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| **RESEARCH ARTICLE**

Empowering the Moroccan Doctoral Researchers: The Need for Pre/In-Service Training on Research Software in Academic Research

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| **ABSTRACT**

As digital tools continue to shape how we teach, learn and grow professionally, research itself is also evolving. Yet, many doctoral students still struggle to engage fully with the software that could support their work. This paper explores how Moroccan doctoral researchers relate to Research-Related Software (RRS), such as reference managers, data analysis tools, and plagiarism checkers, and whether they believe pre- and in-service training could make a difference. A quantitative survey was distributed to 50 doctoral candidates from over six Moroccan universities. The findings show that while most students have heard of RRS, they rarely use them—and those who use them the least are the ones who most want structured training. The desire for training also increases as students advance in their doctoral journey. These insights point to a clear gap in how research and research-related tools are introduced in doctoral programs. The paper suggests that integrating hands-on training in RRS into doctoral curricula—especially early on—could improve students' confidence, motivation, and ability to produce high-quality, independent research.

1. Introduction

Research is often described as a rewarding process, but for most doctoral students, it can also feel overwhelming. The demands are many—from searching through endless academic sources and organizing them properly, to making the right methodological choices and staying rigorous throughout. In recent years, the research field has changed a great deal, especially with the rise of technology. Tools like Research-Related Software (RRS) and artificial intelligence are now common, and researchers are often expected to use them with ease. Some studies suggest that these tools can make the research journey more manageable by helping with data organization and analysis (Veletsianos & Kimmons, 2013; Greenhow & Gleason, 2014).

Still, despite the growing presence of such tools, not all researchers feel confident using them—especially in places where access to training is limited. In Morocco, this seems to be part of the issue. This study tries to understand whether doctoral researchers here could benefit from dedicated training programs—either before starting their doctoral journey or while they're already conducting their research. The goal is to see whether these types of support could help bridge the gap between what researchers are expected to do and the tools they are actually prepared to use. While technology offers new possibilities, the ability to apply it in meaningful ways is not the same for everyone. That's why this study also raises a broader question: should Moroccan doctoral programs start integrating RRS training more formally into their academic plans?

The structure of this paper is as follows: it begins with a review of the literature relevant to research skills, digital literacy, and doctoral training; proceeds with a detailed methodology section outlining the data collection and analysis procedures; presents the results of the study; and finally discusses the implications of the findings in relation to the proposed hypotheses.

1.1 Research Hypotheses

- This paper operates under the following hypotheses:
- Moroccan doctoral researchers underutilize RRS due to a lack of training and familiarity.
- Moroccan doctoral researchers express a strong need for pre-service and in-service training focused on RRS usage.
- There is a positive correlation between the desire for in-service training and the doctoral year, with earlier-stage researchers expressing greater need.

2. Literature Review

The work of a researcher is often described as both intellectually fulfilling and mentally demanding. Doing research is never just one task. It's a long process that involves everything from looking for relevant literature and organizing references, to designing a proper methodology, collecting and analyzing data, and then presenting the findings clearly. Most of the time, the researcher has to carry all this out on their own. And as academic expectations grow, the process has only become more complex. This is where digital tools and software have started to play a bigger role—they're meant to help ease the workload and make things more manageable, especially for doctoral researchers.

There's a growing belief that doctoral students, in particular, should be trained in using Research-Related Software (RRS). These tools don't just make work faster; they also help maintain academic integrity and allow for more solid methodological choices (Weller, 2011; Veletsianos & Kimmons, 2013). But despite how common these tools have become, research shows that many students are not actually using them—or they're using them without confidence.

Globally, it's been noted that graduate students are becoming less motivated to engage in research. The reasons vary but often include pressure from institutions, lack of proper research training, and the feeling of being poorly supervised (Ghasemi & Zahediasl, 2012). In Morocco, Ennam (2020) pointed out that many students lose interest in research mainly because no one teaches them how to go about it. That reluctance might seem like an individual issue at first, but it reflects a deeper problem. If not addressed, it could weaken the entire system of higher education and research in the country.

Khalfaoui (2018), former director of Morocco's CNRST, put it simply: national development doesn't just depend on money or politics—it rests on education and scientific research. In this light, technology—especially research software—could actually help reignite students' interest in research. These tools, when introduced and used effectively, can reduce the technical burden and allow students to focus more on the intellectual part of their work.

