4	0.10	0.11	0.12	0.12	0.14	0.14	0.17	0.18	0.13	0.19	0.16	0.21	0.17	0.22	0.24	0.23	0.17	0.14	0.40	0.42	0.43	0.40	0.48	0.46	0.53							
H1	0.18	0.24	0.17	0.24	0.30	0.28	0.30	0.30	0.22	0.28	0.21	0.23	0.35	0.48	0.49	0.45	0.15	0.23	0.44	0.44	0.44	0.45	0.42	0.39	0.34	0.39						
H2	0.18	0.24	0.15	0.26	0.45	0.40	0.43	0.43	0.26	0.32	0.22	0.27	0.37	0.48	0.49	0.47	0.14	0.24	0.40	0.41	0.41	0.39	0.35	0.34	0.31	0.33	0.71					
H3	0.19	0.23	0.20	0.25	0.32	0.30	0.32	0.36	0.30	0.37	0.29	0.34	0.38	0.40	0.41	0.39	0.13	0.24	0.30	0.28	0.35	0.30	0.29	0.30	0.31	0.26	0.42	0.50				
H6	0.23	0.28	0.23	0.27	0.25	0.23	0.22	0.26	0.33	0.38	0.23	0.31	0.32	0.26	0.23	0.22	0.20	0.35	0.18	0.16	0.27	0.21	0.18	0.19	0.23	0.14	0.26	0.27	0.32			
K1	0.32	0.33	0.25	0.38	0.51	0.42	0.47	0.49	0.39	0.52	0.36	0.39	0.40	0.35	0.35	0.34	0.15	0.31	0.33	0.32	0.43	0.32	0.30	0.31	0.33	0.21	0.30	0.36	0.38	0.41		
K4	0.14	0.14	0.09	0.17	0.29	0.25	0.29	0.29	0.15	0.16	0.10	0.13	0.18	0.20	0.22	0.19	0.18	0.23	0.18	0.19	0.25	0.17	0.17	0.17	0.16	0.15	0.20	0.23	0.21	0.22	0.29	



## Appendix C – Correlation and Reliability

### Section A: Research Infrastructure and Facilities (Cronbach's Alpha = 0.78)

Inter-Item Correlation Matrix (listwise deletion)		A1	A2	A3	A4	*
A1	I have a suitable working space	1.00				0.73
A2	There is adequate provision of computing resources / facilities	0.55	1.00			0.71
A3	There is adequate provision of library facilities (including physical / online resources)	0.35	0.42	1.00		0.74
A4	I have access to the specialist resources and facilities necessary for my research	0.44	0.48	0.55	1.00	0.70

\* Cronbach's Alpha if item deleted

### Section B: Supervision (Cronbach's Alpha = 0.93)

Inter-Item Correlation Matrix (listwise deletion)		B2	B3	B4	B5	*
B2	My supervisor(s) provides the appropriate level of support for my research	1.00				0.90
B3	I have regular contact with my supervisor(s), appropriate for my needs	0.82	1.00			0.92
B4	My supervisor(s) provides feedback that helps me to direct my research activities	0.84	0.76	1.00		0.90
B5	My supervisor(s) help me to identify my training and development needs as a researcher	0.76	0.70	0.78	1.00	0.93

\* Cronbach's Alpha if item deleted

### Section C: Research Culture (Cronbach's Alpha = 0.81)

Inter-Item Correlation Matrix (listwise deletion)		C1	C2	C3	C4	*
C1	My department provides access to a relevant seminar programme	1.00				0.78
C2	The research ambience in my department stimulates my work	0.57	1.00			0.73
C3	I have frequent opportunities to discuss my research with other research students	0.44	0.56	1.00		0.76
C4	I have opportunities to become involved in the wider research community, beyond my department	0.44	0.51	0.55	1.00	0.77

\* Cronbach's Alpha if item deleted

### Section D: Progress and Assessment (Cronbach's Alpha = 0.84)

Inter-Item Correlation Matrix (listwise deletion)		C1	C2	C3	C4	*
D1	I received an appropriate induction / orientation to my research degree programme	1.00				0.87
D2	I understand the requirements and deadlines for formal monitoring of my progress	0.55	1.00			0.78
D3	I understand the required standard for my thesis	0.46	0.67	1.00		0.77
D4	The final assessment procedures for my research degree are clear to me	0.44	0.63	0.75	1.00	0.79

