The Importance of System Architecting for Development

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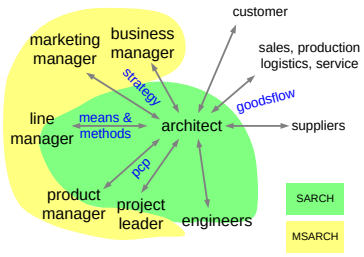

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Abstract

The importance of system architecting for development of products is explained. Current trends show an exponential growth of development teams, product complexity. Team size and product complexity are problematic from cost, time to market and risk point of view. The challenge is to create new products with manageable sized teams. System architecting is one of many measures to cope with this problem.
Architecting is explained in its context and a few main concepts are shown. A curriculum is being developed for (potential) system architects. The next step is to address the managerial context of the system architect. For this purpose a 2 day Management SARCH is developed.

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1 Introduction

Systems architecting is one of the integrating disciplines in Product Creation. Complementary integral teamplayers, such as project leaders, architects and product managers can form the core of highly effective product creation teams.

Several efforts are ongoing to help potential architects in developing the needed skills and obtaining sufficient knowhow, such as the architecure school at research, the ESA course and the SARCH course.

The next step in enabling these complementary core teams, is to address the managerial context of the system architect. A special course, in the form of a two day workshop is developed to create a shared insight in the role of the architect and architecting.

2 The Challenge

The functionality and performance of products is ever increasing. The increase of functionality and performance results in an increase of the effort to make new products. Historical data shows that the effort increase is also exponential, like Moore's law for electronics. The increase of designer productivity (new functionality or performance increase per designer year) is rather limited, despite many promising reuse, platform, COTS (Commercial Off The Shelf) et cetera approaches.

Figure 1 shows the challenge we are facing: to increase the designer productivity dramatically, in order to keep the product creation teams at a manageable size.

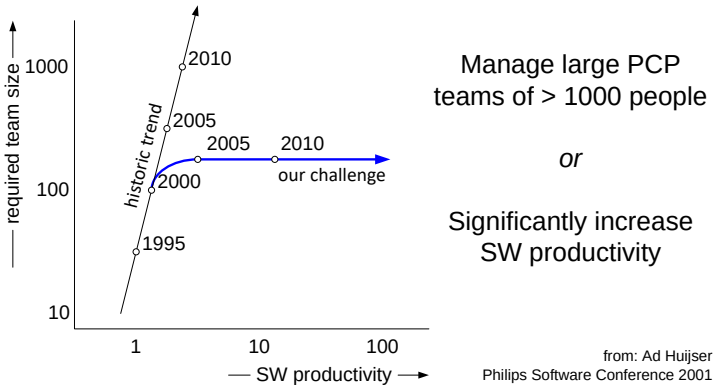

Figure 1: The Challenge

In the keynote speech at the Philips Software Conference 2001 Ad Huijser showed that this challenge must be addressed by a multitude of measures, ranging from business to people management; see figure 2. System architecture is one of many measures to attack the challenge of dramatically increasing the designer productivity.

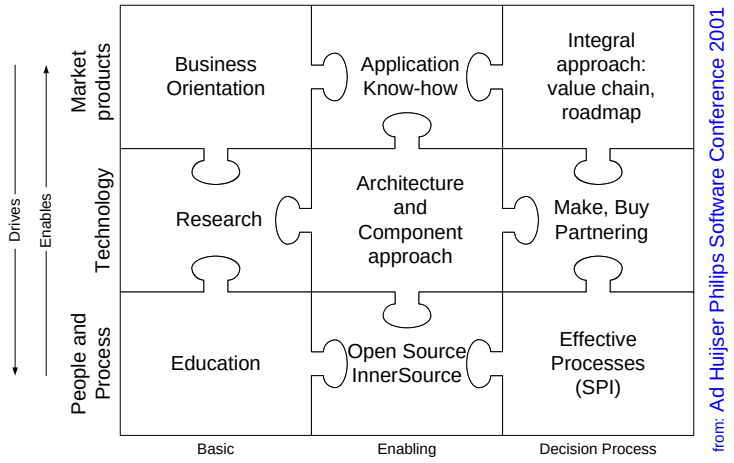

Figure 2: When all pieces fit ...

3 Architecting

The architecting courses at this moment use a few fundamental concepts as the basis of system architecting. A simplified process decomposition, see figure 3, is used to explain the context of system architecting in the business context.

