



## INNOVATION REPORT

# Solutions for challenges in global collaborative product development

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*The size and complexity of embedded systems is increasing rapidly, making it difficult for companies to develop all the required functionality alone. On the other hand, experience has shown that traditional single-company development technologies do not support collaborative product development well. Thus, by improving the collaborative way of working, the competitiveness of software-intensive product developing companies can be increased; for example, they can use subcontractors for simple tasks and focus their own effort on innovative new products. In this innovation report, two solutions to enhance the productivity of collaborative product development are introduced: Merlin Handbook and ToolChain. These solutions have been developed in the three-year Merlin project (no 03010) [1].*

### Trends in global product development

In 2007, the European Information Technology Observatory (EITO) [2] estimated the total value of information and communications technology (ICT) to be € 2,115 billion. The size and complexity of embedded systems keeps on growing, making it difficult for companies to develop all the required functionality alone. As a result, suppliers specialise in specific functionality or specific skills which they can sell to others. This is clearly visible in the growing numbers of outsourcing constructions in the past years. For example, a survey [3] found that 74% of participating companies had more than one development location; 48% had four or more locations; and 26% had more than 20 locations. Furthermore, a major survey carried out by the Software & Information Industry Association in January 2007 indicated that companies are increasing their global development efforts: 57% of the survey participants have significantly increased offshore work in the past 18 months and many plan to add still more in the next 18 months. Growth strategy was cited as an important or critical driver for 84% of respondents, while cutting time to market and increasing productivity were the next most important drivers. Collaborative engineering of embedded systems has become a fact of life, and currently there is no way back anymore; companies have already outsourced large parts of their developments to other companies, resulting in no longer having the related skills available in their own organisations. Instead, companies need to manage a complex situation of many partners, subcontractors, suppliers, software platforms and so on.

### Challenges and improvement opportunities

Experience has shown that traditional single-company development technologies do not support collaborative product development well. For example, another survey [4] shows that 80% of companies are dissatisfied with their overall collaborative development efforts. Survey respondents expressed as main problems the poor foundation for collaboration and poor management of partner relationships. In addition, the survey found few companies – only 9% – are fully satisfied with their current set of tools. These problems are often caused by, e.g., time difference and geographical location that result in new requirements in the ways of working and tools. Moreover, understanding each other is not



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straightforward due to different backgrounds in terms of terminologies, cultures, etc. – all this needs support by technologies.

By improving the collaborative way of working, the competitiveness of software-intensive product developing companies can be increased. For example, European companies can use less costly subcontractors for the straightforward or non-core tasks and focus their own efforts on innovative new products. Also, companies can exploit the best available knowledge more effectively to develop better and more attractive products effectively using highly competent specialised partners.

### **Tool integration improves efficiency of collaboration by increasing transparency and traceability between companies working together to create products**

Few development tools were used in the small-scale product development of the past. Now, software development is becoming increasingly complex and productivity requirements are so high that development tools are indispensable. These development tools and entities are connected and these connections need to be managed efficiently. However, interoperability is not readily available in development tools and data transfer between tools used in different software-development phases has often to be done manually, causing a lot of work and errors.

In practice, companies that are collaborating to develop a product rarely have the same sets of software tools. Different tools often lead to inefficient and ineffective development process. Typical problems caused by lack of interoperability between the tools used include poor co-ordination and synchronisation of work flow; this leads to unnecessary delays due to waiting on each other's tasks to complete and to duplicate missing work. In addition, lack of interoperability between tools leads to poor alignment of work products and their statuses, causing incompatibility issues for example. Improper tool integration also leads to lack of transparency of development for parties involved, which in turn leads to lack of trust and to time-consuming investigation of work status and cause of errors.

Companies making the development tools have also seen the need for interoperability between tools. However, their solution to the problem is integration only between the tools they themselves make. This solution would often require changing the tools that have already been chosen for use, meaning troublesome introduction of new tools and often also new ways of working required by the tool.

