Making CBD effective in your organization

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Preface

Purpose of document

This document provides a framework for implementing Component Based Development into an organization, based on the SCIPIO method.

Questions and exercises

This material has been developed for training purposes. The reader is invited to engage actively with the material. To this end, questions and exercises are interspersed with the text.

> Q   Do you want to enrich your understanding of the SCIPIO method by answering the questions as you along?
>
> Q   Do you want to test your understanding of the SCIPIO method by answering all the questions after you've read the whole document?

Acknowledgements

The approach to implementation planning for tools and methods is based on many years' work with colleagues at James Martin Associates and Texas Instruments Software. Especial thanks are due to Mike Mills for inspiring leadership.

Impact of CBD

The impact of CBD on an organization can be defined in terms of the SEI Capability Maturity Model for Software and/or the ISO SPICE model. This section includes a checklist for each model.

These checklists assume that you already have something in place in a given area, and indicate the extent to which what you have will need altering to accommodate the demands of CBD. If you lack capability in a given area, then this may need addressing separately, but this is not discussed here as part of the implementation of CBD.

SEI Capability Maturity Model for Software

This model defines 18 key process areas, grouped into levels.

2	Requirements Management	🛑	**Major impact**
	Project Planning	🛑	**Major impact**
	Project Tracking and Oversight	🛑	**Major impact**
	Configuration Management	🛑	**Major impact**
	Subcontract Management	🟡	Minor impact
	Software Quality Assurance	🟡	Minor impact
3	Integrated Software Management	🛑	**Major impact**
	Software Product Engineering	🛑	**Major impact**
	Inter-Group Coordination	🛑	**Major impact**
	Process Focus	🟡	Minor impact
	Process Definition	🟡	Minor impact

3	Training Programme	🟢	If you already have a good process for the management of training, CBD can use this without changing it. Obviously the content of the training programme will change.
	Peer Reviews	🟢	Not changed by CBD.
4	Quantitative Process Management	🔴	**Major impact**
	Software Quality Management	🔴	**Major impact**
5	Technology Change Management	🔴	**Major impact**
	Process Change Management	🟢	Not changed by CBD.
	Defect Prevention	🟢	Not changed by CBD.

ISO SPICE

Customer	Acquire software product and/or service	🔴	**Major impact**
	Establish contract	🔴	**Major impact**
	Identify customer needs	🟢	Not changed by CBD.
	Perform joint audits and reviews	🟢	Not changed by CBD.
	Package, deliver, and install the software	🔴	**Major impact**
	Support operation of software	🔴	**Major impact**
	Provide customer service	🟢	Not changed by CBD.
	Assess customer satisfaction	🟢	Not changed by CBD.
Engineering	Develop system requirements and design	🔴	**Major impact**
	Develop software requirements	🔴	**Major impact**
	Develop software design	🔴	**Major impact**
	Implement software design	🔴	**Major impact**

Engineering (cont)	Integrate and test software	🟥	**Major impact**
	Integrate and test system	🟥	**Major impact**
	Maintain system and software	🟥	**Major impact**
Project	Plan project life cycle	🟥	**Major impact**
	Establish project plan	🟥	**Major impact**
	Build project teams	🟩	Not changed by CBD.
	Manage requirements	🟥	**Major impact**
	Manage quality	🟧	Minor impact
	Manage risks	🟩	Not changed by CBD.
	Manage resources and schedule	🟩	Not changed by CBD.
	Manage subcontractors	🟧	Minor impact
Support	Develop documentation	🟧	Minor impact
	Perform configuration management	🟥	**Major impact**
	Perform quality assurance	🟧	Minor impact
	Perform problem resolution	🟩	Not changed by CBD.
	Perform peer reviews	🟩	Not changed by CBD.
Organization	Engineer the Business	🟩	Not changed by CBD.
	Define the Process	🟩	Not changed by CBD.
	Improve the Process	🟩	Not changed by CBD.
	Perform Training	🟩	Not changed by CBD.
	Enable Reuse	🟥	**Major impact**
	Provide Software Engineering Environment	🟧	Minor impact
	Provide Work Facilities	🟩	Not changed by CBD.

Change Management Approach

The implementation of CBD is regarded as a major organizational change programme, involving many different aspects of the IT function, and demands management as such.

Phases

In a perfect world, everything would be in place before you started doing CBD. But this approach leads to endless delay. If you want to do CBD at all, you have to get started with the minimum essentials, and improve later. Of course this means that you may not get all the benefits of CBD from Day 1, but at least you have a chance to get some benefits, and start evolving the capability.

