The Awakening of a System Architect

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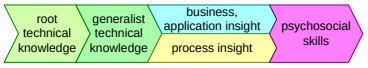

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Abstract

The typical phases of a system architect development are described, beginning at the fundamental technology knowledge, with a later broadening in technology and in business aspects. Finally the subtlety of individual human beings is taken into account.

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1 Introduction

System architects are very rare commodity. This chapter describes the observed general growth pattern of system architects. We hope that by analysis of the the characteristics of existing system architects will facilitate the training of new system architects. Reference [2] contains a good description of a system architect.

2 The Development of a System Architect

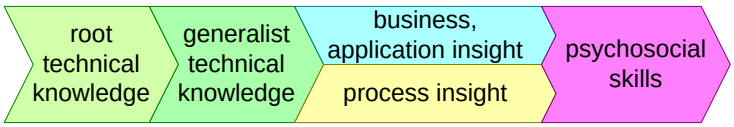

Figure 1: Typical Development of a System Architect

System architects need a wide range of knowledge, skills and experience to be effective. Figure 1 shows a typical development of a system architect.

The system architect is rooted in technology. A thorough understanding of a single technological subject is an essential underpinning. The next step is a broadening of the technical scope. Section 3 describes the path from a mono-disciplinary specialist to a multi-disciplinary system architect with broad technological knowledge.

When the awakening system architect has reached technological breadth, then it will become obvious that most encountered problems have a root cause outside of technology. The system architect starts to develop along two main parallel streams:

The business side: the market, customers, value, competition, logistics, service aspects

The process side: who is doing what and why, necessitated by the amount of involved stakeholders

During this phase the system architect will broaden in these two dimensions. The system architect will view these dimensions from a technological perspective. Again when a sufficient level of understanding is attained an awareness starts to grow that people behave much less rationally than technical designs. The growing awareness of the psychological and the sociological aspects is the next phase of growth.

3 Generalist versus Specialist

Most developers of complex high tech products are specialists. They need an in-depth understanding of the applicable technology to effectively guide the product development. The decomposition of the development work is most often optimized to create a work breakdown enabling these specialists to do their work with as much autonomy as possible.

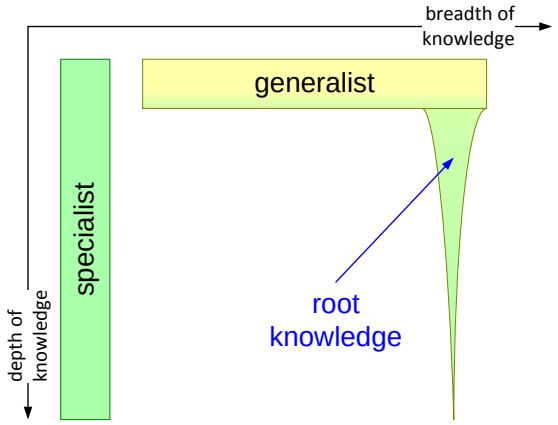

Figure 2: Generalist versus Specialist; depth versus breadth

Figure 2 is a visualization of the difference between a specialist and a generalist. Most generalists are constrained in the depth of their knowledge by normal human limitations, such as the amount of available time and the finite capacity of the human mind. The figure also shows that a generalist has somewhere roots in detailed technical knowledge. These roots are important for the generalist self, since it provides an anchor and a frame of reference. It is also vital in the communication with other specialists, because it gives the generalist credibility.

Figure 3 shows that both generalists and specialists are needed. Specialists are needed for their in depth knowledge, while the generalists are needed for their general integrating ability. Normally there are much more specialists required than generalists.

There are more functions in the Product Creation Process that benefit from a generalist profile. For instance the functions of project-leader or tester both require a broad area of know how.

Architects require a generalist profile, since one of their primary functions is to generate the top-level specification and design of the system. The step from a specialist to a generalist is of course not a binary transition. Figure 4 shows a more gradual spectrum from specialist to system architect. The arrows show that intermediate functions exist in larger product developments, forming natural

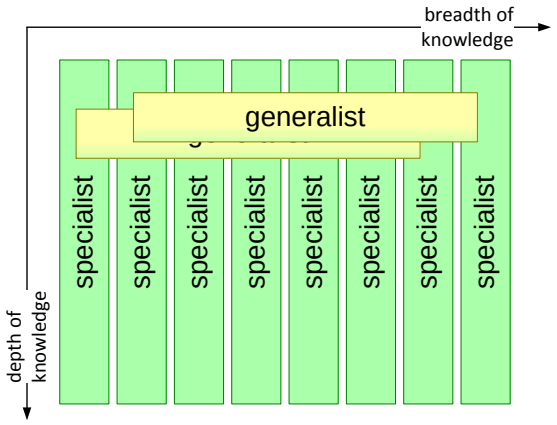

Figure 3: Generalists and Specialists are both needed in complex products, they have complementary expertise

stepping stones for the awakening architect.

Examples of aspect architects are:

subsystem architects subsystems are the main organizational decomposition. In hardware intensive systems subsystems tend to be physical, e.g. loader or generator. Typical number of subsystems is between 5 and 15.

SW, mechanics or electronics architects or discipline oriented architects. The architects ensure consistency across physical subsystems

function architects take responsibility for one system function, ensuring the soundness of that function.

quality architects take responsibility for one quality, e.g. safety, reliability, security.

For instance a software architect needs a significant in-depth knowledge of software engineering and technologies, in order to design the software architecture of the entire system. On the other hand a subsystem architect requires multi-disciplinary knowledge. The limited scope of one subsystem reduces the required breadth for the subsystem architect to a hopefully realistic level.

Many products are becoming so complex that a single architect is not capable of covering the entire breadth of the required detailed knowledge areas. In those cases a team of architects is required, where the architects are complementing each other in knowledge and skills. It is recommended that those architects have complementary roots as well; as this will improve the credibility of the team of architects.

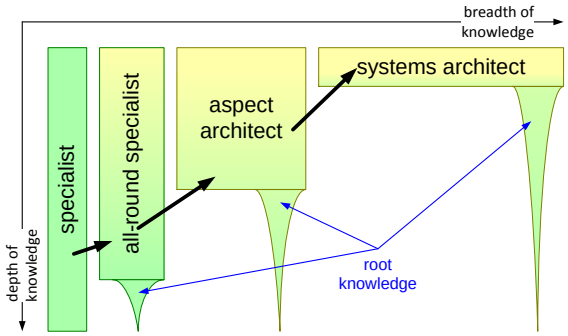

Figure 4: Growth in technical breadth, intermediate functions from specialist to system architect

4 Acknowledgements

Chuck Kilmer suggested a new title and offered many textual improvements.

References

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

[2] Eberhardt Rechtin and Mark W. Maier. *The Art of Systems Architecting*. CRC Press, Boca Raton, Florida, 1997.

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- changed status into concept

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