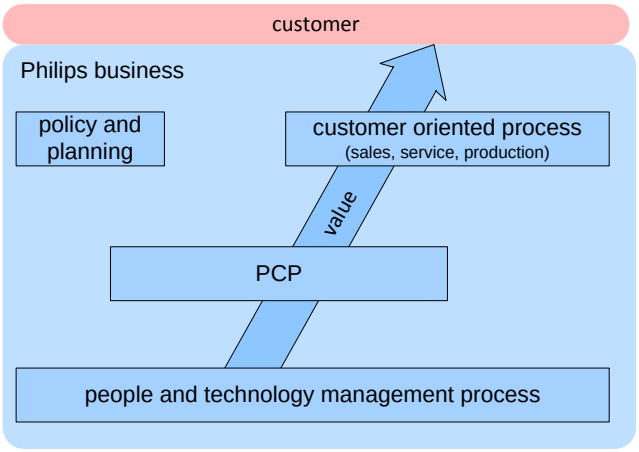

Figure 3: Simplified process view

Figure 4 shows the system architecting process overlayed on this process decomposition, as well as the relations with the other processes. Normally an architect will spend 80% of his time in product creation and 20% in product policy and planning.

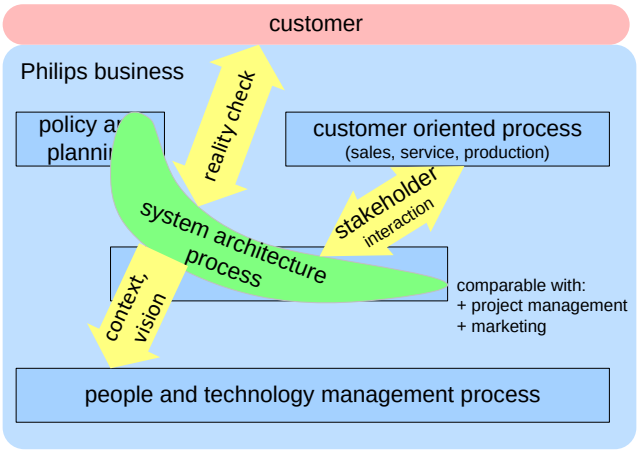

Figure 4: System architecture process

One of the fundamental messages is that architects must combine know how of

the solution (technology) with understanding of the problem (customer/application). The architect must play an independent role in considering all stakeholders interests and searching for an effective solution. The fundamental architecting activities are depicted in figure 5.

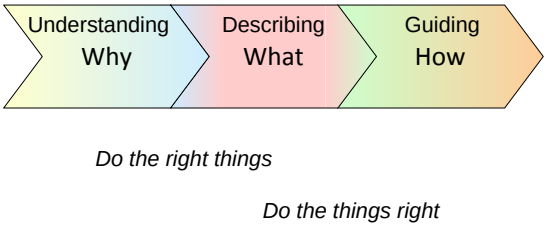

Figure 5: What is architecting?

During the course often the "CAFCR" model is used as simple reference model, see figure 6. This model is a refinement of figure 5

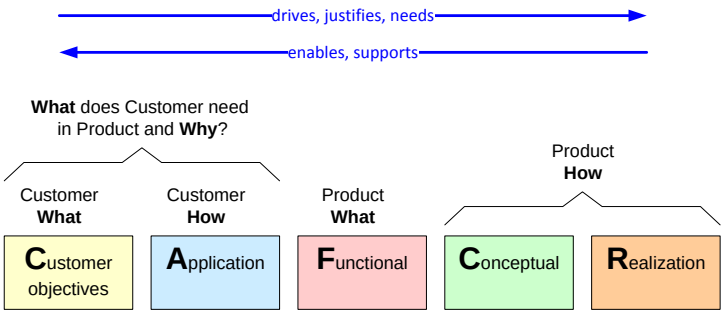

Figure 6: "CAFCR" model

Creating the solution is a collective effort of many designers and engineers. The architect is mostly guiding the implementation, the actual work is done by the designers and engineers. Guiding the implementation is done by providing guidelines and high level designs for many different viewpoints. Figure 7 shows some of the frequently occurring viewpoints for guiding the implementation. Note that many people think that the major task of the architect is to define **the** decomposition and to define and manage the interfaces of this decomposition. Figure 7 shows that architecting involves many more aspects and especially the integrating concepts are crucial to get working products.

Many more initiatives are ongoing in the world. Figure 8 defines the relative position of these initiatives and the ambition of the Gaudí project. The figure shows that the system architecting efforts are not heading for a fixed set of rigid procedures, but instead are stimulating architects to fill their personal toolbox with many

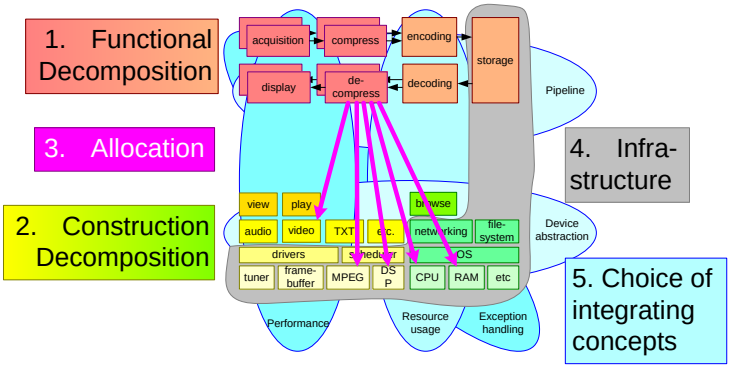

Figure 7: Guiding how

flexible tools to remain agile (responsive, adaptable, et cetera).