\* Cronbach's Alpha if item deleted

### Section E: Development Opportunities (Cronbach's Alpha = 0.64)

Inter-Item Correlation Matrix (listwise deletion)		E17	E18	*
E17	Do you agree or disagree that the teaching / demonstration you delivered enhanced your overall research experience?	1.00		*
E18	Do you agree or disagree that you have been given appropriate support and guidance for your teaching / demonstration?	0.47	1.00	*

\* Cronbach's Alpha when item deleted cannot be calculated for only two items

### Section F: Research Skills (Cronbach's Alpha = 0.86)

Inter-Item Correlation Matrix (listwise deletion)		F1	F2	F3	F4	*
F1	My skills in applying appropriate research methodologies, tools and techniques have developed during my programme	1.00				0.81
F2	My skills in critically analysing and evaluating findings and results have developed during my programme	0.78	1.00			0.80
F3	My confidence to be creative or innovative has developed during my programme	0.57	0.61	1.00		0.85
F4	My understanding of 'research integrity' (e.g. rigour, ethics, transparency, attributing the contribution of others) has developed during my programme	0.61	0.61	0.57	1.00	0.84

\* Cronbach's Alpha if item deleted

### Section G: Other Transferable Skills (Cronbach's Alpha = 0.80)

Inter-Item Correlation Matrix (listwise deletion)		G1	G2	G3	G4	*
G1	My ability to manage projects has developed during my programme	1.00				0.74
G2	My ability to communicate information effectively to diverse audiences has developed during my programme	0.63	1.00			0.73
G3	I have developed contacts or professional networks during my programme	0.43	0.49	1.00		0.77
G4	I have increasingly managed my own professional development during my programme	0.48	0.46	0.53	1.00	0.76

\* Cronbach's Alpha if item deleted

### Section H: Responsibilities and Supports (Cronbach's Alpha = 0.72)

Inter-Item Correlation Matrix (listwise deletion)		F1	F2	F3	F4	*
H1	I understand my responsibilities as a research degree student	1.00				0.63
H2	I am aware of my supervisor(s)' responsibilities towards me as a research degree student	0.70	1.00			0.59
H3	Other than my supervisor(s), I know who to approach if I am concerned about any academic aspect of my research degree programme	0.42	0.50	1.00		0.65
H6	My institution values and responds to feedback from research degree students	0.26	0.27	0.32	1.00	0.75

\* Cronbach's Alpha if item deleted

**Section K: Overall Experience (Cronbach's Alpha = 0.42)**

Inter-Item Correlation Matrix (listwise deletion)		E17	E18	*
K1	How would you evaluate your entire research experience at this institution?	1.00		*
K4	I am confident that I will complete my research degree programme within my institutions expected timescale:	0.29	1.00	*

\* Cronbach's Alpha when item deleted cannot be calculated for only two items

## Appendix D – Aspect Transformation

Aspect	Description	Items	Scale Categories
A	Research Infrastructure and Facilities	4	4
B	Supervision	4	4
C	Research Culture	4	4
D	Progress and Assessment	4	4
E	Development Opportunities	2	4
F	Research Skills	4	4
G	Other Transferable Skills	4	4
H	Responsibilities and Supports	4	4

To compare the aspects on a common scale the following technique has been followed. The original variables are coded from one to five with one being strongly disagree and five being strongly agree. If one was to create an single variable from four variables coded one to five through adding them together then the variable would run from four to twenty. To avoid this and make the scale more interpretable the formulae move the scales downwards through subtraction so that every variable begins at zero.

For Aspects created from four items:

$$\text{Transformed Score} = (\text{Item 1} + \text{Item 2} + \text{Item 3} + \text{Item 4}) - 4$$

For Aspects created from two items:

$$\text{Transformed Score} = [(\text{Item 1} + \text{Item 2}) - 2] * 2$$

Doing this, creates scales that runs from zero where the respondent strongly disagrees with every item contained in the aspect, to sixteen where the respondent strongly agrees with every item contained in the aspect.

In the regression models discussed in Section 7, the aspects are used to indicate strength of agreement with the overall topic. However, the aspect for E differs from the one used in the rest of this report. For all other analyses, the questions used for E: Development Opportunities, are E16 and E17 which relate to teaching. The earlier questions in this section of the questionnaire are simple ‘yes/no’ questions about whether the respondent has availed

of particular development opportunities while conducting their research programme, which would not fit into the rest of the analysis.

