Higher Product Complexity and Shorter Development Time – Continuous Challenge to Design and Test Environment

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Abstract

Digital technologies enable more functionality and new attractive products at faster pace. What are the challenges faced in the development? How must the processes change? How must the tools change? How must the businesses change? What are the strategic questions to be answered?

1. Introduction

Traditionally engineers are regarded as inventors, somehow isolated in their innovative work with interesting new technologies. Technical development processes have been regarded as standalone, with no interaction with surrounding people or processes. Engineering processes have been sequential and have let individual experts be isolated with their own special design environments and databases. Is this true anymore?

2. Times are changing

Business pressures on time, cost, and quality and added value force all companies to rethink their business processes and to seek new ways to improve in all areas. Shorter development times are achieved by shortening each phase and by increasing concurrence between research, technology development, component development, product development, manufacturing, materials management and marketing.

Increased concurrence means more effective usage of time and less rework, i.e. better usage of human and physical resources. There is less room and need for separate development environments (design tools and databases). This makes information management easier but at the same time perfectly working information management is a necessity, as well as seamless integration of development tools for different technologies. Highly integrated multitechnology products for rapidly developing quick-paced markets, like mobile phones, are an excellent example of a business where above described trend is visible.

In order to get predictable and repeatable development processes both design automation and test tools and information management tools must form an easy-to-use multifunctional package. The package must be capable of processing, storing and managing design information and its versions in different phases at different abstraction levels. Development phases must be easy to track back and forth from requirements to specifications to testing. High functionality of tools will then imply enhanced quality of a product because compliance of deliverables to customer requirements can be checked before passing the product forward.

The extreme of the process concurrence and tool integration is a full concurrence of different phases where all parties share the same input information and design information is a fully common database. The database can even be shared with external partners in multisite, multitechnology and multifunction development programs. The working environment resembles networked business environment and brings new critical factors to the engineering environment.

3. Products are also changing

But it is engineers' luck that at the same time as development environment must be more integrated the products developed with these tools are more integrated and must include more functionality in a smaller size at less cost. Because customers are always hungry on more services and better functionality they create pressure to develop new products with more variability and customized features. And because nice features create more market demand, flexible feature upgrades are requested after purchase. In order to manage the requirements and quality a good information management system is not enough; the actual product must also be tested and its compliance with official and defacto standards and internal requirements must be verified. Highly functional products also need testing in different markets with other products from other companies, which creates dependencies on processes, specifications and tools between companies, i.e. partnering is needed not only at

product level, but also at process level. This creates new business opportunities for companies specializing in tool development and test services.

The development that originally started from evolutionary changes in engineering practices has turned into revolution of businesses, accelerated by convergence of digital technologies. It has also brought originally isolated engineers to the daylight in the society and has changed and will change behaviour of millions of people. This development will not stop but influence to the value chain. Also non-technical people want to influence different development phases and bring in their non-technical specifications. Therefore new abstractions are added to the existing complexity. At the same time this is value-adding information for all phases and increases leverage of new technologies. Therefore there are strong incentives to manage requirements and testing of these new non-technical requirements with the same development tools and information management systems as technical requirements. User interfaces and usability of products are good examples of areas where non-technical requirements dominate.

4. Conclusion: tools must also change

New business requirements will change technical design-related information management to knowledge management where usage of information in the right context at the right time is the value-adding element. Concurrent processes, multiple and physically distributed process interfaces, abstract ubiquitous information, complex product functionality and demanding product verification and testing create strategic questions to design and test tool developers:

- How to create tools to support customers' business processes and global development programs that are more networked than ever before?
- What are the technologies for these tools?
- How to help customers manage their huge information content which is multitechnology and multimarket and contains technical and non-technical data?
- How to take new tools into use in a highly concurrent environment, how to train people, how to maintain integrity of information?

Helping customers in managing time, complexity and knowledge will be the crucial prerequisite for successful relationships between EDA/IT/IM companies and their customers. This is a clear guideline for all involved in electronic systems engineering business.