



# The impact of RefME

# on the student experience

Yaz El Hakim  
Jana Hanson  
Phil Gooch  
Renato Fillinch  
Claire Ridall (Sheffield Hallam University)  
Rosalind Francis (University of Greenwich)



**Sheffield  
Hallam  
University**



**RefME saves  
students  
2 minutes 23  
seconds per  
reference**

## Summary

We collaborated with two partner universities to find out about the benefits of using RefME to automate the task of referencing.

The questions we wanted to answer<sup>1</sup>:

1. How much time do we save students who still reference manually?
2. How much more accurate are RefME references than manual ones?
3. How easy is RefME to use for first time users (following a two minute demonstration)?
4. Does RefME get used more by students over time?

Our partners believed that these answers would help in assuring their institutions of the student experience enhancements that we would be able to show (particularly in sector wide ambitions to continue to improve on Question 16 of the National Student Survey).

Key findings included:

1. RefME saves students approximately 2 minutes and 23 seconds per reference
2. The RefME group were more accurate than the Manual group, making 50% fewer errors.
3. RefME users found the software highly intuitive scoring 85 out of 100 on the System Usability Scale (Grade A).
4. References per user per month increase by approximately 25% (year on year).

---

1. Our RefME Insite partners (working with our research team at RefME), have harder questions coming soon - so watch this space [www.refme.com/blog](http://www.refme.com/blog)

# Introduction

## About the study

While the death of printed books and journals has arguably been greatly exaggerated (Hull, Pettifer, and Kell, 2008), the lives of most 21st century students are increasingly lived online, so it is surprising that a large group of students - a little less than half - still produce their bibliographies manually (Head and Eisenberg, 2010). Head and Eisenberg (2010) found that only 55% of students surveyed across the United States in 2010 used Reference Management Software, whereas research conducted on Doctoral students by JISC in the UK points to a slightly higher use of this technology, which may be explained by their maturity or level of study. Whilst meeting citation style requirements is very important to students, a large number of them still struggle with the process. Head and Eisenberg (2010) also found that over one third of students struggle with how to cite, and just under a third are unsure when to cite, but, they identify meeting the citation requirement as one of the things that is most important to them in course-related research.

[RefME](#) is a multi-platform tool that automates the citation, reference list and bibliography process for the wider student community. It allows users to cite any source with a click via web platform, browser extension or mobile app. RefME has over 1.5 million users globally and is used at over 14,000 institutions worldwide.

RefME chose to work in partnership with 15 RefME Institute partners and through our dialogue with some of them, we addressed their questions in order to augment their internal business cases. In completing this comparative evaluation, we worked with 29 students from two universities, who agreed to participate in our comparative study. With almost half of undergraduates referencing manually, our hypotheses from the data collected, were that:

1. Using RefME to produce a nine-item bibliography would save time
2. The references created would be more accurate
3. RefME would be perceived as intuitive and as easy to use

A little less  
than half of  
students still  
produce their  
bibliographies  
manually



# Methodology

The students (n=29) agreed to participate in a referencing task through convenience sampling within the library of each university. They were assigned to one of two groups:

- using RefME to collect nine references and export the bibliography into Word
- manually collecting and formatting a nine reference bibliography in Word

Participants were given three books, three web pages and three e-journals - and were asked to produce a nine reference bibliography, as quickly and accurately as they could. The sources were presented to each participant and they were timed from start to finish of the task.

Participants in the RefME group were asked to use the RefME for Chrome extension on a laptop and the RefME for iOS mobile app to complete the task. The Manual group participants (“Manual” condition) were asked to try to complete the task manually in MS Word, with the aid of an exemplar sheet which showed example references formatted in the MLA style used for the study. None of the participants in the RefME condition had used RefME before and were all given a 2 minute 30 second demo of the RefME for Chrome extension and the RefME App (including how to change styles and edit references using both methods). Afterwards, students using RefME for the task were asked to fill in a System Usability Scale (SUS), which the majority did. SUS is a survey that reveals users’ perceptions of the software’s usability. A total of 11 participants from the RefME group submitted a survey response successfully.