### **Integrable rather than integrated tool solutions**

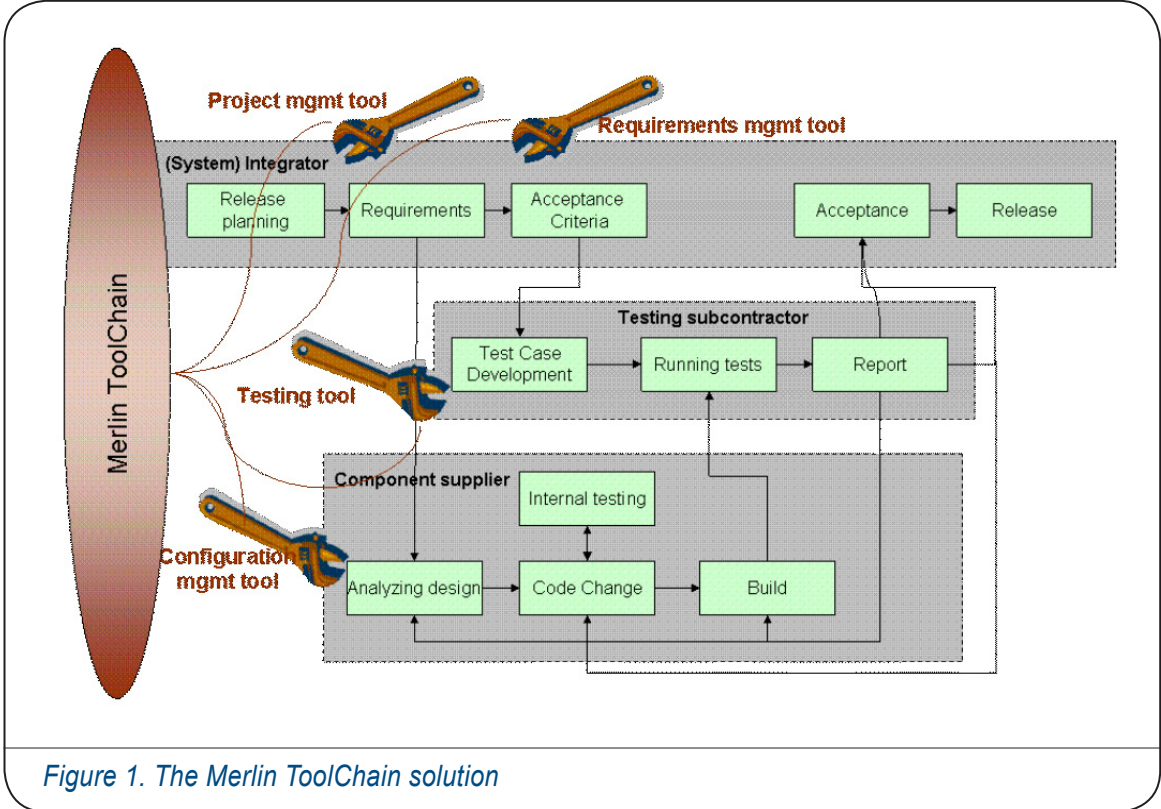
Merlin ToolChain is a tool-integration solution developed to provide customisable tool integration for requirements management (RM), configuration management (CM), project management (PM) and test management (TM) tools. The ToolChain aims to improve collaborative system development, especially by providing better visibility and traceability beyond partner borders.

During the project, the ToolChain was used in a real-life product-development project, where it proved to improve the traceability of product data and visibility of project progress without disturbing product development. Thus the ToolChain is a useful asset to improve collaborative product development productivity. The ToolChain is published as open source.

### **The Merlin collaboration handbook provides a first comprehensive, publicly available source for solutions to improve collaborative product development productivity**

There are several challenges that companies are facing in different phases of the software-development process. For example, time difference and geographical location cause new requirements in the ways of working and tools. In addition, cultural differences and understanding each other needs to be well

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*Figure 1. The Merlin ToolChain solution*

prepared and supported. Now, solutions to problems in collaborative software development can be found in the Merlin Collaboration Handbook [5].

