Bright ideas

Making global cooperation deliver the best products

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For many people, product development still has much to do with lonely inventors toiling away in dimly lit garages. Such clichés surround individuals ranging from Thomas Edison to recent microcomputer whizkids. For most products, however, these methods no longer present an efficient way of developing for an increasingly demanding and dynamic market.

Development has shifted from an intuitive and empiric method where a single genius could take on the world, to a scientifically managed creation process. The impressive store of tools supporting it ranges from market analysis through risk management to the Theory of Constraints[1]. Numerous stakeholders are involved in the development process, spanning different views, ideas, priorities and cultures. Successful project management is about making all these groups work towards a single goal.

In this article, ABB Review looks at the development process in ABB's Distribution Automation business.

ABB Product development organizations must deliver products with innovative functionalities that meet or exceed the customers' expectations. Such a product should have state of the art technology, a competitive price, must be easy to use, and must maintain highest levels of quality and reliability. The invention, delivery and support process presents many challenges for the company's development organizations. The implementation of common processes between R&D centers located in different parts of the world increases collaboration between these, and so raises the efficiency of product development. Areas of focus include project, configuration and requirements management.

ABB's Distribution Automation (DA) business manufactures products for protection, control and monitoring in power distribution. The development organization has units in six different countries, collaborating on multiple parallel projects. Opportunities are created through the different cultures, maturity levels and processes of the local organizations. ABB is focused on creating very efficient processes to better and more fully meet its customer specifications and expectations while strengthening its position as global leader.

In general, there are three major opportunities for improvement in global product development: knowledge transfer, coordination, and cooperation. The sharing of knowledge and the transformation of an individual's knowledge into organizational knowledge is an essential ingredient to success. Lack of cooperation and coordination is often caused by differing interests or goals, undefined roles, poor personal relationships or unfamiliar processes [1].

ABB Distribution Automation launched a project to improve process development in terms of greater quality, reliability, scalability, predictability and customer focus while reducing time to market. The areas of focus included:

- *Knowledge Transfer:* Increasing the communication between the business units by providing an environment that increases the ability, desire and skills to listen and share information.
- *Co-ordination:* Defining goals and responsibility through implementing and developing a common process essential to achieving better, faster and competitive products.
- *Co-operation:* Ensuring that all relevant stakeholders are involved in the process, aware of the status, risks, and issues, and committed to the defined goals and plans.

The development of a good requirements management structure is perhaps the most important of the development practices in the creation of a new product.

Process Improvement

When the process improvement plan was embarked upon, two different models were adopted: the Capability Maturity Model Integration (CMMI) of the Software Engineering Institute (SEI), and the IDEAL (Initiating, Diagnosing, Establishing, Acting, and Leveraging) model. Both models are frequently used to assist in the setting of process improvement objectives and priorities and provide guidance for ensuring stable, capable, and mature processes.

The CMMI is a reference model 1 of mature practices in specified disciplines within product development; it is used to assess a group's capability to perform that discipline. Practices identified in the CMMI address productivity, performance, costs, and stakeholder satisfaction. Its strength lies in its integration of multiple systems and software disciplines into one process improvement framework Textbox.

The IDEAL model 2 is used to guide the development of a long-range, integrated plan for initiating and managing a process improvement program.

Initiation phase

Senior management identified the objectives and secured the commitment for process improvement within the organization. Based on the business objectives, an appraisal was conducted to identify the strengths and weakness of the existing development organizations.

Based on the findings, a plan was developed to define the projects for correcting the identified weaknesses. Teams were formed to implement the plans and define the new processes to

CMMI

Adoption of CMMI (Capability Maturity Model Integration) aids organizations in achieving:

- a higher level of confidence of delivery of promised scope, cost, and schedule
- collaboration with stakeholders to meet or exceed their expectations
- competitive world-class products and services
- an integrated enterprise from the business and engineering perspective
- proactive program management techniques
- use of best practices to cope with development challenges such as changes in technology, customer requirements and markets environments
- optimize resources where the developer works on multiple, different projects while using the same or similar processes

The resulting benefits include:

- commitment: understanding who the stakeholders are and achieving common understanding of the project's scope, time, and budget.
- control: a measurement-focused process offering proactive controls throughout the program where the requirements are a fundamental basis for planning and control, and risk management is explicitly used throughout the project.
- Communication: Enhancing knowledge sharing by building an integrated project team.

be approved, trained and adopted within the organization.

Improvement activities

There are currently ongoing process development activities in several areas. The three most significant of these are: Requirements Management, Project Management, and Configuration Control.

