The Importance of Feedback for Architecture

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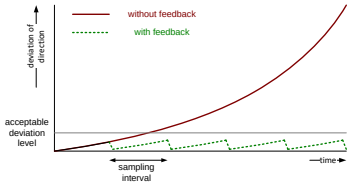

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Abstract

The role of feedback in the Product Creation Process is described, especially for the System Architecting.

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1 Introduction

Feedback is a universal principle that is applied in highly technical domains such as control engineering, but also in social sciences. This Intermezzo discusses feedback as part of the Systems Architecting Process and explains its importance.

2 Why Feedback?

2.1 Control

Feedback is used in control systems to ensure that the actual direction corresponds to the desired direction. In general the deviation from the desired direction grows exponentially in time, see Figure 1.

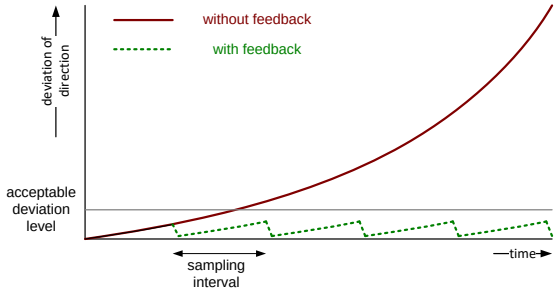

Figure 1: The deviation of the actual direction of product development with respect to the desired direction as function of the time

Many control systems implement a feedback loop to force the system back in the desired direction. Figure 1 also shows the effect of a discrete feedback system over time. It will be clear that the sampling interval is determined by the time constant of the deviation and the acceptable deviation level.

Product development can be seen as an ordinary system that can be controlled analog to technical control systems. Product developments without feedback result in products that are out of specification (too late, too slow, too expensive, too heavy et cetera). Sound development processes contain (often multiple) feedback loops.

2.2 Learning

Human beings learn from their mistakes, *provided that they are aware of them*. Feedback is the starting point of the learning process, because it provides the detection of mistakes. Efficiency of individuals and organizations can be increased by learning. Without learning similar mistakes are repeated: a waste of resources.

2.3 Applicability

The principle of feedback can be applied on **any** activity. The higher the uncertainty or the larger the duration of an activity is, the more important feedback becomes.

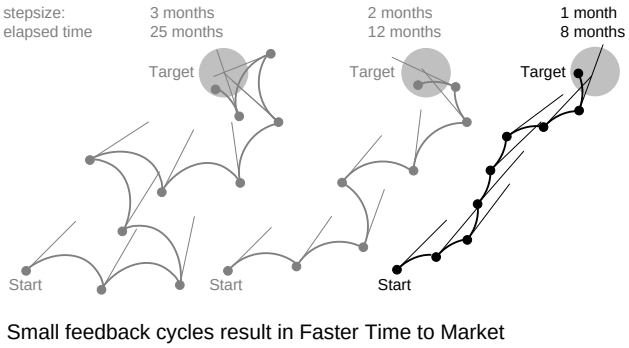

Figure 2: Example with different feedback cycles (1, 2, and 3 months) showing the time to market decrease with shorter feedback cycles

Figure 2 shows an example of a development with three different feedback cycle times, respectively three, two, and one months. The three month feedback cycle results in an project duration of 25 months. Decreasing the feedback cycle to 2 months brings the total project duration down to 12 months. One month feedback cycles give a total time of only 8 months. This simple model ignores the cost of obtaining feedback, but it clearly illustrates the essence of short feedback cycles.