Right now, there are various tools that support different parts of the research journey. These include reference managers, statistical software, data collection platforms, and plagiarism detectors. Reference Management Software (RMS) like Mendeley, Zotero, and EndNote were among the first to be adopted widely, and they've changed the way researchers handle their sources. According to Gilmour and Cobus-Kuo (2011), these tools brought more structure to academic writing since their introduction in the 1980s. In Morocco, students often struggle with citation and bibliography management—something usually expected of them early on by their supervisors. These tools, therefore, are not just helpful; they're essential.

In a study by Lorenzetti and Ghali (2013), around 80% of researchers working on systematic reviews said they had used reference management software. Interestingly, many didn't report using it, which shows that while these tools are part of research practice, they're still underrecognized. In this study too, the authors (including myself) rely heavily on Mendeley.

Beyond citations, one of the biggest challenges for doctoral researchers is data analysis. For those using quantitative methods, SPSS remains the most common tool. Since its development in the 1960s, it has evolved and is now used in a range of disciplines like healthcare and market research (Field, 2018). It helps researchers carry out complex statistical analyses, even if they aren't math experts.

For qualitative research, NVivo is widely recommended. It supports coding, theme development, and organizing large amounts of textual data (Zamawe, 2015). NVivo was launched by QSR International in the late 1980s and is still one of the top tools used in the social sciences.

Finally, there's the matter of academic integrity. Plagiarism detection software—like Turnitin, Grammarly, and iThenticate—has become a standard part of scholarly work. These tools compare a researcher's writing with a vast database of published work to catch overlaps. In Morocco, iThenticate is now the official tool offered to doctoral students, thanks to a national-level initiative.

These tools emerged in the late 1990s with the expansion of internet accessibility (Bailey, 2019). iThenticate, in particular, has become a standard tool for checking academic manuscripts prior to submission. Recognizing its importance, the Moroccan Ministry of Higher Education has provided all doctoral students with access to iThenticate as part of a national initiative to support academic quality. The authors of this study also use iThenticate regularly as part of their own research process.

Despite the wide availability of RRS, the question remains: why are these tools still underused by Moroccan doctoral researchers? If such software can support every stage of the research process—from literature management to plagiarism prevention—what explains the low adoption rates among students pursuing the highest academic degrees?

This study aims to explore that gap, particularly through the lens of training. It asks whether pre- and in-service instruction in the use of RRS could bridge the divide between what students need to succeed and what they currently receive from academic institutions.

2.1 Theoretical Framework
This research paper is inspired by the Technology Acceptance Model (TAM) introduced by Davis in 1989. The model explains why people choose to accept or reject a certain technology. It highlights two main factors: how useful people believe the technology is, and how easy they think it is to use. These two factors often shape people's attitudes toward that technology, and eventually whether they use it or not.

This model makes sense in the context of this study, as it helps explain why many Moroccan doctoral researchers either do or do not use Research-Related Software (RRS). In fact, some of the scales used in the questionnaire directly reflect the elements of TAM. The scale on familiarity with RRS relates to how easy these tools seem to be. The frequency of usage reflects whether or not the researchers are actually using them. And the scales on desire and need for training show how ready or motivated they are to learn and use these tools more confidently.

What this framework adds to the study is a better understanding of the "why" behind the problem. It is not just about whether students are using RRS or not, but about how they feel about using it in the first place. If something seems too complicated or not very helpful, they will most likely stay away from it. On the other hand, if they believe it's both useful and manageable, they will be more willing to adopt it — especially if proper training is provided.

By using TAM in this research, the goal is to connect the technical side of software usage with the human side of doctoral research. It is about understanding the researcher's experience and helping build a better, more supportive environment for academic work

3. Methodology
This study adopts a quantitative research design, specifically a descriptive correlational approach. Descriptive correlational research aims to describe variables and examine potential relationships between them without direct manipulation by the researcher (Creswell & Creswell, 2018). This approach was selected to explore the extent to which Moroccan doctoral researchers perceive the need for pre- and in-service training in the use of Research-Related Software (RRS).

Data was collected through an online questionnaire designed and distributed by the author using the Qualtrics platform. Participants were recruited through link-sharing across doctoral researchers' Facebook pages and through QR code distribution during academic events. A total of 50 doctoral researchers from over six Moroccan universities participated in the study. Data analysis was conducted using SPSS, Version 25.