Requirements Management

Typical obstacles to the management of requirements are posed by situations where such requirements are changing or unclear. This results in incorrect facts, omissions, inconsistency and ambiguity [2]. In global development environments, the challenges identified relate to coordination and communication and can typically result in cost overruns, schedule slips, frustrated and overworked employees, unhappy customers, and lost profitability.

The more effort is put into identifying risks and evaluating their impact, the more accurate the project's estimates will be.

The development of a good requirements management structure is perhaps the most important of the development practices in the creation of a new product. Typically the most significant potential for improvement lies in:

- Business focus on acquiring correct data and establishing a good understanding of customer and market needs.
- Communication between different functions and across different locations and cultures.
- Consistency of the requirements specification.

A new requirement management system was deployed. This allows all relevant stakeholders to input their requirements and easily review those of other stakeholders. Requirement reviews are held to agree on the scope, priorities and rationale of every requirement. The participation of people from different development centers (ie, sales, marketing, production and support) in the reviewing enables a common understanding of it. The business focus of the process was strengthened through the separation of the business aspects of the market requirement specification into a new document – the "Product Business Plan". This document links the strategy, product portfolio management and requirements. It defines the competitive environment of the product, describing the strategic aspects of why the product is needed.

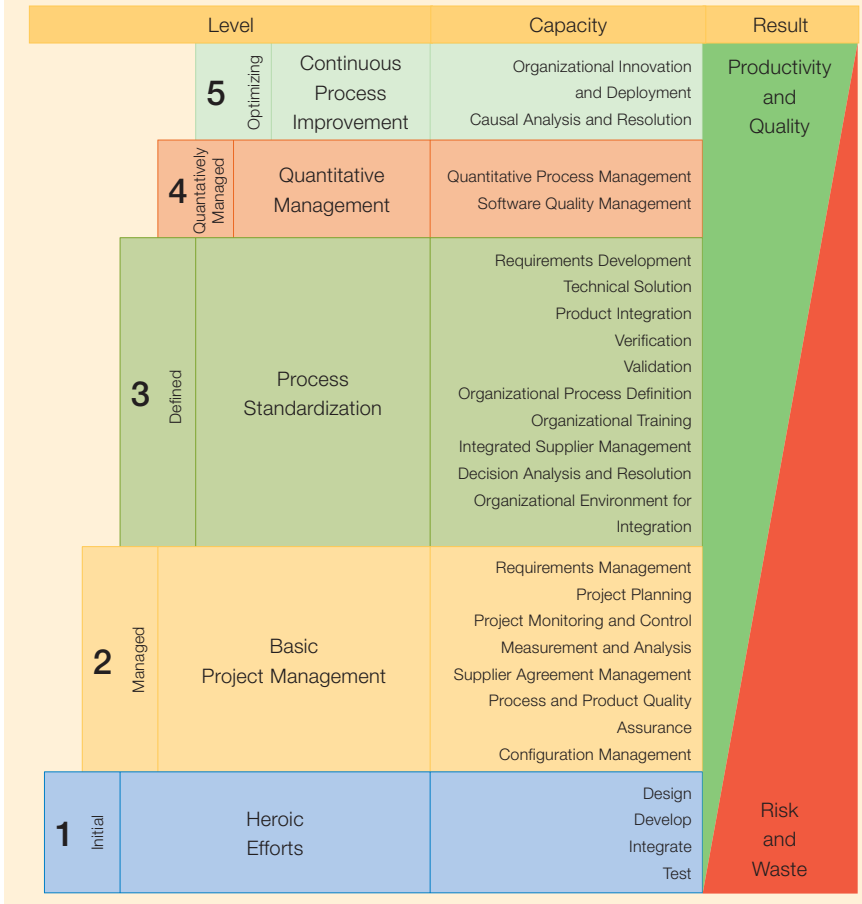
To enhance the quality of the requirement management process, multiple phase assessments and review meetings are held to determine the readiness and quality of the requirement specification. Checklists are enhanced to ensure the requirement specification contains the appropriate information and is reviewed when appropriate.

Project Management

ABB Distribution Automation focused its project management resources on two areas within project management: risk management and project estimation. Risk management identifies potential problems throughout the life of the product or project so that the appropriate risk-handling activities can be planned and implemented. Product development always engenders significant risks. ABB DA implemented a four-phase risk management process which is iteratively looped through the project lifecycle. These phases are: identifying and classifying the risks, analyzing the risks, responding to the risks and monitoring them.

The more effort is put into identifying risks and evaluating their impact, the more accurate the project's estimates will be. ABB DA initiated workshops to identify, analyze and classify risks associated with the project. In these, product management arranges the workshops, where it concludes the findings and discusses the market risks associated with different existing and

1 The CMMI (Capability Maturity Model Integration) model



planned products: how can the established market share within a key market be maintained or improved, and what are the estimated costs associated with each option. When a project is started, risk identification and analysis is more focused on technical risks, and considering whether the project can be managed according to the planned time schedule, cost and scope.