Phase 0: Preliminary Assessment

The purpose of the preliminary assessment is to confirm the planning priorities. This document suggests typical priorities and indicates which areas may need to be addressed first, but these priorities need to be confirmed for your organization.

In some cases, it may be decided to bundle other general software process improvements in with the implementation of CBD. There may be a serious problem in an area that is only indirectly affected by CBD, but the implementation of CBD provides an opportunity to fix other problems as well. This may be tactically appropriate in a given situation, but it complicates the plan, and will make it more difficult later to evaluate the costs and benefits of implementing CBD.

Phase 1: Getting Started

In phase 1, the emphasis is to get something started. This usually includes one or more pilot projects to demonstrate how CBD works in your organization. Within most organizations, there are some people who are keen to develop new ideas and skills, and are willing to accept the uncertainties and challenges of new tools and methods. They are known as 'early adopters'. It is from among them that the pilot teams are selected.

In phase 1, we focus on the Major Impact process areas. An initial set of processes will be formulated for use by the pilot teams. These will be in draft form, with limited automated support.

During Phase 1, the benefits of CBD will be small.

Phase 1 typically takes about 3-6 months.

Phase 2: Getting Ahead

In phase 2, the emphasis is on extending CBD from the early adopters to other parts of the organization. The successes of the pilot need to be captured and disseminated, so that other developers and project managers feel confident that they can achieve similar (or even better) results.

In phase 2, we should be able to formalize the Major Impact process areas, based on the experience of the pilot. At this stage, it becomes appropriate to consider automation of these

processes, using desktop tools. Meanwhile, we can start to address some of the Minor Impact process areas.

During Phase 2, the benefits of CBD should increase. The organization should start to receive a positive return on its investment in CBD. However, some of the longer-term or strategic benefits of CBD may take longer to realise.

Phase 2 typically takes 1-2 years. In a large organization, it can take considerably longer.

Phase 3: Getting on Top

By phase 3, the use of CBD should be well established across the organization. All of the Major Impact and Minor Impact areas have been addressed. More importantly, the full benefits of CBD are now available to the organization.

Streams

The project will be managed as five parallel streams of activity:

Management Stream	**Coordination.** How much to use CBD. Investment appraisal. Process improvement. Reporting and communication.
Policy Stream	**Strategy and Architecture**. When to use CBD. What to use CBD for. How CBD fits into the overall IT strategy for the organization.
Capability Stream	**Knowledge, Skills and Attitudes of Individual and Teams.** Who to use CBD. Team structures, job descriptions, training plans, skills, career paths, motivation.
Infrastructure Stream	**Tools and Support**. Where to use CBD.
Project Stream	**Processes and Products.** How to use CBD.
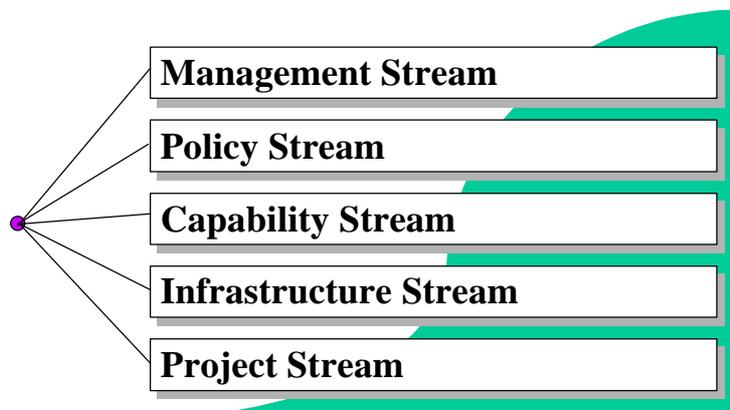
The coordination of the plan, and the monitoring of progress against the plan, entails a project management resource.

1   Management Stream

This stream includes overall responsibility for the coordination of the other four streams.

Our focus in this stream is a cost model for the use of CBD within the target organization. The purpose of this model is to support investment and procurement decisions (including periodic reevaluation and confirmation of the use of CBD, as well as specific supporting tools and methods), and to support negotiations with product and service vendors.

One short-term objective in this stream is to develop, use and disseminate an initial cost model. Much of this work may already have been done - we need to pull things together that already exist.

In the medium term, we shall need to collect data and revise the model. Then we will be in a position to embed the cost model into a formal investment appraisal procedure.

1.1   Total Cost of Ownership

Establish a systematic basis for estimating the total cost to the target organization of acquiring CBD capability, methods and tools, and of making effective use of it. Should include: software licences, platform costs, external training and consultancy services (both vendor and third party), internal staff costs (including skills acquisition, project costs, support costs and management). Should allow fair comparison of CBD with alternative development approaches and environments.

