



**Rational** software

## **Staying in control when requirements change.**

*Learn ways to keep schedules and costs in line*

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**The costly consequences of the unknown**

The way systems are interconnected now increases the challenge of changing one system component without affecting another. From vehicles to smart phones to medical devices, the software, electronics, electricians and mechanics that run them are no longer independent of one another. As a result, changing requirements while building or modifying a system often affects—sometimes extensively—development costs and schedules because a single change can create a domino effect of changes.

The U.S.'s Marine One helicopter fleet offers a keen example of the necessity of controlling costs and schedule when requirements change. The U.S. Navy—which is in charge of overseeing the helicopter program—was granted US\$6.1 billion in 2005 from the national defense budget to replace the aging fleet with its defense contractor. But in 2008, the Navy reported that the price tag had ballooned to US\$11.2 billion and the schedule had fallen behind because of alleged dramatic changes to the original scope. The Defense Science Board, a federal advisory committee, conducted a study that ultimately blamed poor communication regarding the aircraft requirements between the government and contractors.

In times of economic struggles and burden, the U.S. government was faced with doubling its allocated Marine One budget because of poor communication. The extreme budget overage eventually caused the U.S. Department of Defense to call off the fleet replacement in 2009.

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**Highlights**

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***Organizations need to know how changing requirements in a complex system will affect development. An effective change management process can help you better identify how alterations will affect cost and schedule so you can keep them in control.***

Poor communication is only one reason cost and schedule can deviate off track when systems and requirements change. Geographically dispersed teams, limited insight into possible change outcomes and manual—and therefore error-prone—requirements tracking can also present challenges. Additionally, companies developing complex systems are subject to an exceptional number of changes from external sources. Because they handle multiple development domains, they multiply their vulnerability to changes. And because organizations cannot control external change, they must manage it to be successful.

Ultimately, organizations must know how changing requirements in a complex system will affect other requirements, designs, tests and developed components. This is particularly critical for requirements where any unauthorized edit, mistake or miscommunication can have an extremely costly domino effect throughout the lifecycle. A global requirements change management process can increase the efficiency of the change control board through capabilities such as Web review and approval functionality as well as impact analysis.

An effective change management process can help you better identify how alterations will affect cost and schedule so you can keep them in control. This paper will explore change management approaches and how you can use IBM Rational® solutions to manage changes to development, system and IT artifacts.

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**Highlights**

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***You can use tools and best practices to prepare for changes and efficiently integrate them into a system.***

***You can obtain input from key stakeholders to help you decide whether to accept and implement, postpone, or reject a request.***

**Implementing tools and best practices to manage change**

Given all of the internal and external factors driving requirements, change is inevitable. To help optimize your budget and maintain control over costs and schedules, it's essential to foster a change-ready organization. By using tools and best practices to accept change requests based on priority, determine the best actions to prepare for changes and efficiently integrate changes into a system, organizations can better manage the effects of change.

Obtain buy-in from key stakeholders—before acting

It is, of course, not necessary to accept or immediately incorporate every change requested. Although some will be required by external forces, there will be proposed and opportunistic changes during the development lifecycle that can be prioritized, postponed until the next iteration or completely rejected. Otherwise, a system may never reach completion. The challenge is how to decide whether to accept and implement, postpone, or reject the request. A thorough impact analysis and feasibility study of the change request can help you make an informed decision.

One of the best ways to determine the impact and feasibility of the change request is to obtain input from key stakeholders in the project. A company can request a change review, approval and an electronic signature from personnel across varying departments, such as engineering, manufacturing, marketing, quality assurance, legal, safety and finance. These individuals will be able to help you thoroughly analyze the feasibility and the impact of the change request on costs, schedules and resources. However, if you have a geographically dispersed change control board, that review process can be lengthy and complicated.

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Highlights

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***IBM Rational Change software helps you clearly define, communicate and obtain input on requirements changes through an easy-to-use Web form – an ideal solution for virtual change control boards.***

***To improve control over the change management process, you can manage requirements and change requests using integrated requirements management and change management tools, such as Rational DOORS and Rational Change software.***

Web-based change management can support distributed system development teams. Members of a virtual change control board can use nearly any device with Internet access to log on to a Web-based change management platform to review proposed changes, which can reduce meeting travel costs and improve the board's ability to respond more dynamically to change. By gaining input on and support for the change before implementing it, you can find out whether the change will affect cost and schedule so you can adjust accordingly. Moreover, with a strong requirements change management process, you can better assess the full effect of a change across multiple development domains.

