Embedding Digital Libraries into Knowledge Processes of the e-Science Environment

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We are facing a disruptive change for digital libraries. Research is moving into a Fourth Paradigm of data-intensive knowledge discovery with increasingly open and computable e-science world, where all the data (including but certainly not limited to library resources) becomes a web-scale knowledge laboratory. Fundamental evolutions occur in users' perspectives on what information services they really need and are in the reach of today's and tomorrow's technologies. Knowledge is no longer considered a static and passive content package (represented by an item in the library's collection, digital or otherwise), but a value-adding process where interactive and collaborative discovery is played out. Here digital libraries have to be an inherent, proactive, and indispensable part in this new game of e-Science.

This requires a paradigm shift for libraries themselves, where an embedded knowledge service model is prerequisite, by working together with researchers and in their research processes, and by providing robust analytic knowledge informatics services beyond traditional search, retrieval, and delivery. To enable this new paradigm, transformations of digital library systems are required: to capture (not necessarily in the traditional library way) the rich, dynamic, and inter-linking e-Science knowledge environment, to turn this knowledge context into a semantic web enabling knowledge exploration and computation, and to make this enriched context a live tool accessible and playable by researchers or their computer agents from within their own work processes. To achieve this, emerging technologies such as SOA, Semantic Web, linked data, mush-ups, research informatics, visualized discovery, embedded techniques, etc., will be needed, but a re-thinking of the roles of the digital library and its major components is essential. An open, re-usable, re-purposable part of user knowledge processing is what e-Science is asking for a digital library.