However, these questions are of interest in the regression models as theoretically being engaged in numerous development opportunities could lead to higher evaluations of their research experience. Conversely, if they engage in a large number of these opportunities, respondents could have difficulty in completing their degree within their institutions expected timescale. As such questions E1 to E15 were recoded so that 'no' was coded zero and 'yes' one, then a cumulative variable was created. This variable runs from zero, when a respondent does not engage in any of the development opportunities to fifteen when they participate in all of them.

## Appendix E – Inter-Aspect Correlations by Study Groups

### Pearson's R

NFQ 9		A	B	C	D	E	F	G
A	Research Infrastructure and Facilities							
B	Supervision	0.42						
C	Research Culture	0.48	0.55					
D	Progress and Assessment	0.36	0.60	0.56				
E	Development Opportunities	0.14	0.33	0.23	0.31			
F	Research Skills	0.22	0.45	0.40	0.41	0.31		
G	Other Transferable Skills	0.26	0.34	0.45	0.38	0.25	0.64	
H	Responsibilities and Supports	0.38	0.51	0.51	0.67	0.34	0.46	0.44

NFQ 10		A	B	C	D	E	F	G
A	Research Infrastructure and Facilities							
B	Supervision	0.32						
C	Research Culture	0.45	0.43					
D	Progress and Assessment	0.35	0.43	0.44				
E	Development Opportunities	0.22	0.23	0.25	0.25			
F	Research Skills	0.30	0.41	0.38	0.43	0.25		
G	Other Transferable Skills	0.28	0.33	0.39	0.39	0.24	0.68	
H	Responsibilities and Supports	0.38	0.48	0.49	0.60	0.32	0.54	0.51

## Appendix F – Spearman’s Rho Correlation Matrices

### Inter-Item Correlation Matrix

	A1	A2	A3	A4	B2	B3	B4	B5	C1	C2	C3	C4	D1	D2	D3	D4	E17	E18	F1	F2	F3	F4	G1	G2	G3	G4	H1	H2	H3	H6	K1	K2	
A1																																	
A2	0.54																																
A3	0.32	0.42																															
A4	0.40	0.47	0.53																														
B2	0.20	0.24	0.18	0.27																													
B3	0.18	0.22	0.18	0.25	0.77																												
B4	0.17	0.20	0.17	0.26	0.81	0.74																											
B5	0.19	0.21	0.18	0.27	0.74	0.66	0.76																										
C1	0.25	0.26	0.30	0.37	0.30	0.27	0.29	0.35																									
C2	0.31	0.29	0.27	0.35	0.38	0.33	0.37	0.42	0.56																								
C3	0.27	0.21	0.19	0.27	0.26	0.24	0.26	0.31	0.42	0.56																							
C4	0.24	0.25	0.23	0.30	0.29	0.27	0.28	0.35	0.44	0.50	0.55																						
D1	0.20	0.24	0.22	0.28	0.36	0.31	0.33	0.37	0.36	0.38	0.30	0.35																					
D2	0.19	0.25	0.24	0.28	0.35	0.33	0.35	0.36	0.31	0.33	0.28	0.29	0.56																				
D3	0.18	0.22	0.20	0.26	0.35	0.32	0.35	0.37	0.28	0.30	0.26	0.28	0.45	0.66																			
D4	0.17	0.21	0.21	0.27	0.32	0.30	0.32	0.33	0.28	0.30	0.25	0.27	0.44	0.62	0.75																		
E17	0.09	0.08	0.08	0.08	0.13	0.13	0.13	0.15	0.14	0.14	0.11	0.09	0.09	0.12	0.13	0.13																	
E18	0.18	0.22	0.17	0.20	0.25	0.23	0.26	0.28	0.25	0.27	0.17	0.19	0.27	0.26	0.25	0.26	0.46																
F1	0.17	0.20	0.19	0.23	0.32	0.28	0.33	0.32	0.20	0.30	0.26	0.25	0.25	0.31	0.33	0.34	0.17	0.20															
F2	0.15	0.18	0.19	0.23	0.31	0.27	0.32	0.31	0.22	0.28	0.25	0.25	0.23	0.28	0.34	0.32	0.16	0.18	0.76														
F3	0.18	0.19	0.16	0.21	0.33	0.28	0.34	0.36	0.22	0.34	0.27	0.30	0.28	0.31	0.35	0.34	0.19	0.24	0.57	0.61													
F4	0.17	0.19	0.18	0.20	0.28	0.26	0.30	0.28	0.21	0.29	0.21	0.23	0.25	0.32	0.33	0.33	0.18	0.22	0.57	0.58	0.58												
G1	0.19	0.19	0.18	0.19	0.25	0.23	0.26	0.27	0.20	0.29	0.26	0.28	0.23	0.28	0.29	0.29	0.17	0.19	0.50	0.51	0.53	0.47											
G2	0.17	0.16	0.16	0.20	0.22	0.21	0.24	0.25	0.18	0.27	0.28	0.28	0.23	0.28	0.28	0.28	0.17	0.18	0.44	0.49	0.51	0.45	0.62										
G3	0.17	0.17	0.13	0.21	0.23	0.23	0.25	0.30	0.24	0.31	0.29	0.39	0.24	0.24	0.28	0.28	0.18	0.15	0.37	0.39	0.43	0.36	0.43	0.49									
G4	0.10	0.10	0.12	0.12	0.14	0.13	0.15	0.18	0.13	0.19	0.16	0.22	0.18	0.23	0.23	0.24	0.17	0.15	0.38	0.40	0.43	0.39	0.46	0.45	0.54								
H1	0.19	0.24	0.19	0.25	0.31	0.28	0.32	0.32	0.23	0.28	0.22	0.24	0.35	0.47	0.48	0.46	0.15	0.22	0.42	0.42	0.45	0.43	0.41	0.38	0.35	0.36							
H2	0.18	0.24	0.18	0.26	0.46	0.41	0.46	0.45	0.27	0.33	0.23	0.28	0.37	0.48	0.49	0.47	0.15	0.25	0.39	0.40	0.42	0.40	0.36	0.34	0.32	0.32	0.73						
H3	0.20	0.23	0.20	0.27	0.33	0.31	0.33	0.36	0.29	0.36	0.29	0.34	0.38	0.41	0.42	0.39	0.14	0.24	0.30	0.28	0.36	0.30	0.28	0.30	0.32	0.26	0.44	0.52					
H6	0.22	0.25	0.23	0.26	0.24	0.23	0.22	0.25	0.31	0.37	0.23	0.30	0.32	0.27	0.22	0.20	0.20	0.34	0.18	0.17	0.26	0.20	0.18	0.18	0.22	0.13	0.25	0.26	0.31				
K1	0.31	0.32	0.27	0.38	0.49	0.41	0.45	0.48	0.37	0.51	0.36	0.38	0.40	0.36	0.36	0.35	0.16	0.32	0.36	0.35	0.42	0.33	0.30	0.32	0.32	0.22	0.34	0.38	0.38	0.39			
K4	0.14	0.15	0.12	0.19	0.29	0.26	0.30	0.29	0.15	0.16	0.12	0.14	0.19	0.21	0.23	0.20	0.16	0.21	0.20	0.20	0.26	0.17	0.19	0.19	0.16	0.16	0.23	0.26	0.23	0.20	0.30		

