

# Panel: Impact of Environmental Evolution on Requirements Changes

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## 1 Introduction

One reason why systems fail to deliver expected services is that, given certain requirements, the rest of the implementation is not faithful to the stated objectives. There are a number of reasons for this, such as weaknesses in the technologies used, lack of expertise among technical and managerial staff, perceived time pressures, market competitiveness, etc. Much is being done in research and practice to attack this problem, even though progress is slow.

Unfortunately, even if this problem can be solved – unlikely by a long shot – we still confront another problem of major proportion. This is due to the changing environment in which the system is being developed or is meant to be used. Specifically, when a system is being developed, even for a short release cycle, the environmental changes affect the survivability of the system. For example, the requirements implemented may no longer be as adequate at system completion as at the start of development. This inadequacy of the requirements manifests itself in a number of symptoms, such as functional deficiency, performance problems, inter-operability problems, usability problems, higher maintenance costs, etc. Such problems can have minor to severe consequences during system usage.

Thus, one must not only ensure building a “correct” system given a specification but must also work at identifying at the earliest point in time, perhaps continuously, how the environment has changed and how this change calls for changes in the current requirements and how to incorporate these changes into the system. One must understand this issue in a scientific manner and develop or use principles, methods, techniques and tools to address this issue.

This panel will focus on the management of requirements changes due to environmental evolution. In essence, we “are” aware of requirements changes during system development and that of system decay over time, and so this is not a new revelation. In fact, Lehman’s program classification and laws of software evolution [1], for example, are an important contributor to this awareness.

Still, on a day-to-day basis, much development is “inward” focused. When it is time to plan a new release, we identify or select new requirements deemed most appropriate for the next release, and these are then implemented. These “reactive” cycles are re-

peated until the system is eventually decommissioned. Little thought is given to looking “outwards” on to the environment of the system, how it is changing, and how it is affecting the current requirements. Little methodological [2] and technological work has been done to help us cope with such environmental changes in a “proactive” manner so that we can incorporate the implications of such changes in the existing system design for its longevity. The work in the area of user-centred design is a start but it needs to be generalised to all aspects of system requirements and need not be limited only to human-computer interaction.

## 2 Purpose of the Panel

There are numerous stages a community must go through in building a viable subfield within requirements engineering to deal with requirements changes due to environmental evolution. One of the first ones is to take stock of the known problems and current practices in this subfield. This panel brings together selected experts, who have had to deal with requirements changes, to share their experiences in diverse application domains and to exchange views with the audience.

Although domain-specific issues can dominate discussions of requirements change (e.g., system safety vs. system availability), the panel will focus first on “requirements change due to environmental evolution” and then on any differences due to domain-specific issues. Some relevant questions are

1. What lessons have been learned from practice in attempting to manage requirements change in the midst of environmental evolution?
2. Is there empirical data linking concrete environmental changes to concrete requirements changes over a period of time?
3. How should one document requirements and environment changes and their interrelationships?
4. What are the principles, methods, techniques and tools associated with requirements and environment change?
5. How do you know what has changed, or is likely to change, in the environment of the system in question (over a period of time)?

6. What effects do past (or anticipated) environmental changes have on system requirements (and hence on system behaviour)?
7. How does deregulation affect system requirements?
8. Can past environmental changes help predict future changes?
9. How often should one monitor environment changes? It costs money!
10. How can current processes (or life-cycle models) be extended to incorporate this aspect of requirements engineering?
11. How do you ensure that you have a feedback mechanism that effectively and efficiently monitors change?

### 3 Panelists

William Agresti (MITRETEK)  
Peri Lucopoulos (University of Manchester Inst. of  
Science and Technology)  
Ted Thompson (LPS Aviation)  
Karel Vredenburg (IBM Canada)

### References

- [1] M.M. Lehman and L.A. Belady. *Program Evolution: processes of software change*. Academic Press, London, 1985.
- [2] Vivek Nanda. *Impact of Environmental Evolution on Requirements Change*. Masters Thesis, McGill University, Montreal, Canada, May 1996.