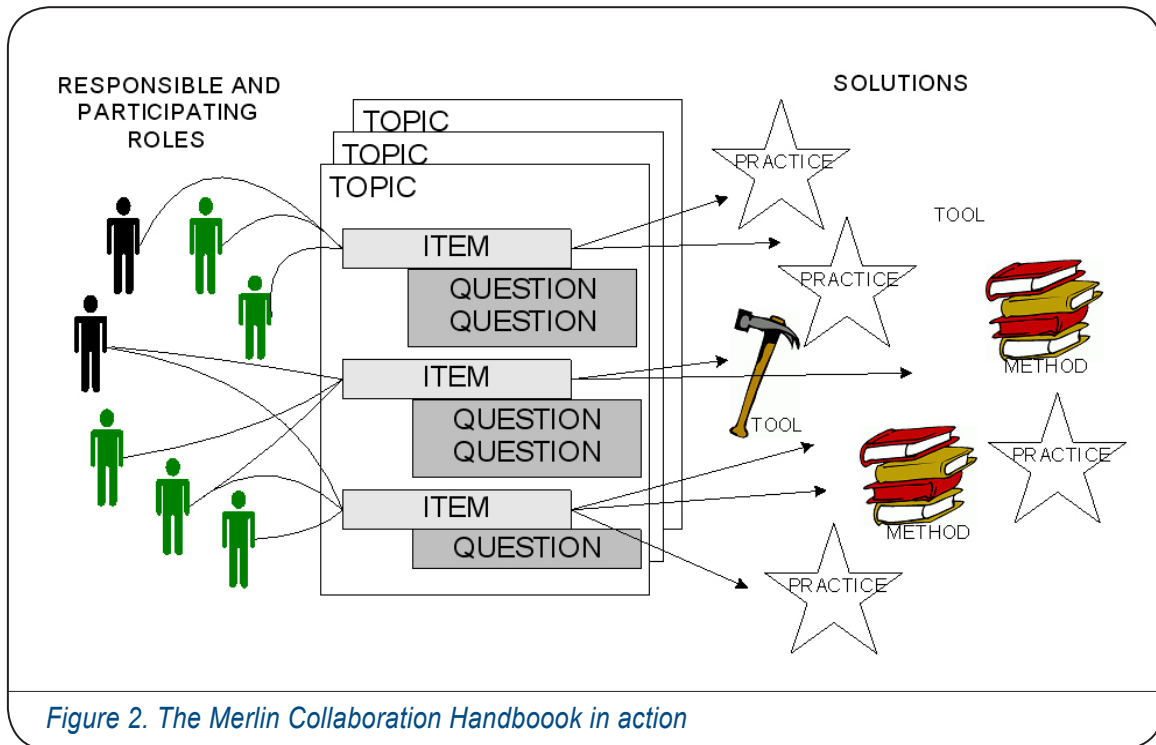
The Merlin collaboration handbook is a first-of-a-kind collection of best practices that support collaborative software development. The guidebook covers various collaboration modes and describes solutions for success in the critical activities of collaborative product-development projects. One of the main advantages of the handbook is that solutions to challenges in collaborative software development are collected in one place.

The handbook provides fast information search and concrete solutions to support collaboration in practice. It includes the main problem areas of collaborative software development and solutions to the problem, validated in practice. The handbook can also be used to support evaluation and to verify that all important aspects have been taken into account during various phases of the collaborative project.

Since the purpose of the handbook is to support various people working in collaboration projects, it includes several roles – such as chief architect, legal counsel, product manager, project manager and quality manager. The responsibilities can be responsible or participating roles. Based on these roles, the handbook can be searched to find specific information relating to the role.

The content of the handbook is divided into three main categories: topic, item and question. Topics are categorised into three main practices – management, engineering and support. Topics are used to structure and group items. Items are important issues that should be taken into account in collaborative development, such as models for collaboration and clear agreements with suppliers. Questions refine the items and help to understand them. Solutions are methods, tools or practices that assist in taking care of important items. Solutions are collected from a large number of experiences in industrial companies. In addition, literature resources are included to guarantee a solid methodological

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*Figure 2. The Merlin Collaboration Handbook in action*

basis for decision making. The solutions include description and further information with details and background. The handbook also provides a dynamic environment, which is continuously updated by the users' own solutions.

The handbook was used by several industrial partners and proved to help especially in gaining confidence to change as the solutions and experiences presented in the handbook supported the company's own ideas. Use of the handbook helped also to minimise risks, as the handbook could provide proven guidelines that can then be applied to the company's own situation. Also, instead of having to reinvent the wheel, the knowledge gained by larger network of people could be used. That saved time by avoiding using effort on basic issues and being able to focus on adapting proven solutions to own needs.

As a result, due to the improved, more effective practices, the number of subcontracted personnel could be significantly increased, meaning that more work can now be subcontracted, freeing the company's own personnel for other tasks.

### References

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