Survey on Research Software Engineering in the Netherlands

Ben van Werkhoven, Tom Bakker
Netherlands eScience Center
Amsterdam, the Netherlands
b.vanwerkhoven@esciencecenter.nl,
t.bakker@esciencecenter.nl

Olivier Philippe, Simon Hettrick
Software Sustainability Institute
University of Southampton
o.philippe@software.ac.uk,
s.hettrick@software.ac.uk

***Abstract*—This paper presents a brief overview of the Research Software Engineering landscape in the Netherlands and includes a summary of the results from a survey held in December 2017 in the Netherlands and several other countries. The results show that best practices are widely adopted. Research software is produced by small teams or individuals, is often used for scientific publications, and is frequently acknowledged in publications.**

I. Introduction

Scientific practice increasingly relies on research software, ranging from small scripts for data analysis to large codes for modeling and simulation [1]. The increasing reliance on software in research has strongly increased the number of people writing and contributing to research software. Several surveys have revealed that many scientists spend significant amounts of time developing software, while many of them lack a formal education and/or interest in software engineering practices [2], [3]. At the same there are many issues with the reproducibility of scientific results [4], [5] and the sustainability of research software [6].

A proposed solution to these issues is the creation of a new academic professional designation, the Research Software Engineer (RSE), which is to complement the existing postdoctoral career structure [1]. RSEs are both a part of the scholarly community and are professional software developers, who understand the scientific literature and research questions and have a professional attitude towards software development. Their work is to be measured by software output as much as through traditional academic metrics.

The RSE role is being advocated by the UK RSE association since 2014. To also promote the RSE role in academia in the Netherlands, we have established the RSE Community in the Netherlands (NL-RSE) in 2017.

II. Research Software Engineering in the Netherlands

While NL-RSE community is inspired by the RSE movement in the UK, the situation in the Netherlands is significantly different. Compared to the UK, the term RSE is less well known and there are fewer people who identify themselves as RSEs, even if they match the description. Unlike the RSE fellowships provided by the EPSRC [1] in the UK, the Dutch research council NWO[2] does not provide funding specifically for RSEs or setting up RSE groups.

Many RSEs are employed under various job titles as the designated person for setting up experiments and using compute infrastructure within academic research groups. There are also several small RSE groups at university or faculty-level that do or do not identify themselves as RSEs [7], [8].

The Netherlands eScience Center plays a very central role in the Dutch RSE landscape. The eScience center is a research institute and funding agency that employs over 40 eScience Research Engineers that do work that is very similar to that of RSEs. Through open calls for funding, the eScience center grants projects with both in-cash funding, to be used to hire a postdoc or PhD student, and in-kind funding, in the form of eScience Research Engineers working on the project.

In order to get a better picture of the research software engineering activities in the Netherlands we decided to join an international effort in holding RSE surveys, and also hold a survey in the Netherlands similar to the RSE Survey held in the UK in 2016 [9].

III. Survey setup

The survey was held internationally simultaneously in Canada, Germany, the United Kingdom, the United States, South Africa, and the Netherlands. Most questions were the same for different countries, although some modifications had to be made to adjust the survey to specific countries. In total, 841 respondents were analyzed and included in the survey results. Table I shows the respondents per country. We present the results based on 77 respondents from the Netherlands.

The full data from the international survey is published online, doi:10.5281/zenodo.1194669 [10]

IV. Survey results

85% of respondents reported that they have experience with releasing software as open source. We can also see that the RSEs in the Netherlands regularly make use of digital object identifiers (DOIs) to refer to their software. Both of these practices have been adopted by RSEs in the Netherlands relatively more frequently than in other countries.

[1] https://epsrc.ukri.org/funding/calls/rsefellowships/

[2] https://www.nwo.nl/en

Countries	Number of analyzed responses
Canada	110
Germany	325
Netherlands	**77**
United Kingdom	253
United States of America	164
South Africa	22

Table I
NUMBER OF RESPONDENTS PER COUNTRY.

Country	Use of open source license	Use of DOI
Canada	84%	26%
Germany	62%	18%
Netherlands	**85%**	**31%**
United Kingdom	68%	22%
United States of America	81%	32%
South Africa	44%	11%

Table II
RELEASING SOFTWARE AS OPEN SOURCE AND USING DOIS.

As expected, the vast majority of RSEs write code and most of them indicate that they mainly develop code for other people, as shown in Figure 1. Despite a vast majority of RSEs mostly spending their time writing code, only 65% consider themselves as professional software developer.

Another very important point is whether the software developed by RSEs is actually used in scientific publications and equally important, whether or not the RSEs contribution to the research was acknowledged in the paper. Table III displays the survey results, showing that the work of RSEs in the Netherlands very often contributes to scientific publications and that they are often, but unfortunately not always, acknowledged for their contribution in the paper.

