

## The new, new thing comes to the laboratory

Many of you will have heard of the Internet of Things. However, if you head to the Wiki entry on the subject you may end up rather confused. The one key point is the observation, in 2009, that the internet was changing from an environment where most of the data floating around originated with human intervention (e.g. emails, photos, text messages) to one where a majority of the data was automatically generated (e.g. sensors, RFID tags).

Another current trend is Big Data. This one refers to the fact that databases around the world, particularly those generated by devices conforming to the Internet of Things, are getting way too big for old-school searching. Data Analytics is now a hot area of internet R&D; it describes the new technologies that are used to extract useful knowledge out of databases that are simply too large and diverse to search with, say, simple keywords.

The final trend that is changing how we live and work is the rise of ubiquitous Mobility of Internet Access through the use of smartphones and tablets, together with Cloud Computing and Data Storage. That is, we can access both communications to other people and web services wherever and whenever we want. And yet this capability is not in any way constrained by the size and power of the devices that we use for this access; just the opposite.

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Combined, all of these relatively new technologies are compelling us towards more complex and productive work practices. Not everyone believes this, but the proof is that late business adopters of these technologies are falling behind their competitors. It is a case of adapt or become extinct.

Until now, much of the commercialisation of these new technologies has been focused on consumer use. However, business applications are now multiplying, especially as start-up technology companies see opportunities to redeploy these already-proven disintermediation technologies into new business niches. It was only a matter of time before some of these companies started focusing on the professional laboratory environment.

By way of example, I will discuss three companies that are introducing new products and services into the professional laboratory environment. At the surface, these products are simply making work more productive and efficient for laboratory professionals and with lower costs for their employers. However, if one delves deeper, these technologies represent a more fundamental shift; more on this later.

Instrument Works, an Australian start-up company, has opted the new Bluetooth low-energy technology to introduce a battery-powered wireless sensor controller. Currently, the company

sells controllers for pH and temperature measurement and will soon add others to this list. By using this approach, users can throw away their old pH meters and instead use their smartphones to take these measurements. This has certain benefits of portability, cost and even performance (the system allows for auto-calibration and sensor health checks).

However, the real benefit behind Instrument Work's efforts is the free iPhone app called DataWorks. DataWorks automatically detects the sensor controller and allows the user to control the sensor remotely. This can be done manually or automatically. Data can be stored in the cloud together with time and location tagging. The app also allows the control of a number of third-party Bluetooth scientific sensors and the company hopes that its easy and flexible app will eventually be a hub whereby laboratory users focus their measurement taking and data management.

German company Labfolder has introduced a cloud-based laboratory book. Designed for mobile device data entry, this product takes the old lab-book online and into the cloud. Apart from the archival benefits, this technology allows easy searching and collaboration. In addition, data entry can be set up in re-useable templates. Laboratory managers, in particular, will appreciate the immediate and direct access to their workers' results. Data entry, however, unlike with the Instrument Work's offering, is mostly through a manual touch screen.

Labguru, from the US, is an even more sophisticated version of Labfolder that incorporates, for example, R&D team tracking and reporting, and access to materials databases and ordering system from external suppliers. I suspect that the more complex these systems become, the more of an effort it is to adopt them and exploit their benefits across different types of laboratory environments. This paradox is similar to the issues associated with adopting new enterprise software solutions for business operations and customer relations. However, over time we have seen certain approaches, such as that of SAP, capture market leadership in large corporations and the same is eventually bound to happen in the professional laboratory data management environment.

Laboratories are awfully large generators of data. New technologies, such as those described above, are helping to automate data collection, storage and sharing; by doing so they increase the productivity of individual laboratories. However, these technologies also focus on the extraction of useful information from the ever-accumulating mountains of laboratory data; it is here that I expect sophisticated new technologies to make the most impact. Today we are just at the beginning of this paradigm shift in how businesses and research institutes use new information technologies to extract value from their investment in laboratories.



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