To control for prior knowledge and expertise, we chose the MLA format; a referencing style that is not widely used in the UK, therefore simulating a situation where a student has to use a style they had never used before (e.g. moving into university from varying educational backgrounds).



# Results

## Time saving

Results suggest that using RefME did save time in comparison to the time spent writing out references manually. The results showed that students who used RefME to collect their references and build their bibliography took an average time of 4 minutes and 37 seconds. Students who did the task manually on average needed 26 minutes and 07 seconds. Therefore RefME saved students 21 minutes and 30 seconds on a 9 reference bibliography, an average of 2 minutes and 23 seconds per reference.

An independent-samples t-test showed that the time-taken was significantly higher for the Manual condition ( $M = 26.07$ ,  $SD = 5:00$ ) than for the RefME condition ( $M = 4:37$ ,  $SD = 1.01$ ), by reporting a significant difference between the two groups ( $t(14) = -15.652$ ,  $p < 0.01$ ).

## Accuracy

When measuring referencing accuracy, we compared the students results against a curated, gold standard set of formatted references created manually by an in-house MLA expert for the 9 references that students were asked to create.

We count the following as an error: one character substitution (e.g. a comma for a full stop, a lowercase letter for an upper case one), one deletion (e.g. a missing comma), or one addition (e.g. an extra full stop). If one or more complete words is missing, e.g. the name of the publisher, then each character in the missing word is counted.

As a baseline, we measured the accuracy of RefME's automated citation tool using the MLA style format for these nine references against a gold standard set. The results are shown in Table 1.

The baseline accuracy of RefME's automated tool for creating correctly formatted references in the MLA style was 87% in this study. The main errors in the baseline were: showing the country of publication for two books rather than the city, some incorrect title casing of text in single quotes, and not showing the publisher name for the three news articles.



**The RefME group were more accurate than the Manual group, making 50% fewer errors.**

Table 1. Baseline performance of RefME MLA for the study references

Baseline	Character in gold data set	Errors (abs)	Errors (%)	Accuracy
RefME MLA Export	1448	186	13%	87%

Table 2. Comparison of RefME and Manual Errors/Accuracy

Condition	Error (abs)	Errors (%)	Accuracy (%)
Manual Mean	619	43	57
RefME Mean	315	22	78

In the manual group, students made 619 referencing errors on average, leading to a mean accuracy of 57%. Common errors in the manual referencing group included either using {family name, given name} for all authors (rather than for just the first author as per MLA), or using {given name, family name} for all authors; abbreviating given names with initials; omitting the author of online news articles; omitting the subtitle from book references; using the county of publication rather than the town/city; and abbreviating 'and' with '&'.

Students in the RefME group made 315 errors on average, resulting in a mean accuracy of 78%. Errors in the RefME group appeared to be due to a lack of familiarity with the tool, they included: omitting a reference, referencing the wrong URL, and selecting the wrong style.

Only one student (8%) in the manual group matched the mean accuracy of the RefME group, whereas 5 students (33%) in the RefME group matched the RefME baseline, i.e. they created the best possible reference within the boundaries of the functionality of the tool.

**RefME scored in the top 10% on the SUS scale**

# Usability

RefME scored an average of 85 (out of 100) on the SUS scale, which, as a score above 80.3, would rank it in the top 10% for usability (Sauro, 2011). This would give the website a grade of A for usability.

Although this was a small sample size of users (who had not used RefME previously) there is evidence suggesting that SUS is one of the most reliable tools for measuring usability at low sample sizes (Tullis, 2013).

# Behaviour Adoption

Usage of RefME has shown increasing year-on-year engagement and reference creation within the platform, both at an institutional level and globally. This was demonstrated in the ‘references per user’ annual ratio growing by an additional 25% from 2014-15 to 2015-16, across the RefME platform. Figure 1 visually reflects this in the increased trajectory from September 2014 - September 2015. Both RefME and our institutional partners valued this increased usage as it strongly indicates deeper user adoption and engagement.



