

## Requirements Analysis: The Next Generation

Anja Wever and Neil Maiden

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. It was this last topic – asking about Anja’s young children – that got us future-gazing. What sorts of requirements techniques and tools might the 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 the 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 will look like, and imagine how stakeholders, if indeed there will still be stakeholders in the traditional sense, will communicate what they will 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. We hope you will also be surprised, interested, even excited by new opportunities our future offers.

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 to influence future requirements processes will be **ubiquitous computing**. Technologies will be far more integrated than at the moment into the fabric of our everyday lives – our homes, our cars, even our clothes and jewellery. It is likely to mean that scoping new computer-based applications – differentiating them from other applications and everyday tasks such as preparing meals, cleaning and taking exercise – will be more challenging.

Another important advance will be **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/or services from third-parties. Discovering and describing requirements for rapidly evolving, open-ended applications will be a serious challenge.

A related trend will be 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, and requirements that will be more challenging to meet.

The vision also revealed widespread availability of complete and accurate **user profiles** containing personal information for use in applications. Whilst 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.

Clearly this list of technological advances is not complete. Our crystal ball was low-spec, and the remaining bandwidth was used to reveal how applications and stakeholders will change.

### How applications will change

Technological advances will change the nature of applications that stakeholders will have requirements on in 20 years time. 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, our cars and our clothes.

Of course, not all applications will be developed to support our lifestyles. Others, such as finance and defence, will not change as rapidly. We expect analysts to take advantage of new analysis and management tools, but their requirements work will not alter radically. 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

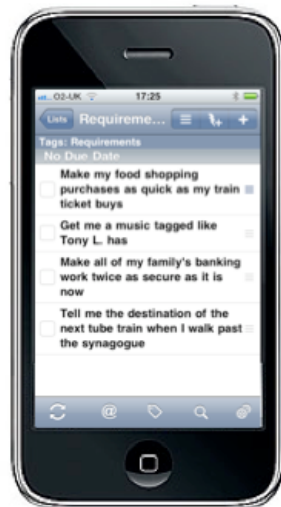
Stakeholders' capabilities to express their requirements and obtain solutions for them will increase substantially. We are already seeing this with the widespread uptake of app stores for iPhone and Android smart phones. Stakeholders can browse, select, download and configure software to meet their needs.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

### Implications for Requirements Processes

So what might these visions mean for requirements processes 20 years hence. We think that the trends all 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 run-time 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 the user's 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 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, more about choices and decisions to make. They will audio-record, blog and annotate as well as type their requirements, based on everyday experiences with their physical and digital environments. They will directly communicate their requirements to potential service providers in virtual communities operating as self-contained marketplaces of trusted partners, following super-agile processes. Figure 1 shows an individual's requirement specification in 2030.



**Figure 1: Personalized individual requirements in to-do lists**

### Making the vision real?

So that's 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.

Or you might disagree with the vision. If so, let us know, IEEE is a great place to debate the future of requirements.