### Inter-Aspect Correlation Matrix

		A	B	C	D	E	F	G
A	Research Infrastructure and Facilities							
B	Supervision	0.29						
C	Research Culture	0.45	0.45					
D	Progress and Assessment	0.35	0.47	0.46				
E	Development Opportunities	0.20	0.28	0.26	0.28			
F	Research Skills	0.28	0.42	0.38	0.44	0.28		
G	Other Transferable Skills	0.26	0.34	0.40	0.39	0.26	0.65	
H	Responsibilities and Supports	0.39	0.50	0.50	0.61	0.34	0.52	0.48

### Inter-Aspect Correlations by Study Groups

NFQ 9		A	B	C	D	E	F	G
A	Research Infrastructure and Facilities							
B	Supervision	0.30						
C	Research Culture	0.44	0.49					
D	Progress and Assessment	0.34	0.58	0.57				
E	Development Opportunities	0.15	0.37	0.24	0.36			
F	Research Skills	0.21	0.46	0.36	0.44	0.35		
G	Other Transferable Skills	0.26	0.35	0.47	0.41	0.30	0.61	
H	Responsibilities and Supports	0.36	0.53	0.52	0.67	0.38	0.48	0.43

NFQ 10		A	B	C	D	E	F	G
A	Research Infrastructure and Facilities							
B	Supervision	0.29						
C	Research Culture	0.45	0.44					
D	Progress and Assessment	0.36	0.45	0.44				
E	Development Opportunities	0.21	0.26	0.27	0.27			
F	Research Skills	0.30	0.41	0.38	0.45	0.27		
G	Other Transferable Skills	0.26	0.34	0.39	0.39	0.25	0.66	
H	Responsibilities and Supports	0.39	0.50	0.50	0.60	0.34	0.52	0.48