Average number of References per User per Month

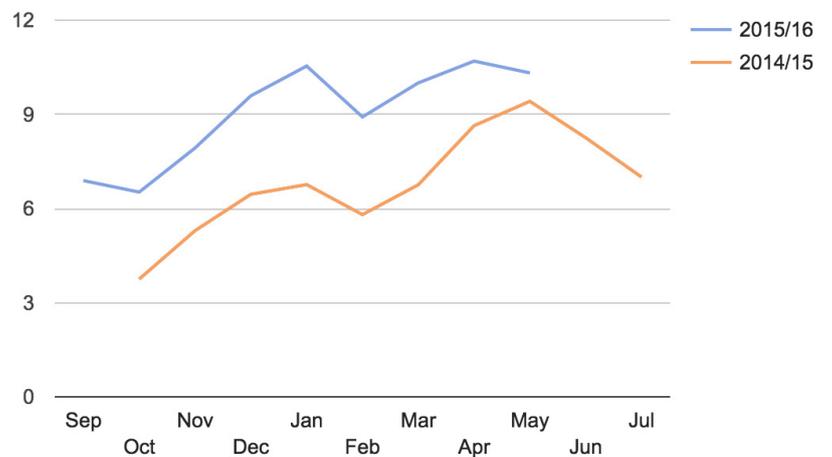


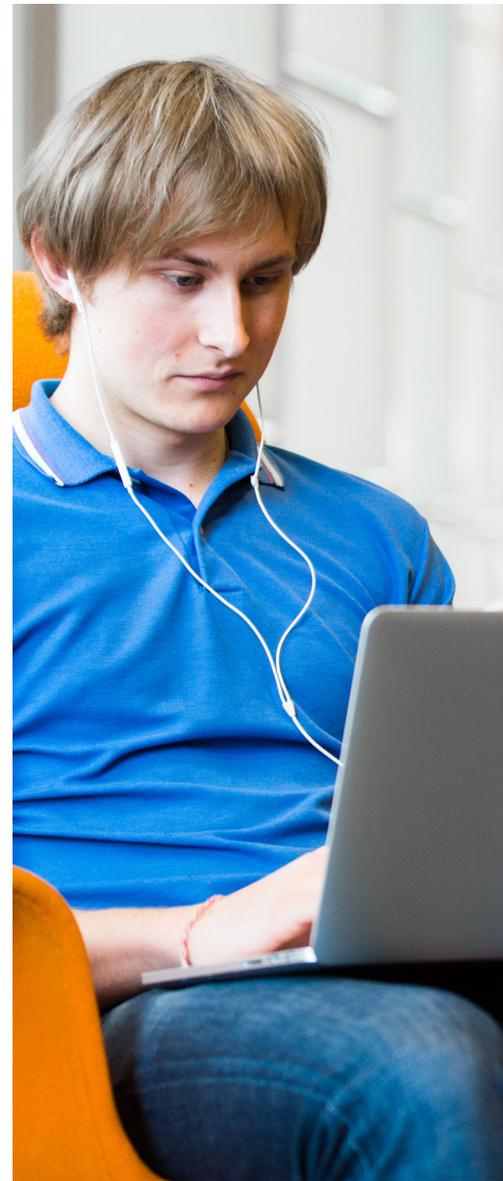
Figure 1. A graph demonstrating the increased ratio of references per user per month, across the RefME Platform.

**‘References per user’  
annual ratio growing by an  
additional 25% year on year,  
across the RefME platform**

# Discussion

On average, students using RefME for the first time create references in one-fifth of the time and make 50% fewer errors than those who create their references manually. This can not be proven to lead to behaviour adoption, but there seems to be a compounding effect on the positively perceived user experience (through the SUS score - 85 of 100) and the improvement in time and accuracy of references on behaviour adoption. RefME have evidenced behaviour adoption and increased engagement across the platform (Figure 1).