The structure of the risk workshops are
- Brainstorming risk sources
- Applying a list of potential risk sources and organization specific risks identified on the basis of lessons learnt
- Prioritizing the risks (probability and severity) using risk defined categories

The idea of using risk severity categories and risk sources assures that, in addition to the most probable risks coupled with small consequences, other kinds of risks are also identified, and it also avoids that risks with considerable consequences, but which have never yet occurred, remain unidentified. Prioritization of the risk also identifies those risks that require contingency and/or mitigation plans to reduce the impact or probability of the risk becoming a problem.

Risks are monitored and reported during phase assessments and also at monthly meetings of the project steering committee. In addition, risks are reported weekly to management. This weekly project reporting is used for the sharing of knowledge between different stakeholders, and communicating this knowledge to a wider group of people.

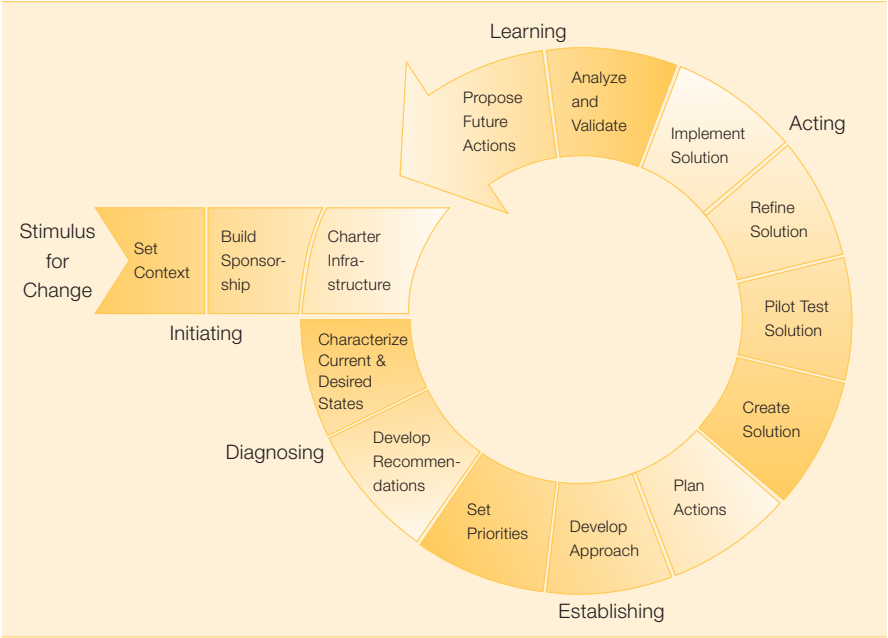
The project management assures that each project is allocated the resources it requires, as if it were in a single project environment. ABB DA uses Theory of Constrains techniques (TOC)[1)], among many others, to ensure efficient project planning, monitoring and control in the multi-project environment. When using TOC, project plans are created based on the optimistic and pessimistic estimation of each task. Critical chain[2)] and project buffers are created based on those estimates. At the beginning of a project, it is scheduled according to the availability of critical resources. Furthermore, critical resources only work on tasks where their unique ability is required – so optimizing overall performance of the process. To ease scheduling, each project is given a relative priority. A project with higher priority is allocated resources in preference to one with lower priority. Consumption of the risk buffer and progress on the critical chain is monitored and reported weekly. Project managers futher collect weekly information regarding the work remaining for each task. These activities provide the information needed for managing the whole process.

Configuration Control

As was done in requirements management, a global configuration management system was deployed with a lifecycle management system. The benefits of this system are:
- Communication: allows the sharing information across different functions, locations and cultures by making the information available to all stakeholders
- Control: Ensures that everyone is working from the same version of the document
- Commitment: Requires that relevant stakeholders agree by approval of the documents
- Quality: Forces the use of reviews to ensure that the work products are complete and accurate
- Knowledge sharing: Use of a system service and an information pool

Only a properly understood and implemented development process can satisfy the demands of tomorrow's market!

2 The IDEAL (Initiating, Diagnosing, Establishing, Acting, and Leveraging) model



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References
[1] Smith, 1995, Surakka, 2005, Hoopes, Postrel, 1999
[2] Hooks, Farry, 2001

Footnotes
[1)] For more background on TOC, see also "How to control the chain with TOC", ABB Review 1/2006, page 25.
[2)] The Critical Path is the sequence of work packages in a process with the longest overall duration, taking resource dependencies into account.