

Emergent Science – a new way forward?

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Recent advances in Cyberinfrastructure that democratize the use of computational and data resources via services, together with new social networking and collaboration technologies, now present an unprecedented opportunity to radically change the science process. This change in the science process can move us from “circumspect science” [Cottey, 2000] – where scientists publish only when the project is complete and typically include only the final results – to “open science”, where scientists share and publish every element in their research process in addition to the final results, such as the data used as input, workflows used to analyze these data sets, and even failed experiments. The notion of open science can foster novel ways of social collaboration in science. We are already seeing in our daily lives the impact of social collaboration creating “emergent knowledge” [Gruber, 2008]. This phenomenon has been well documented in a variety of circumstances under many names, such as Smart Mobs [Rheingold, 2002], Wisdom of Crowds [Surowiecki, 2004], Wikinomics [Tapscott and Williams, 2006], Crowd sourcing [Howe, 2006] and We-Think [Leadbeater, 2008].

The concept of “virtual” research collaborations in science is not something new. Bos et al., [2007] propose the concept of a collaboratory as “an organizational entity that spans distance, supports rich and recurring human interaction oriented to a common research area, and fosters contact between researchers who are both known and unknown to each other, and provides access to data sources, artifacts, and tools required to accomplish research tasks”. We believe that social collaborations during the science process will lead to the notion of “emergent science”: a way complex science problems can be resolved, new research directions forged out of a multiplicity of relatively simple collaborative interactions.

The prevailing practice of publishing science results in journals is slow and restricted, in which the research data and the initial-stage research knowledge is never shared. The motivation of moving towards “emergent science” is to address the inefficiencies in current science practice [Tero et al., 2008] and to leverage new technologies now available to communicate ideas, data, algorithms and results. There are, however, barriers that prevent social collaboration within the science process. Some of these barriers are technical, such as lack of science collaboration

platforms, while others are social. Also, emergent science carries some risks, particularly where issues of trust surface, which require some attention to mitigate.

The change from traditional science to emergent science is already happening. The recent effort at IGARSS to promote "Community Remote Sensing" is one such example. This paper will investigate the different online collaboration models and the features that are relevant to science collaborations such as building a critical mass, motivating to participate, making contributions visible and accessible, providing and gaining trust and engaging the user community during the process. In addition, this paper will also address risks and obstacles (both technological and social) facing emergent science that hinder collaboration and suggest possible solutions required to reach a tipping point.

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