

# Researchers study motivations of open-source programmers

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Open source software development is a model that provides free public access to software packages and source code. Since programmers can freely contribute improvements, bug fixes and modifications, open source development gives rise to communities of authors and users that can number into the thousands for some software packages. The free, open-source Linux operating system is a prominent open source success story.

Another is the R environment for statistical computing, supported by the R Project for Statistical Computing. Freely available via the [open-source](#) GNU General Public License, R has evolved into an invaluable tool for professionals in data analysis fields across many industries. A group of researchers in Austria became interested in the motivations and values of the hundreds of people who give their time and energy so freely to advance such a large technological project. As there were no known empirical studies investigating these psychological factors, they designed a study to collect data from a large group of R developers. They have published the results of their study in the *Proceedings of the National*

*Academy of Sciences*.

It seems illogical for software developers to give away their skills and efforts from an economic point of view. The authors hypothesized that a different set of motivations was required for the successful development of such a large software environment. They sent surveys to about 4,300 software package developers, and ultimately received around 764 responses.

Analyzing the collected data, the authors concluded that hybrid motivations and social characteristics were broadly responsible for the success of the R project. Hybrid motivations refer to both intrinsic and extrinsic motivations; among R project developers, purely intrinsic motivations like personal satisfaction and purely extrinsic motivations like receiving compensation were found to be less important.

The social work design characteristics of the R project are a strong determinant for contributing. Open source software development provides high degrees of social dependency and feedback from peers, and among the psychological findings of the study, the authors noted that interactions with persons perceived as important within the community contributed to personal reputation; and that interaction with like-minded people contributed to social inclusion. The authors write, "From a perspective that goes beyond work design characteristics, social aspects include social recognition and identification. The R community seems to offer the opportunity for R developers to identify with this highly valued group and feel a sense of belonging." Heightened self-esteem, they continue, results in high motivation to contribute to the group.

On the other hand, task characteristics were found to negatively influence participation. The authors explain that if a project's central task is development of an R package, the authors do

contribute, but are less likely to be involved with further packages, mailing lists, or discussions. Conversely, the authors who do contribute to multiple packages and participate more with the community are less driven by package development—they appear to be driven by a combination of [motivations](#) beyond project goals.

The authors conclude, "Our results are important for institutions and individuals that want to stimulate growth of R developments: They must provide a work environment and corresponding incentives that foster a high amount of interdependence and feedback from others." These results are most likely applicable to other social coding platforms, they note.

**More information:** Motivation, values, and work design as drivers of participation in the R open source project for statistical computing *PNAS* 2015 ; published ahead of print November 9, 2015, [DOI: 10.1073/pnas.1506047112](#)

### **Abstract**

One of the cornerstones of the R system for statistical computing is the multitude of packages contributed by numerous package authors. This amount of packages makes an extremely broad range of statistical techniques and other quantitative methods freely available. Thus far, no empirical study has investigated psychological factors that drive authors to participate in the R project. This article presents a study of R package authors, collecting data on different types of participation (number of packages, participation in mailing lists, participation in conferences), three psychological scales (types of motivation, psychological values, and work design characteristics), and various socio-demographic factors. The data are analyzed using item response models and subsequent generalized linear models, showing that the most important determinants for participation are a hybrid form of motivation and the social characteristics of the work design. Other factors are found to have less impact or influence only specific aspects of participation.

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