We have also inquired RSEs about the *bus factor* of their most important software project. The bus factor is a measurement of the risk resulting from information and capabilities not being shared among team members [11]. Figure 2 shows the distributions of bus factors for RSEs in several countries. The results suggest that in the Netherlands research software is developed mostly by individuals or small groups.

V. CONCLUSIONS

While the survey was held to gather more information about RSEs working in the Netherlands, it also proved to be very effective for spreading the word about the NL-RSE association. During the survey period (December 1st to 31st, 2017) the number of members rose from 10 to over 70. Currently, NL-RSE has 111 members from over 30 different universities, research institutes, and companies.

Overall, it appears that RSEs are positioned relatively well and can be very effective in the Netherlands. Yet, there are no financial instruments such as the RSE fellowships in the UK

Country	Used for publication	Acknowledgment
Canada	76%	70%
Germany	83%	71%
Netherlands	**95%**	**77%**
United Kingdom	91%	78%
United States of America	90%	71%
South Africa	74%	42%

Table III
USE OF RSE DEVELOPED SOFTWARE IN SCIENTIFIC PUBLICATIONS AND ACKNOWLEDGMENT.

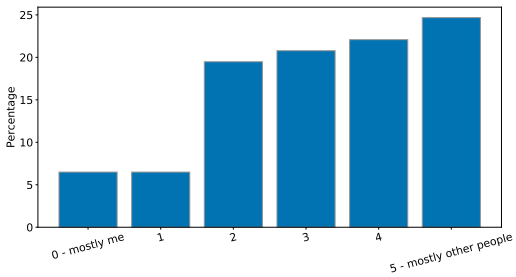

Figure 1. Responses on who uses code developed by RSEs in the Netherlands.

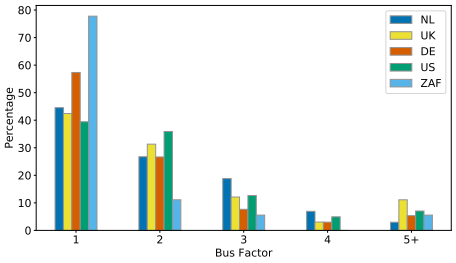

Figure 2. Bus factor of the software projects of RSEs.

that would allow RSEs to start new RSE groups at universities or research institutes. And while Research Software Engineer is starting to appear in more and more vacancies as a job title, there is still a lot of work to be done in promoting the RSE role in the Netherlands.

REFERENCES

[1] R. Baxter, N. C. Hong, D. Gorissen, J. Hetherington, and I. Todorov, "The research software engineer," in *Digital Research Conference, Oxford*, 2012, pp. 1–3.

[2] J. E. Hannay, C. MacLeod, J. Singer, H. P. Langtangen, D. Pfahl, and G. Wilson, "How do scientists develop and use scientific software?" in *2009 ICSE Workshop on Software Engineering for Computational Science and Engineering*, May 2009, pp. 1–8.

[3] S. Hettrick, M. Antonioletti, L. Carr, N. Chue Hong, S. Crouch, D. De Roure, I. Emsley, C. Goble, A. Hay, D. Inupakutika, M. Jackson, A. Nenadic, T. Parkinson, M. I. Parsons, A. Pawlik, G. Peru, A. Proeme, J. Robinson, and S. Sufi, "Uk research software survey 2014," Dec. 2014. [Online]. Available: https://doi.org/10.5281/zenodo.14809

[4] R. D. Peng, "Reproducible research in computational science," *Science*, vol. 334, no. 6060, pp. 1226–1227, 2011. [Online]. Available: http://science.sciencemag.org/content/334/6060/1226

[5] M. Baker, "1,500 scientists lift the lid on reproducibility," *Nature News*, vol. 533, no. 7604, p. 452, 2016.

[6] S. Crouch, N. C. Hong, S. Hettrick, M. Jackson, A. Pawlik, S. Sufi, L. Carr, D. De Roure, C. Goble, and M. Parsons, "The software sustainability institute: Changing research software attitudes and practices," *Computing in Science & Engineering*, vol. 15, no. 6, pp. 74–80, 2013.

[7] SURF - Support4research, "Research support in the netherlands - current situation," 2017.

[8] University of Amsterdam, "Technology centre, http://tc.uva.nl/engineering/software/software.html," 2018.

[9] O. Philippe, N. C. Hong, and S. Hettrick, "Preliminary analysis of a survey of uk research software engineers," in *4th Workshop on Sustainable Software for Science: Practice and Experience*, 2016.

[10] O. Philippe, M. Hammitzsch, S. Janosch, A. van der Walt, B. van Werkhoven, S. Hettrick, D. S. Katz, K. Leinweber, S. Gesing, and S. Druskat, "softwaresaved/international-survey: Public release for 2017 results," Mar. 2018. [Online]. Available: https://doi.org/10.5281/zenodo.1194669

[11] Wikipedia, Bus factor, "https://en.wikipedia.org/wiki/Bus_factor," 2018.