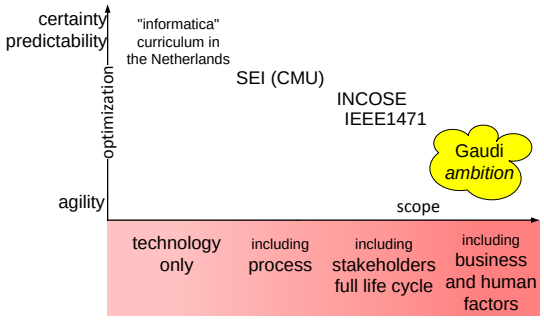

Figure 8: Gaudí ambition

The architect is the technical oriented integrating core team player. In most cases the project leader is operational organization oriented, and the product manager commercial oriented. These 3 roles exist recursively at other levels, from component level to product portfolio. Figure 9 shows this operational oriented hierarchy in product creation.

Figure 9 makes clear that the architecting role is present at multiple scopes. Parallel with the increase of the scope in the product direction the scope of the architect is increasing in the people direction, as shown in figure 10

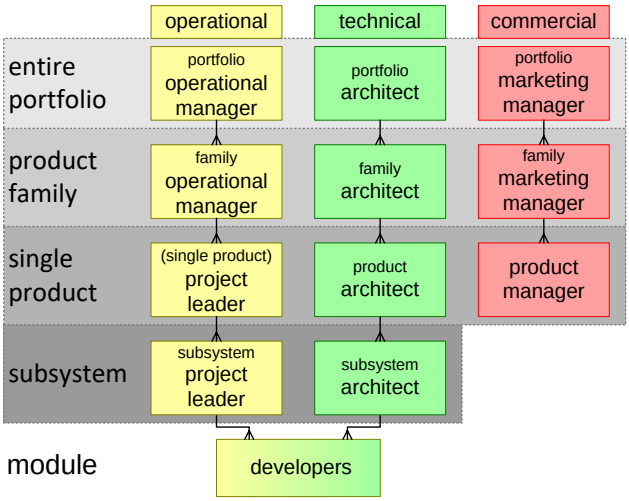

Figure 9: Operational hierarchy

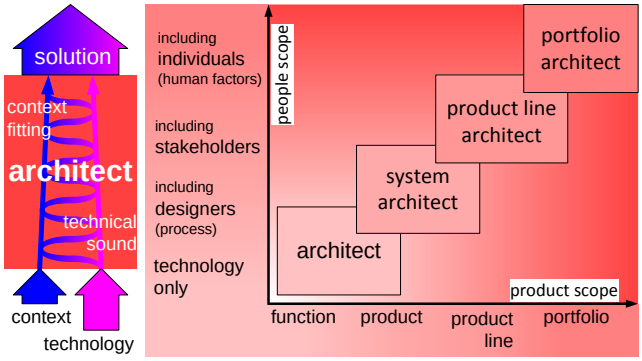

Figure 10: Architecting Scope

4 Architecting Courses

The two main types of architecting courses are:

- courses for (potential) architects and close relatives
- courses for the managerial context

Figure 11 shows the architect and his stakeholders, and positions the SARCH and the MSARCH in this landscape.

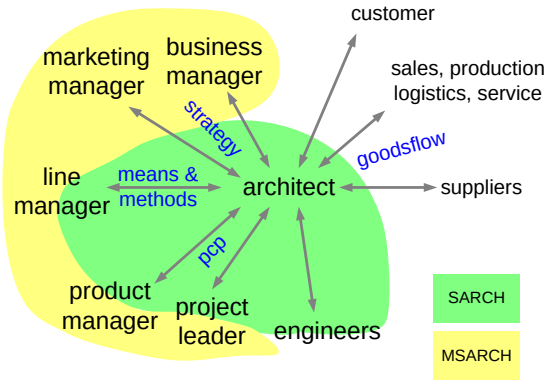

Figure 11: Stakeholders Architect

The course tries to stimulate the (potential) architect to broaden his profile, as shown in figure 12. Note that this broadened scope will somewhat reduce his technology involvement. The architect has to learn to cooperate with the designers and engineers to compensate for this reduction. For most architects this is a difficult step, managers should coach and help architects through this transformation.