3 Theory versus Practice

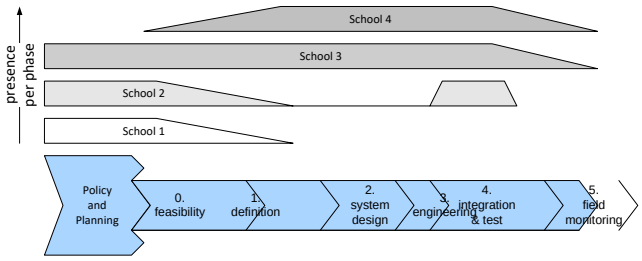

Figure 3: Four different schools of architecting, showing the presence of the architect in relation to the policy and planning process and the product creation process

Systems architecting is partially a very conceptual activity. The concepts are theoretical as long as they are part of presentations or specifications. Some architecting schools promote the system architecting function as strategic, providing direction, without being drowned in operational problems. A second school promotes an architect who is active in the definition phase of a product as well as in the verification phase. We argue a third direction: architecting has to be done during the entire development life cycle. In practice many architects function still in a fourth way: entirely in the technical domain. Figure 3 visualizes the 4 different schools as function of the process phase.

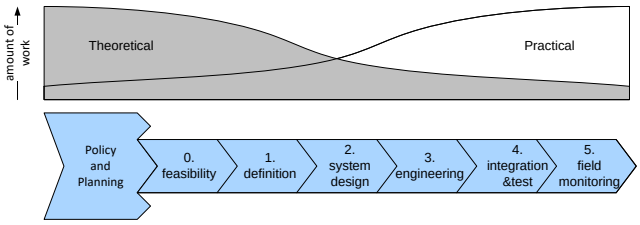

Figure 4: Theoretical versus Practical system architecture work in relation to the development life cycle

Figure 4 shows the amount of "theoretical" work and the amount of "practical" work also as function of the process phase. Where we use the term "theoretical" for concepts in presentations or specifications that have not been exposed to the physical world. Similarly, "practical" is used for work where the design is realized and tested.

A number of feedback loops can be closed during the Product Creation Process. Normally the next phase in the process provides feedback to the previous phase in the process. This phase transition feedback is often applied. However, feedback from the next phase is a rather indirect measure for the desired direction. The next step provides feedback on the usefulness of the input to continue the work, but the user satisfaction and market success can not be measured by the next step.

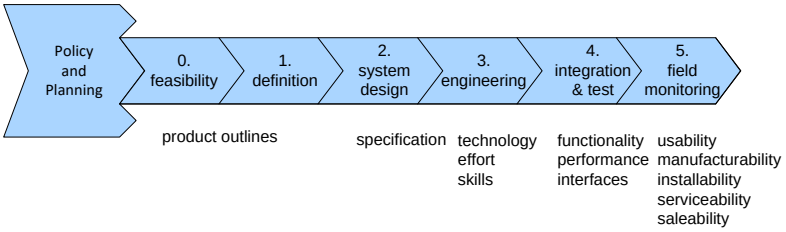

Figure 5: Feedback per development phase

The feedback for theoretical work comes from the practical work. Figure 5 shows the feedback per development phase. This figure makes it immediately clear that the amount of feedback is proportional to the amount of practical work going on.

4 Conclusions

The conclusions of this paper are given here as a set of position statements:

1. For the education of system architects it is essential that they participate in the entire feedback loop.
2. The education of system architects is never finished.
3. System architects must participate in the entire product creation lifecycle for most of their carrier.
4. The value of system architects in the policy and planning process stems from the practical feedback during the product creation process.
5. Feedback can never come too early.
6. System architects can have fantastic dreams, feedback is required to prevent that dreams turn into a nightmares.

References

[1] Gerrit Muller. The system architecture homepage. `http://www.gaudisite.nl/index.html`, 1999.

History

Version: 1.0, date: June 17, 2010 changed by: Gerrit Muller

- moved the section on development models to ProductCreationProcess
- updated the text
- added the "simulation" of shorter feedback cycles
- changed status to concept

Version: 0.4, date: June 8, 2010 changed by: Gerrit Muller

- replaced lists by figures

Version: 0.3, date: August 5 2002 changed by: Gerrit Muller

- small updates

Version: 0, date: January 19 2000 changed by: Gerrit Muller

- Created, no changelog yet