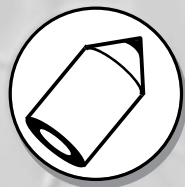
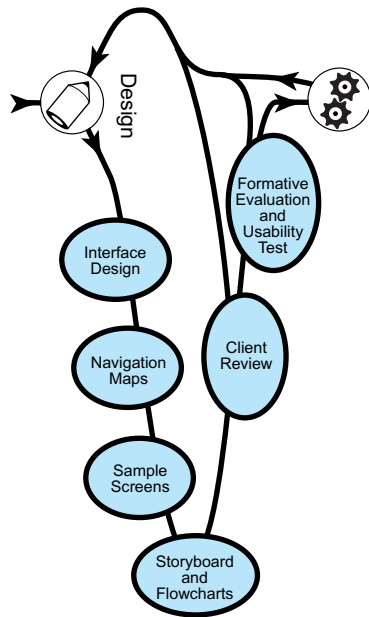


# Design





		Initiation	Specifications	Design	Production	Review and Evaluation	Delivery and Implementation
Development	Generic	The overall strategy for product development is determined by the initiation of ideas for MM projects which may come from a variety of sources, the client's expectations and budget.	Detailed specifications are derived from the client's expectations, the user's requirements and the capability of the production unit or organisation.	<b>The design solution identifies the key components, and relationships between the technical, interface and educational requirements reflecting the primary purpose of communicating effectively with the end user.</b>	Production of quality MM requires the utilisation of development environments and media integration strategies linked to the specifications and design solution.	Client review and user evaluation occurs at periodic intervals in the development process, and ensures that the final product meets the needs of the client's.	Delivery and commissioning processes outlined at the planning stage are implemented.
	Online	Providing on-demand access to interactive education/training requires a documented account of not only hardware, software and bandwidth, but also the requirements of the user.	Course design for online delivery focuses on the objectives to be achieved and not on the means of achieving them, necessitating a shift in the instructional design paradigm.		Delivering course material online requires knowledge and understanding of technical issues so that the end user is not impeded by the limitations of the medium.	The review, assessment or evaluation, and modification of online course material will reflect the faster and more cost-effective process.	Once the course is operational, on-going management and maintenance strategies are implemented to ensure currency, correctness and applicability.
Management	Legal	Costs associated with copyright and rights negotiations need to be incorporated into the budget to ensure that legal complications do not jeopardise the project financially.	The diversity of inputs to multimedia means that there are more rights involved and therefore more clearances to obtain for both production and/or delivery of	<b>It is desirable to incorporate a significant proportion of original material in online resources, and ensure that linked materials are attributed to the respective authors.</b>	All copyright restrictions and encumbrances are resolved before production commences.	Arrange any non-disclosures for outside parties involved in evaluation or acceptance testing.	Confirm that all licencing agreements have been finalised and that liability and insurance coverage has been arranged for the delivery of the product.
	Project	Project scope and contract requirements are reviewed. The client is briefed on change control procedures, review and approval procedures, and confirms the	Stated and implied needs of the client are matched with appropriate development methods, tools and skilled resources to supply a quality product.	<b>A global overview of the project is derived once revisions of cost estimates, schedules, team participants and other matters are conducted in accordance with the concept brief and the detailed design document.</b>	Each skill group, such as graphic artists, animators, programmers, goes about their tasks with appropriate guidance/support from the project manager.	Provide evidence that the project achieved what it was designed to do. Obtain independent evaluation of the expected outcomes from the use of the product.	Provide the handling, storage, packaging, preservation, and delivery mechanism to guarantee the product is shipped as built. Release notes and instructions for installation and setup are provided.
	Risk	The scope of the risk management (business, technical and project risks) to be performed is identified.	Potential risks are identified, analysed and assessed, and mitigation strategies, metrics and corrective actions outlined.	<b>Identified risks are quantified and qualified and corrective strategies are validated.</b>	Mitigation strategies and error trapping techniques are employed to reduce the impact of technical risks and risks associated with interface complexity and creativity.	Confirm that risk management strategies have achieved their purpose in all previous phases and that potential risks are minimised for on-going delivery and implementation.	Strategies to reduce technical risks from version control, documentation development, and pre-testing will be employed.
Support	Change Control	The project deliverables and their associated supporting documents, are identified, presentation standards are defined and change procedures established.	A baseline for the user's requirements for the system is established and defined, and changes to the baseline are agreed through a formal process.	<b>The design solution is traceable to the requirements baseline, and agreed changes are reflected in both.</b>	The integrity and consistency of the developed system is ensured through the enforcement of agreed standards and control of change.	Changes to the user's requirements identified during evaluation of the multimedia system are agreed through a formal process.	The configuration for the developed multimedia product to be implemented and distributed is defined and agreed, and placed under formal controls.
	Quality Assurance	Planning for the project assures key sponsors that the plans, procedures and standards outlined will be followed, and that the work products will meet the requirements for quality.	The QA group will confirm that the specification of user requirements has been reviewed for completeness and feasibility, and that any issues previously raised have been addressed.	<b>Confidence is established that the design solution accurately reflects the user's requirements, and that the agreed standards are followed.</b>	The developed system will be shown to be derived from the agreed design using defined actions and agreed standards.	The agreed steps for addressing issues raised in evaluation will be shown to have been followed.	The planned tasks for implementing and distributing the final product will be shown to have been followed.
	Validation & Verification	A strategy, including tools, techniques and activities, is defined for determining whether each work product functions correctly and meets the user's requirements for the product.	Criteria for verifying the system specification, and for demonstrating that the requirements have been satisfied, will be defined and applied.	<b>The correctness and appropriateness of the design solution will be demonstrated through a process of design review.</b>	The developed system and its components will be shown to be a robust and accurate reflection of the user's requirements.	Evaluation and testing will confirm that the user's requirements have been fully addressed as well as identify and rectify technical and other errors.	Verify that the implementation criteria have been fully addressed and that the product meets the client's and/or end user's requirements in an operational environment.