1.2   Investment Decisions

Establish a systematic basis for cost-justifying and evaluating extensions, improvements or upgrades to CBD usage and practice within the target organization.

1.3   Communication and Management Reporting

Establish a regular mechanism for updating interested parties on the costs, risks and benefits experienced by the target organization from using CBD. May include non-financial as well as financial measures - for example, delivery times, user satisfaction surveys, quotes from satisfied users, or individual success stories. Should be seen as objective and informative, rather than boasting.

Interested parties include: business users, IT management and software developers users themselves. It may be appropriate to target each audience separately.

Q   Which of the SEI CMM key process areas does this stream cover?

Q   Which of the SPICE base practices does this stream cover?

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2   Policy Stream

The short-term objective is to formulate policies that pull together the essence of what is required, and to analyse the potential impact of these policies on the rest of the organization (as well as other associated organizations).

The longer-term objective is to establish a consistent set of policies across the organization. These policies would be formally managed within the policy management process.

2.1   Requirements Management Policy

Establish a core set of principles and good practices for requirements management, applicable to all Build and Buy projects. This should be initially applied to all CBD projects. (Note: the Key Process Area of the SEI Capability Maturity Model would be a good starting point.)

Some organizations have Service Level Agreements (SLAs) between User Departments and the IT department, and this often provides a good mechanism for driving out requirements.

2.2   Build-Buy Policy

Define the profile of a 'Good' CBD project - in other words, these are the characteristics that should lead to a decision to develop using CBD. Note that one of the strengths of CBD is the potential connectivity between multiple CBD projects and CBD-developed applications. This potential connectivity should be considered in the Build-Buy decision.

Review the overall architecture of the enterprise, to identify groups of requirements that would be well served by CBD.

Ideally, all new projects should undergo an investment appraisal, using the generic cost model. This should help make the department more professional.

2.3   Development Policy

Establish a policy for the use of Rapid Application Development across CBD projects. Identify the extent to which this approach has benefits for non-CBD developments. Negotiate a common base across all projects..

Establish a policy for the use of Component-Based Development across CBD projects. Identify the extent to which this approach has benefits for non-CBD developments. Negotiate a common base across all projects.

2.4   Data Management Policy

Establish a core set of principles and good practices for data management and reuse, applicable to all Build and Buy projects. This should be initially applied to all CBD projects.

2.5   People Management Policy

Establish a core set of principles and good practices for people management, to make best use and reuse of skills and experience.

2.6   Organizational Scope

A target organization may be interested in the use of CBD outside the target organization, especially by alliance partners and software houses. There is a need to negotiate the extent to which the target organization policies can be extended to these organizations.

> Q   Which of the SEI CMM key process areas does this stream cover?
>
> Q   Which of the SPICE base practices does this stream cover?

3   Capability Stream

This stream covers the organization's capability to do CBD. This typically involves changes to the structure of the organization, as well as acquiring new skills for individuals and teams. It also involves changes to the way individuals and teams are managed and motivated.

Many IT organizations create a separate component group, known as a **software factory**, which takes responsibility for creating and maintaining components for use across the rest of the organization. The establishment or evolution of this group is included in this stream.

In terms of skills development, a short-term objective is to understand what are the desired characteristics and behaviours of a good CBD developer, and to embed this in HR practices. This will enable us to set meaningful objectives for people (timescale 3-6 months or less). This should then be extended to other CBD roles, including project management and support. The longer-term objective is to address other people management issues, using the People-CMM as a checklist.

3.1   Organization Structure

Define the desired future organization structure for CBD. This may include the establishment of a separate group of component producers, known as a **software factory**. Some organizations will wish to set up a software factory from the start. Others will wish to gain some experience with CBD before making large structural changes to the organization., and may prefer the transition to a software factory structure to be a gradual evolution.

Even if a formal separation is made between the software factory and the rest of the IT organization, much of the capabilities, processes and infrastructure will be shared.

3.2   Team Structure and Job Descriptions

Define the key roles within a CBD development project. Define the key roles for CBD support, including data management and repository management. Develop outline job descriptions that capture the main responsibilities of each role.

3.3   Skills Profiles

Define the knowledge, skills and experience needed to fulfil each role.

3.4   Skills Acquisition Plan

Establish clear criteria for recruitment, selection and deployment of staff onto and between CBD projects. Define training plan.