IBM Rational Change software enables you to customize approval forms so members of the change control board can be automatically alerted when they need to review a change. They then can approve, reject or partially approve the change and deliver feedback to the rest of the team. This tool helps you clearly define and communicate requirements changes through an easy-to-use and configurable Web form. You can create and format reports on requirements change requests and perform full-text searches and advanced queries, helping to reduce rework, increase visibility and improve productivity.

Manage requirements and changes using integrated tools

Manually tracking requirements and changes in spreadsheets or documents severely complicates tracking- and tracing-related requirements and exposes an organization to basic threats such as versioning issues and losing or misplacing documents. By managing requirements and change requests using integrated tools designed for the task, an organization could improve control over the change management process. A standardized repository can store requirements in a single location, helping developers track iterations and ensure that changes are implemented.

*Advanced Info Service Public Company Limited (AIS) provides 15 million Thai customers with mobile phones, digital and cellular services, and other related services. Facing rapid growth, AIS's development team struggled to develop its innovative products and services with an outdated systems development lifecycle.*

*To update its development lifecycle, AIS implemented and integrated Rational DOORS and Rational Change software to help automate its change management processes. The solution provides a traceable, accessible, single repository for all project and product information. Implementation status is now visible in real time. With the integrated Rational tools, products are better defined, better developed and delivered on schedule.*

By using a solution that manages requirements documents online, an entire distributed team can easily and rapidly access the latest requirements, and all users can work within the central requirements database. IBM Rational DOORS® software provides such a centralized repository and enables users to lock sections of documents for editing. It allows multiple users to view and update documents simultaneously, without the danger of conflicting changes.

To prevent users from making changes to requirements without approval from the change control board, the Rational DOORS tool integrates with the Rational Change application to enhance communication, collaboration and coordination. The integrated solution breaks down existing information silos and integrates aspects of the systems and software development lifecycle, enabling it to generate impact reports and help the change control board reach a consensus before applying changes.

#### Automate processes and workflows

Automating—and thus enforcing—your change management process is one of the best ways to maintain control. Organizations may have a specified workflow for requirements changes. By automating your change control workflow, you can accelerate information capture and reduce errors. This approach also provides traceability between releases and original customer needs, and it enables you to more rapidly respond to change. This control over the workflow and process translates into control over the cost and schedule: An enforced and automated workflow avoids clerical errors as well as deviations from the workflow that might decrease the efficiency of system development.

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### Highlights

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***Rational Change and Rational DOORS integration automates the process of requirements workflow management, supporting new or existing processes at virtually all levels within an organization.***

***Rational DOORS software enables you to analyze the effect requirements changes will have on business goals, development and other areas.***

Rational Change and Rational DOORS integration automates the process of requirements workflow management, supporting new or existing processes at virtually all levels within an organization. It provides the flexibility needed to implement processes for managing, tracking and reporting on all proposed changes against critical requirements, links, requirements structures, specifications and other information maintained in the Rational DOORS repository. Through the implementation of repeatable workflows, the Rational solution can help ensure that our out-of-the-box or your unique processes are followed, providing you with comprehensive control and flexibility in your change management process.

Analyze impact to improve decision making

Developers run impact analyses to determine how changing one requirement will necessitate changes in related requirements. When cost and schedule are the priorities, you can use impact analysis to decide whether the proposed requirement change is worthwhile given time and budget. Realizing the effect of the change may help you decide whether to implement the idea now, adjust the cost and timeline for the customer, or table the idea for the next release.

By leveraging a powerful lifecycle traceability solution, you can analyze the effect requirements changes will have on business goals, development and other areas. Rational DOORS software provides teams with a comprehensive picture of lifecycle traceability from user requirements through systems and software requirements and beyond, letting you perform impact analysis so you can make the right decisions.



### **A holistic solution for comprehensive control**

Although changes to your requirements are inevitable, you can handle those changes efficiently and with minimized effect on cost and schedule if you have a robust requirements change management process in place. A high level of control helps ensure an on-time, on-budget delivery, which is critical for maintaining client satisfaction and, in some cases, avoiding penalties.

Integrated change and requirements management tools such as Rational Change and Rational DOORS software are key to maintaining control. The Rational Change application can help you obtain input from globally dispersed teams and automate formal change management workflows, while Rational DOORS software helps you perform impact analysis and stores all requirements and changes in a single, easily accessible location. Together, these software packages offer a holistic solution that can help you implement and enforce change management processes — and gain control over change.

### **For more information**

To learn more about IBM Rational Change and IBM Rational DOORS software, contact your IBM representative or IBM Business Partner, or visit:

[ibm.com/rational/solutions/systems](http://ibm.com/rational/solutions/systems)

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