# DESIGN

Development	Generic	The design solution identifies the key components, and the relationships between the technical, interface and educational requirements reflecting the primary purpose of communicating effectively with the end user.
	Online	
Management	Legal	It is desirable to incorporate a significant proportion of original material in online resources, and ensure that linked materials are attributed to the respective authors.
	Project	A global overview of the project is derived once revisions of cost estimates, schedules, team members and other matters are conducted in accordance with the concept brief and the detailed design document.
	Risk	Identified risks are quantified and qualified and corrective strategies are validated.
Support	Change Control	The design solution is traceable to the requirements baseline, and agreed changes are reflected in both.
	Quality Assurance	Confidence is established in that the design solution accurately reflects the user's requirements, and that the agreed standards are followed.
	Validation & Verification	The correctness and appropriateness of the design solution are demonstrated through a process of design review.

## Overview of the Phase

This phase, often referred to as the creative phase, takes the functional specifications to a further level of detail in which the Design Document: Identifies the human activity that the proposed interactive system will support; Identifies the people, or users, who will perform the activity; Sets the levels of support that the system will provide, otherwise known as the system's usability; Selects the basic form of solution to the design problem.

In this methodology functional specifications are not frozen; on the contrary, team members in consultation with the client, are encouraged to revise and change their requirements as prototypes are evaluated and tested. However, there needs to be a balance between proposed changes to the Design Documents and their likely cost to avoid the 'creeping features' syndrome. The feasibility of the project is once again reexamined.

It is at this point that developers give priority to the specified learning outcomes of the product and the ways in which end users will interact with the product. A user centred attitude in all aspects of the Design phase including instructional, interface, technical and graphic design is essential. The use of metaphors to place the information into a familiar context for users should be considered. A modular approach to design suits most educational/training courseware; modules can be reused and tracking of errors is less complex.

## Key Features

- A metaphor for the product which places the goals and information in a familiar context should be considered.
- The educational design of the product, navigational structure, interface methodology, design tools and sample screens are described in a detailed Design Document.
- The physical size of screens and the elements on each, including text, graphical images, video clips, audio portions and program code are determined.
- A Graphic Design Brief is formulated, the interface design is created and the underpinning technical design defines how the authoring/programming system is structured to effectively deliver the educational design.
- The overall design is evaluated by the development team, experts and end users. This includes iterative testing and analysis of educational strategies, user interface design and ease of use.
- The client approves the Design Document and project estimates and schedules are revised.

## Design

The design solution identifies the key components, and the relationships between the technical, interface and educational requirements reflecting the primary purpose of communicating effectively with the end user.

### Description

A coherent design strategy guides the production and implementation of educational/training multimedia products from the outset of the project. The integration of visually effective interface design, technically correct and appropriate authoring environments and information which is presented at the knowledge level of the target audience has a crucial impact on the success of the entire product.

Modular design reduces complexity and effort, facilitates change and implementation through parallel tasks and easier testing, and in the design of online pages its advantage is that it can be quickly updated without reformatting.

This component of the project is very much focused on the team, including the client, as all members have a key role to play in the design of the final product.

### Tasks

#### *Develop the Design Document*

While the documents used as 'blueprints' for producing multimedia may differ in form, the information they contain and the relationship between the elements is much the same. A Design Document can be 50 or 500 pages long, depending on the complexity of the project, the documentation required by the development organisation to develop the product and the client's requirements.