3.1 Instrument
The primary data collection instrument was a structured online questionnaire consisting of 16 items. The first five items collected demographic information including age, gender, academic institution, research domain, and doctoral year. The remaining eleven items were organized into four thematic scales:

1. **Familiarity with RRS** (3 items),

2. **Frequency of RRS Usage** (3 items),

3. **Desire for In-Service Training** (3 items),

4. **Need for Pre-Service Training** (2 items).

The questionnaire was designed to assess participants' awareness of RRS, frequency of use, desire for training, and perceived need for structured instruction. The structure of the questionnaire was also informed by the Technology Acceptance Model (Davis, 1989), as discussed in the theoretical framework. The scales used—familiarity with RRS, frequency of usage, desire for

training, and perceived need for training—reflect core components of TAM such as perceived usefulness, perceived ease of use, and behavioral intention. This connection helped guide the interpretation of results and ensured that the questionnaire addressed both practical and conceptual dimensions of software adoption.

To ensure internal consistency, a Cronbach's Alpha test was conducted for each scale. Results demonstrated acceptable to excellent reliability across the scales, with alpha values ranging from .51 to .92, as shown in Table 1.

Table 1: *Reliability Test of the Survey Scales*

#	Scale	Number of Items	Cronbach's Alpha
1	Familiarity	3	0.75
2	Frequency of Usage	3	0.51
3	Desire	3	0.92
4	Need	2	0.89

While the reliability of the Frequency of Usage scale (.51) was somewhat lower than ideal, it was considered acceptable for exploratory research purposes.

The structure of the questionnaire was also informed by the Technology Acceptance Model (Davis, 1989), as discussed in the theoretical framework. The scales used—familiarity with RRS, frequency of usage, desire for training, and perceived need for training—reflect core components of TAM such as perceived usefulness, perceived ease of use, and behavioral intention. This connection helped guide the interpretation of results and ensured that the questionnaire addressed both practical and conceptual dimensions of software adoption.

3.2. Analytical Procedures

The questionnaire employed mainly five-point and three-point Likert scales. Scales measuring Familiarity and Need used a five-point agreement scale (1 = Strongly Agree to 5 = Strongly Disagree), allowing assessment of participants' degree of agreement with statements about RRS knowledge and training needs. The interpretation of mean scores followed the key below:

- 1.00–1.80 = Strongly Agree (Very High),
- 1.81–2.60 = Agree (High),
- 2.61–3.40 = Neutral (Moderately High),
- 3.41–4.20 = Disagree (Low),
- 4.21–5.00 = Strongly Disagree (Very Low).

The Frequency of Usage scale also used a five-point Likert scale but was framed around frequency (1 = Always to 5 = Never), interpreted as:

- 1.00–1.80 = Always (Very High),
- 1.81–2.60 = Frequently (High),
- 2.61–3.40 = Sometimes (Moderately High),
- 3.41–4.20 = Rarely (Low),
- 4.21–5.00 = Never (Very Low).

The Desire for In-Service Training scale employed a three-point Likert scale (1 = Yes, 2 = Maybe, 3 = No), with the following interpretation:

- 1.00–1.66 = Yes (Very High),
- 1.67–2.33 = Maybe (Moderately High),

- 2.34–3.00 = No (Very Low).

Prior to analysis, scale items were computed into composite variables, given that all items within a scale shared a consistent structure and demonstrated acceptable internal reliability.

3.3 Participants
The study sample was demographically diverse. Of the 50 doctoral researchers who participated:

Table 2: *Demographic Profile of Participants*

Category	Group	Percentage
Gender	Female	68%
	Male	32%
Age	20–30	58%
	30–40	32%
	40+	10%
Research Domain	Social Sciences & Humanities	80%
	Hard Sciences	20%
Doctoral Year	Year 1	26%
	Year 2	34%
	Year 3	18%
	Year 4	14%
	Year 5	8%
University Affiliation	Ibn Tofail University	58%
	Ibn Zohr University	14%
	Mohammed V University	12%
	Moulay Ismail University	2%
	Other Moroccan Universities	12%

- **Gender**: 68% were female and 32% male.

- **Age**: 58% were aged 20–30, 32% were 30–40, and 10% were above 40 years old.

- **Research Domain**: 80% belonged to social sciences and humanities fields (e.g., Education, Cultural Studies, Literature), while 20% represented hard sciences (e.g., Computer Science, Renewable Energies).

- **Doctoral Year**: Participants ranged from first to fifth-year doctoral researchers. Specifically, 26% were first-year students, 34% second-year, 18% third-year, 14% fourth-year, and 8% fifth-year.

