Chapter 3
Scientific Community-Driven Ecosystem as a Supporter to Co-Create and Co-Evolute Science

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ABSTRACT

One critical aspect of science is the ability to reproduce the same experiment by another researcher. In other to do so, the same ambient, variables, data, setup should be considered. The method tells how the original researcher planned and did their research, but how can others replicate or even advance the preview research? The scientific community has been focusing on efforts to increase transparency and reproducibility and develop a "culture of reproducibility." When researchers share their data, their workflow, and co-evolute a way of doing research, all the players win. The value co-creation is established in a business ecosystem. The actor who is part of the business platform by the co-creation can leverage the advantage of one or more partners that make up the platform. Thus, the knowledge created from the interaction between the different technological domains and knowledge shared on the platform can improve all the research and researchers. Stating that, this chapter proposes a business ecosystem model to ensure research repeatability.

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INTRODUCTION

This chapter promotes the use of a business ecosystem to co-create and co-evolute science. According to Ziouvelou and McGroarty (2017, p. 1), "business success in this complex and constantly evolving system is determined by the ecosystem's ability to bring together a variety of strategic business elements in order to jointly co-created shared value". One critical aspect of science is the ability to reproduce the same experiment by another researcher. In order to do so, the same ambient, variables, data, setup should be considered. The method tells how the original researcher plan and did their research, but how can others have the same environment to check the consistency, replicate, or even advance the preview research? In computer science is not different; the same issues appear; how can other researchers repeat the experiment? Think, many different variables are not considered when describing the methodology, which should be — hardware, Software, Operational System, Database, Indexes, among others. So, the ability to reproduce the results of other researchers is a core tenet of the scientific method, and computational science has driven scientific development in many knowledge areas (Peng, 2011).

Nonetheless, many authors have drawn attention to the rise of purely computational experiments that are not reproducible (Cohen-Boulakia et al., 2017). Studies show that scientific work generally does not show all the essential experimental details for reproduction (Nekrutenko, 2012), and have difficulty replicating published experimental results (Loannidis et al., 2009). In recent years, the scientific community has been focusing on efforts to increase transparency and reproducibility and develop a "culture of reproducibility" for computer science. Research is considered reproducible when all data used are available, and the exploited computational analysis workflow is clearly described (Kulkarni et al., 2018). Workflow is a well-established way to capture the scientific method, and it can generate a graph abstract revealing the interrelated processing tasks. Workflows have become a valuable mechanism for specifying and automating scientific experiments running on distributed computing infrastructure. Researchers in different disciplines have embraced them to conduct a wide range of analyses and scientific pipelines (Deelman et al., 2009), mainly because a workflow can be considered as a model defining the structure of the computational and/or data processing tasks necessary for the management of a scientific process (Liu et al., 2012). The challenges in workflow reproducibility can be summarized as an insufficient and non-portable description of a workflow including missing details of the processing tools and execution environment, unavailable execution environments, missing third party resources and data, and reliance on external dependencies, such as external web services, which add difficulty to reproducibility at a later time (Qasha et al., 2016). Workflows are not only useful in representing and managing the computation but

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