It is fair to say that some of the results were to be expected, given that 1.5 million registered users (millions more through the RefME 'Open Citation Generator') who probably would not utilise this software if it were not saving them time, intuitive to use and helpful to their specific needs (research journeys in this case). Some of the data collected herein illustrates the potential enhancement to the student experience. We will continue to monitor success metrics with all the RefME Institutes that are now subscribing, and look forward to answering some of our deeper and more complex questions. Such work will lead us to finding the best ways to support institutions and students by improving their experiences with referencing, and the subsequent and potential impacts of citation data and citation analytics that it will inevitably bring in the future.



# Acknowledgments

In completing this Whitepaper, RefME would like to acknowledge the participation of students at two of our institutional partners: Sheffield Hallam University and University of Greenwich. We were privileged to have worked with colleagues Claire Ridall and Rosalind Francis and other colleagues at those institutions and Duncan Belk (AUB) whose inputs have made this evaluation rigorous and higher quality with their attention to detail.

## About RefME Institute

RefME Institute empowers institutions to improve the student learning experience. It gives your entire student community the ability to use our RefME for Word integration, stay organised with Folders, as well as improving research behaviours and learning outcomes amongst your students.

RefME is a multi-platform tool that automates the citation, reference list and bibliography process for the wider student community. With over 7,500 citation styles, it's the world's leading and most accurate citation generator and management tool, allowing users to cite any source with a click via web platform or mobile app. RefME has over 1.5 million trusted users globally and is used at over 14,000 institutions worldwide

**[Find out more about RefME Institute](#)**  
**or email [institute@refme.com](mailto:institute@refme.com)**

# Bibliography

Head, A.J. and Eisenberg, M.B. (2010) *How college students evaluate and use information in the digital age*. Available at: [http://projectinfolit.org/images/pdfs/pil\\_fall2010\\_survey\\_fullreport1.pdf](http://projectinfolit.org/images/pdfs/pil_fall2010_survey_fullreport1.pdf) (Accessed: 6 July 2016).

Hull, D., Pettifer, S.R. and Kell, D.B. (2008) 'Defrosting the digital library: Bibliographic tools for the next generation web', *PLoS Computational Biology*, 4(10), p. e1000204. doi: 10.1371/journal.pcbi.1000204.

Jisc (2012) *Researchers of tomorrow*. Available at: <https://www.jisc.ac.uk/reports/researchers-of-tomorrow> (Accessed: 8 July 2016).

Tullis, T.S. (2013) 'A comparison of questionnaires for assessing Website usability'. Available at: <http://65.54.113.26/Publication/5481433/a-comparison-of-questionnaires-for-assessing-website-usability> (Accessed: 5 July 2016)

Sauro, J. (2011) 'Measuring usability with the system usability scale (SUS): MeasuringU'. Available at: <http://www.measuringu.com/sus.php> (Accessed: 7 April 2016).

# Appendix A

## Manual referencing group

Table 3. shows the error counts for each student in the manual referencing group, along with median, mean, maximum and minimum errors for the group.

Table 3. Error counts for students creating references manually

Student	Errors (abs)	Errors (%)	Accuracy (%)
M1	724	50	50
M2	664	46	54
M3	550	38	62
M4	424	29	71
M5	827	57	43
M6	323	22	78
M7	633	44	56
M8	750	52	48
M9	356	25	75
M10	954	66	34
M11	538	37	63
M12	682	47	53
MEDIAN	649	45	55
MEAN	619	43	57
MIN	323	22	78
MAX	954	66	34

## RefME group

Table 4. shows the error counts for each student in the group using RefME to create the same nine references as the manual group, along with median, mean, maximum and minimum errors for the group.

Table 4. Error counts for students creating references in RefME

Student	Errors (abs)	Errors (%)	Accuracy (%)
R1	363	25	75
R2	363	25	75
R3	186	13	87
R4	240	17	83
R5	188	13	87
R6	473	33	67
R7	363	25	75
R8	363	25	75
R9	188	13	87
R10	186	13	87
R11	242	17	83
R12	364	25	75
R13	363	25	75
R14	188	13	87
R15	657	45	55
MEDIAN	363	25	75
MEAN	315	22	78
MIN	186	13	87
MAX	657	45	55