- **University Affiliation**: The majority of participants came from Ibn Tofail University (58%), followed by Ibn Zohr University (14%), Mohammed V University (12%), Moulay Ismail University (2%), and 12% from other Moroccan institutions.

Because the participants came from different institutions and disciplines, their responses reflect the mixed experiences many Moroccan doctoral students have with research software.

3.4 Ethical Considerations

Ethical considerations were taken seriously throughout the study. Before starting data collection, I obtained approval from my doctoral research center, the laboratory I'm affiliated with, and my supervisor. All participants were clearly informed about the purpose of the research and were asked for their consent before filling out the survey. Their responses were treated with full confidentiality, and I made sure they knew they could stop participating at any time without any consequences.

4. Results

This part of the paper presents what the study found regarding how Moroccan doctoral researchers relate to Research-Related Software (RRS). I used SPSS (Version 25) to run both descriptive and inferential statistical tests, looking into participants' familiarity with these tools, how often they use them, and whether they feel they need training—either before or during their doctoral work. The analysis was also shaped by the Technology Acceptance Model (TAM), especially its core ideas about how perceived usefulness, ease of use, and intention to use technology influence behavior.

4.1 Descriptive Statistics

As shown in Table 2, the average score for familiarity with RRS was M = 3.13 (SD = 1.37), which falls in the "Neutral" category. This suggests that while some participants have had some exposure to research software, their familiarity with it is still fairly limited and not very consistent.

The frequency of usage produced a mean of M = 3.50 (SD = 1.13), placing it in the "Rarely" category. This shows that despite moderate familiarity, regular use of RRS is low among the participants.

As for training-related perceptions, the desire for in-service training showed a strong result of M = 1.36 (SD = 0.55), reflecting a clear interest in receiving structured guidance. Similarly, the need for pre-service training yielded M = 1.31 (SD = 0.57), falling within the "Strongly Agree" range, which indicates participants' belief that training should be offered at the beginning of their doctoral journey.

Table 3: *Descriptive Statistics for RRS Variables*

Variable	N	Min	Max	Mean	Std. Deviation	Interpretation
Familiarity with RRS	50	1	5	3.13	1.37	Neutral
Frequency of RRS Usage	50	1	5	3.50	1.13	Rarely
Desire for In-Service Training	50	1	3	1.36	0.55	High (Yes)
Need for Pre-Service Training	50	1	4	1.31	0.57	Strongly Agree

4.2 Test of Normality

To determine the appropriate statistical tests, normality was assessed using the Shapiro–Wilk test, given the sample size is below 100. As shown in Table 3, all variables significantly deviated from a normal distribution, with p-values < .05 across the board. This result indicates the need to use non-parametric tests for subsequent analyses.

Table 4: *Shapiro–Wilk Test of Normality*

Variable	Shapiro–Wilk Statistic	df	Sig. (p-value)
Familiarity with RRS	.816	50	.000
Frequency of Usage of RRS	.918	50	.002
Desire for In-Service Training	.698	50	.000
Need for Pre-Service Training	.599	50	.000

These findings confirm that the dataset does not meet the assumptions of normality, and therefore, non-parametric statistical techniques were applied in the following analyses.

4.3 Spearman Correlation: Desire vs. Usage

A Spearman correlation test was conducted to examine the relationship between desire for in-service training and the actual frequency of RRS usage. Results revealed a statistically significant moderate negative correlation (ρ = −0.361, p = .010). This suggests that those with a stronger desire for training are generally those who use RRS less frequently.

This finding points to a gap between behavioral intention and actual behavior — a dynamic consistent with TAM, where limited usage may stem from low perceived ease of use or lack of access to training.

Table 5: Spearman Correlation Between Desire and Usage

Variables	Spearman's ρ	p-value	Interpretation
Desire ↔ Usage	−0.361	.010	Moderate negative correlation

4.4 Spearman Correlation: Desire vs. Doctoral Year

A second Spearman correlation was conducted to explore the relationship between doctoral year and desire for in-service training. Results showed a moderate positive correlation (ρ = 0.320, p = .024), indicating that as doctoral students progress in their research, their interest in receiving training increases.

This supports one of the study's core assumptions: that more advanced students become increasingly aware of their need for technical support and structured training in software tools.

