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# Requirements Analysis: The Next Generation

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**LAST YEAR, WE** met at the IEEE Requirements Conference for the first time in ages. We talked about the usual—what's new, life changes, kids—and this last topic, talking about Anja's young children, got us future-gazing. What sorts of requirements techniques and tools might our kids use in 20 years' time? What form will the work we currently call requirements take in 2030? After all, the digital world has changed enormously since 1990, and most observers expect even greater changes in the next 20 years.

To answer these questions, we needed to look far beyond the current crop of requirements vision papers in academic sources. We needed to take a stab at what a future digital world would look like and imagine how stakeholders—if indeed, stakeholders still exist in the traditional sense—would communicate what they want.

Our future-gazing was pretty unscientific—just a couple of people staring into a crystal ball through the looking glasses of requirements practices. But we were surprised by what we found. The crystal ball revealed two visions to us. In the first, we were able to see how technologies will evolve, how stakeholders will change in response to these new technologies, and the consequences for the applications that stakeholders will want. In the second, we were able to explore how these changes will influence future requirements processes.

## How Technologies Will Change

One technological advance that will influence future requirements processes is ubiquitous computing. Technologies will be far more integrated into the fabric of our everyday lives, from our homes to our cars to even our clothes and jewelry. It's likely to mean that scoping new computer-based applications—differentiating them from other applications and everyday tasks such as preparing meals, cleaning, and exercising—will be even more challenging.

Another important advance is total connectivity. In 20 years, we will be able to find and access all of the information and most of the services that we will ever need quickly, reliably, and at no significant cost. Total connectivity will lead to large-scale extensibility of software-based applications using information and services from third parties. Discovering and describing requirements for rapidly evolving, open-ended applications will be a serious challenge.

A related trend is the emergence of massive computing power. Even small devices will be able to undertake complex tasks, thereby removing many barriers that limit people's current expectations about what technologies can do for them. This, combined with the explosion of third parties providing services, will mean that people will almost always get what they want. Expectations and horizons will be lifted, along with requirements that will be more challenging to meet.



0740-7459/11/$26.00 © 2011 IEEE

The vision also revealed widespread availability of complete and accurate user profiles containing personal information for use in applications. Although privacy and security concerns are likely to remain, we feel that, over time, the advantages available from personalized applications and services will outweigh the risks, making interactions with technologies a very individual experience. Extreme personalization will mean that everyone's requirements will be different.

## How Applications Will Change

The very large number of applications to choose from in a dynamic and evolving marketplace will lead to more stakeholder requirements. These requirements will be more important because applications, especially lifestyle applications, will be omnipresent in our homes, cars, and clothes.

Of course, not all applications will be developed to support our lifestyles. Others, such as finance and defense, won't change as rapidly. We expect analysts to take advantage of new tools, but their requirements work won't radically shift. That said, stakeholders in these applications will also be stakeholders in lifestyles for which requirements practices will evolve more rapidly. These advances will create new expectations in workplace project practices. Stakeholders will expect similar levels of requirements attainment at home and work from our public and private services.

## How Stakeholders Will Change

Stakeholders' capabilities to express their requirements and obtain solutions for them will increase substantially. We already see this with the widespread uptake of app stores for iPhones and Android smartphones. Stakeholders can browse, select, download, and configure software to meet their needs. Old divisions of stakeholder, analyst, and designer roles will disappear. In 20 years, many stakeholders will also be both analysts and designers.

All these trends point in one direction: a significant shift down in granularity from requirements on applications to requirements on features. Requirements will be met quickly, on demand when the requirements emerge, rather than in application projects managed as now. Software as a service will collapse the separation between design-time and runtime activities.

Scoping requirements will still be essential to understand and deliver features. But, unlike today, requirements will be bounded by dynamic maps of existing software applications and models of users' physical and digital environments. Many of us will be analyst-designer-stakeholders able to describe and implement our own requirements within basic qualities. Negotiating service-level agreements will be second nature to most, just as we choose utility providers today based on a widely accepted lingua franca for expressing qualities of required features.

Requirements will be the equivalent of items in to-do lists that evolve as new requirements emerge and existing ones are met by software or other means. In 20 years, getting software will be almost as commonplace as shopping for food is today. Stakeholders will think less about requirements and more about choices and decisions to make. They'll record, blog, and annotate as well as type their requirements, based on everyday experiences with their physical and digital environments. They'll directly communicate their requirements to potential service providers in virtual communities operating as self-contained marketplaces of trusted partners, following super-agile processes.

This is what our crystal ball revealed to us. We've stressed some parts of the vision, left others out. Pick some of the vision apart, and it reveals some major requirements and software engineering challenges for the next 20 years. Perhaps you disagree with this vision. If so, let us know: *IEEE Software* is a great place to debate the future of requirements.

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