3.5   Career Plans

Establish career development and promotion prospects for CBD staff that retain their CBD skills. In other words, we want to make sure that when people have achieved success with CBD, this leads to further opportunities to use their CBD experience.

This may include opportunities for component users to become component producers, and vice versa, if there is a match of abilities and aspirations.

3.6   Performance Management and Compensation

Establish performance appraisal criteria that increase the probability that CBD staff (including project managers) will be rewarded (both financially and in terms of career enhancement) for acquiring and deploying relevant skills and for delivering high levels of productivity and quality.

3.7   Team Spirit

Establish and maintain a sense of community among staff using CBD. (As the number of staff using CBD increases, informal and social mechanisms may need to be supplemented by specific management action.) Establish a sense of ownership among CBD users that stimulates continual process improvement.

3.8   Knowledge Sharing

Define mechanism for identifying and disseminating best practices within the CBD community.

> Q   Which of the SEI CMM key process areas does this stream cover?
>
> Q   Which of the SPICE base practices does this stream cover?

Infrastructure Stream

This stream covers the support processes.

Typically, while there is only one or two pilot projects, these processes may be managed informally within the pilot teams themselves. The short-term objective is to gather relevant information and experience.   The longer-term objective is to define standard processes for CBD projects.

However, some attention needs to be given to processes that span CBD and non-CBD projects, especially Configuration Management.

4.1   Quality Process

Establish a quality assurance process for CBD projects.

4.2   Configuration Management Process

Establish a configuration management process for components. This should be based on ISO 10007.

4.3   Data Management Process

Establish a process for sharing model and system elements between CBD models, projects and systems, using the component repository.

Establish a process for data sharing between CBD-developed systems and other systems. There will usually be a need to map data names across multiple packages and systems. Establish a process for system integration. Determine the extent to which the component repository supports this process.

4.4   Metrics

Establish a set of project metrics, enabling productivity and quality to be measured, as well as the volatility of requirements. (Note that although requirements volatility causes CBD estimates to be increased, it often causes non-CBD estimates to be increased by a far higher amount.)

4.5   Tool Requirements

Define the tool environment for CBD projects. This will typically include:

- A requirements management tool, to store, analyse and retrieve user requirements, and to map these onto the systems and components that are intended to fulfil these requirements.

- Process and object modelling tools.

- A component repository, to store and retrieve component specifications.

- A tool for the design and development of componentware against a defined specification.

- Assembly tools, for the design and development of applications from components (including wrapped legacy).

- Configuration management and component deployment tools.

- Run-time component management and messaging tools.

Initially, not all projects within the target organization will be using CBD fully. However, some or all of these may benefit from access to the CBD tool environment.

4.6   Support Organization

Define the support services needed by projects. Define appropriate service levels.

Establish a support organization capable of delivering these support services. Note that some of these services may be subcontracted to external suppliers. However, there is a need for some overall management and coordination of these services by the target organization.

> Q   Which of the SEI CMM key process areas does this stream cover?
>
> Q   Which of the SPICE base practices does this stream cover?

Project Stream

This stream covers the Life Cycle processes.

The short-term actions are around definition and implementation of key development processes, followed by continuous improvement.

5.1   Requirements Process

Establish a process for managing the detailed requirements for CBD development projects. This includes indexing requirements, resolving conflicts and priorities, mapping user requirements onto specific software components and data stores, and testing that developed applications satisfy a given set of requirements. Ideally, this should be a process that would apply equally to non-CBD developments, including Buy projects.

5.2   Software Procurement and Contracts

Establish a process for the procurement of software components and component-based services. Review the extent to which your standard contract covers the special requirements of component-based products and services. Define special terms and conditions, if appropriate.

5.3   Testing Process

Establish a process for testing developed applications. Ideally, this should be a process that would apply equally to non-CBD developments, including Buy projects. All test work should be reusable. The system test environment should be separated from the deployment environment.

5.4   Deployment Process

Establish a process for putting CBD-developed applications into production. This process includes packaging, delivery and installation. The emphasis here should be on getting follow-through - rapid development leading to rapid business benefit. The success measure is for speed-to-market, both for the developed software and for collateral deliverables such as user documentation and training.

This process needs to be balanced against the configuration management process. The configuration management process sets strict controls to prevent the wrong release of the wrong products at the wrong time; while the deployment process concentrates on accelerating the right release of the right products at the right time.

> Q   Which of the SEI CMM key process areas does this stream cover?
>
> Q   Which of the SPICE base practices does this stream cover?

References

ISO 10007, Configuration Management Standards

ISO 15504, SPICE: Software Process Assessment Model.
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