Table 6: Spearman Correlation Between Desire and Doctoral Year

Variables	Spearman's ρ	p-value	Interpretation
Desire ↔ Doctoral Year	0.320	.024	Moderate positive correlation

4.5 Age as a Possible Extraneous Variable

One possible confounding factor is age, as generational differences may influence familiarity with or interest in technology. As Gen Z participants dominate the first and second years, and millennials are more prevalent in the later years, this might partially explain why advanced-year students express more desire for training.

To explore this further, a Kruskal–Wallis H test was conducted to assess differences in familiarity with RRS across age groups.

4.6 Kruskal–Wallis Test: Age vs. Familiarity

The Kruskal–Wallis test revealed no statistically significant differences in RRS familiarity across age groups: H(2) = 4.79, p = .091. While the +40 age group had a slightly higher mean rank, the difference did not reach significance, and the null hypothesis (no group difference) was retained.

Table 7. Kruskal–Wallis Test: Familiarity by Age

Age Group	Mean Rank (Familiarity)
20–30 years	24.21
30–40 years	23.20
40+ years	38.70

Test Statistic: H = 4.793, df = 2, p = .091

This suggests that the increased desire for training in later doctoral years is more likely related to academic maturity or research experience than age.

5. Discussion

Conducting academic research—while intellectually fulfilling—is often overwhelming. For doctoral researchers in particular, the process demands not only strong content knowledge but also technical proficiency with a wide range of digital tools. This study set out to examine whether Moroccan doctoral researchers feel adequately equipped to use Research-Related Software (RRS), and whether they would benefit from structured pre-service or in-service training. The findings support both of these inquiries, suggesting that the current research culture in Moroccan universities could be improved by providing timely, skill-based support.

One of the key findings was the moderate negative correlation between the frequency of RRS usage and the desire for in-service training. In other words, those who reported using these tools the least were the most eager to receive training. This supports the first hypothesis and reflects a common pattern identified in the Technology Acceptance Model (TAM): when perceived ease of use is low, behavioral intention to adopt the technology remains unrealized—until structured support is introduced.

Another important finding emerged through the correlation between doctoral year and desire for training. As doctoral students progressed through their research journey, their interest in receiving in-service support grew. This aligns well with TAM's notion of perceived usefulness—as students become more engaged with the research process, they begin to better understand the potential value of RRS and become more motivated to learn how to use them.

Interestingly, while some might expect age to influence attitudes toward technology, the results of the Kruskal–Wallis test revealed no statistically significant difference in RRS familiarity between age groups. This suggests that interest in training is not generational, but rather tied to researchers' increasing awareness of the demands of scholarly work. This makes it clearer that the year of study—not age—is the more important factor when it comes to how students view the need for training.

What stands out in these findings is that doctoral students aren't avoiding technology; rather, many of them just haven't been given the proper training to feel confident using it. As they move further along in their research, they start to realize what's missing and begin to look for that support themselves.

This brings up bigger questions about how we train doctoral researchers in Morocco. If students aren't equipped with the tools they need to do research well and independently, it's no surprise that some begin to lose motivation. In fact, the lack of training in research software could be one of the hidden reasons why some students feel stuck or disconnected from the research process. Including proper RRS training—both before starting the doctorate and during it—might ease some of the pressure and help build a more engaged and capable research community.

6. Conclusion

This research set out to explore how Moroccan doctoral students relate to Research-Related Software in their academic work. What came through in the findings is that, although many students say they're somewhat familiar with these tools, they don't actually use them very often. This underuse appears to stem not from disinterest but from a lack of training and guidance. The participants expressed a clear desire for in-service training, and an even stronger belief in the importance of pre-service training, which supports the study's main hypotheses.

These findings offer two clear pedagogical recommendations. First, Moroccan universities should consider introducing an elective module at the MA level for students interested in pursuing a doctorate, where they can be introduced to essential research software. Second, a dedicated training module for doctoral researchers should be implemented to help students build the practical skills needed for effective research.

While this paper offers valuable insights, it also has its limitations. Most notably, the sample size—though diverse—is relatively small. With over 40,000 doctoral students in Morocco, a larger, more representative sample would be necessary to generalize these findings across the country. Future research could also investigate the extent to which doctoral researchers are using RRS in practice, and whether institutions are formally tracking or encouraging this usage.

Ultimately, this study highlights that the tools we offer students are just as important as the theories we teach them. To build a more vibrant and productive research community in Morocco, we must begin by equipping our doctoral students with the resources and training they need to succeed.

Conflicts of Interest: The authors declare no conflict of interest.
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