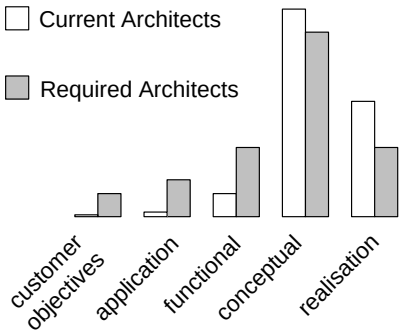

Figure 12: Profile of System Architect

A first attempt to define a curriculum for architects is shown in figure 13. At the top of the figure the growth path of a system architect[1] is shown. Below the courses or course subjects are shown which fit in the architect career path. Note that this is not a unified list for all architects. Instead it is a palet of courses, where the architect must select the courses which best fit his current needs. In color coding is indicated if courses are available inetrnal or external.

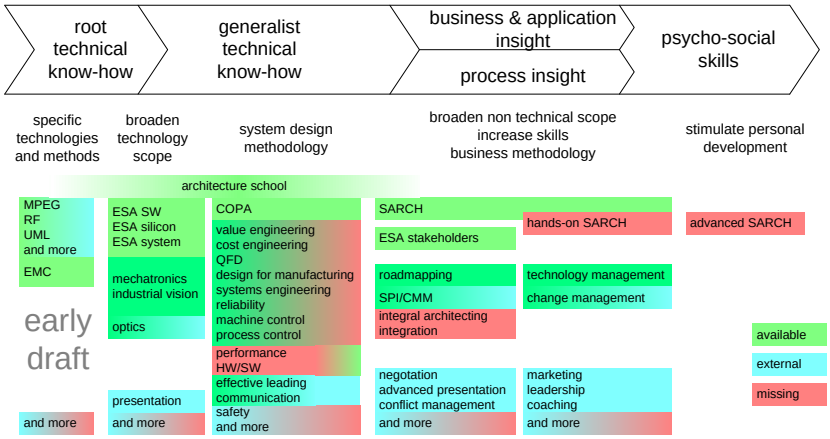

Figure 13: Draft System Architect Curriculum

Figure 14 shows the current status of courses within Philips. The first SARCH course has been given end of 1999, the ESA course started mid 2000 and the MSARCH was first given begin 2002.

Course	Abbreviation	number of courses upto May 2002	appr. total participants	Lecturers
System Architecture	SARCH	15	230	Gerrit Muller 2002 H2: others
Embedded Systems Architecting; Stakeholders	ESA	5	80	Pierre America Frank Pijpers
System Architecting for Managers	MSARCH	1	12	Gerrit Muller

Figure 14: Course status in Philips

Figure 15 shows the goal of the 2 day management SARCH workshop. Many architects complain that their (managerial) context does not share the same view on

architecting, which limit them in performing the job in the broad role as described here. One of the main messages to the architects is that they themselves must earn credibility and create visibility. Philips may gain a lot of effectiveness if the managers are working and facilitating in the same direction, by sharing the same vision on architecting and architects.

managerial awareness of:

+ what is architecting
+ business impact of architecting
+ role and profile of an architect

to

+ enable integral approach
+ stimulate architects to substantially contribute:
  * at business level
  * to strategic goals
  * from technological strength

Figure 15: Goals of 2-day Management SARCH course

The challenge for a Management SARCH is to balance the theory (200+ sheets of SARCH material), with practical illustration and even more important active hands-on work. It is extremely dangerous if the management course only consists of glossy, well defined models and processes. That creates an illusion of understanding, while the subtle relationships, conflicting interests and non ideal behavior are not experienced. That is the main reason that more than half of the time is spent (inter)active. Alltogether a very loaded program is followed, see figure 16.

session	subject
day 1 morning	positioning the System Architecture Process Product Creation Process
	product families, generic developments
day 1 afternoon	role and task of the system architect profile of the system architect
	documentation, reviewing and other supportive processes
day 2 morning	requirements capturing, roadmapping
day 2 afternoon	HRM aspects; selection, appraisal, career path, etcetera wrap up, expectations, how to continue, evaluation

Figure 16: Program of 2-day Management SARCH

When approaching management teams the investment of 2 full days is often a hurdle. Nevertheless to reach the desired objectives this is the minimum time needed. If managers are not yet ripe to show commitment by investing these two days, than other bootstrapping activities, like given a short interactive presentation, are needed before forcing this course on them. Only self motivated teams will benefit from such a course.

References

[1] Gerrit Muller. The arisal of the system architect. `http://www.gaudisite.nl/MaturityPaper.pdf`, 1999.

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

History

Version: 0.3, date: May 29, 2002 changed by: Gerrit Muller

- moved "CAFCR" model to the section "Architecting"

Version: 0.2, date: May 28, 2002 changed by: Gerrit Muller

- Created, no changelog yet