Revisit the goals and messages that the product must convey. The two primary interactions of educational/training courseware are between content/learning goals and the multimedia design goals. Therefore, the content and design needs to be closely examined to ensure that all team members understand the scope of it.

#### *Prepare storyboards*

Prepare storyboards or screen by screen blueprints of all of the content of the project (levels of screens and links, content elements). These can be stored

in a database for quick revisions. Determine the style and level of detail contained in the storyboards so that they are appropriate for the project.

#### *Provide navigational design*

Provide flowcharts or concept maps which document the logical flow of the interactive interface. Again keep in mind the educational and project goals. Allowing the user as much control as possible in the way they use the program (eg, sound levels, what images display at startup) - customise.

#### *Design user interface*

Find the most appropriate graphical user interface for content (visual layering techniques) and keep it simple and user oriented. Visualise how the product will look and feel and what users will be able to do. Consider using innovative or effective design features such as drawing the user's eyes to a particular place on a screen first.

## Design

The design solution identifies the key components, and the relationships between the technical, interface and educational requirements reflecting the primary purpose of communicating effectively with the end user.

### Description

When designing interactive educational multimedia for the Internet it is important to keep in mind that the design of complex electronic documents can be a mixture of highly interactive forms of communications media. For example, some may incorporate live data links from high bandwidth optical fibre computer networks. When deciding on delivery methods, consider the tradeoff between speed and visual impact from the user's perspective. There has to be a balance between lack of bandwidth and the user's patience in an online environment. Smaller file sizes lead to quicker access, more hits, more utility, and thus to more user satisfaction. The format for storing multimedia files online is also important since not all computers can display all file formats. Adding multimedia to educational/training courseware delivered on the Internet is a relatively simple procedure. It is worth asking however, how much it adds to the learning experience and how it enhances the information being presented.

### Tasks

#### *Consider online issues which impact on design*

- Link concepts using hypertext as a navigation tool.
- Align design with distribution medium (Internet; eg WWW, email, listservs, Intranet).
- Weigh the advantages and disadvantages of using browser specific techniques (eg advantages of Java applets: interactivity - works better than HTML-based ones; portability - works on any platform where WWW browser has Java support; access to network data).
- Consider bandwidth of user's Internet connection - multicast packet delivery for efficient bandwidth usage and scalable bandwidth to support variable multimedia requirements.
- Set up security mechanisms - firewalls or other internal/external system before making information public.

#### *Maintain a user centred design approach*

Determine the depth of the information structure - how many levels of information will there be.

Create a hypermedia design model for the learning environment with the end user in mind.

Design a virtual system that hides underlying technology and focuses the attention on images/information presented to the user. Know your user - anticipate what users might do on each Web page - (users like to be in control).

#### *Determine most appropriate development medium*

Explore different ways of creating web pages using different tools - eg, in animating pages: animated GIFs, Director (Shockwave) or Java; digital video for the web with minimum load time.

Specify compression formats for inlined WWW graphics (eg low and high resolution JPEG files). Preview images on several hardware and browser combinations.

## Design

It is desirable to incorporate a significant proportion of original material in online resources, and ensure that linked materials are attributed to the respective authors.

### Description

As the multimedia product develops, original material developed on the project is incorporated. Assignment of copyright on agreed materials is made to the client.

The focus on development of original material for online multimedia projects is labour intensive, and the client/s need to be aware of the potential value of the resulting proprietary material created for them.

Where links are made online to other material, the authors of that material need to be identified. To minimise the risks associated with potential breaches, the Project Manager should arrange for all such links to be tested and reviewed before product release.

### Tasks

#### *Confirm copyright assignment by development staff*

Retain records of the assignment of copyright to the client by project team members.

#### *Register original material in IP Register*

Details of original materials created by the project team members are recorded in the IP Register.

#### *Record other proprietary material in the IP Register*

Record ownership details of any proprietary materials to be used in the multimedia product(s).

#### *Identify proprietary linked material*

Where proprietary material is linked indirectly in online products, identify those links and record in the IP Register.

#### *Verify linked materials are attributed to the respective authors*

Develop a strategy to verify that all linked materials are attributed to their respective authors. This is implemented in the Review and Evaluation stage.

## Design

A global overview of the project is derived once revisions of cost estimates, schedules, team members and other matters are conducted in accordance with the Concept Brief and the detailed Design Document.

### Description

The Project Manager integrates the plans for the management of the project. The plans associated with the execution of the project contain descriptions of the associated activities and tasks and identification of the work products to be produced.

The tasks and resources necessary to complete the work defined in the Concept Brief and the detailed Design Document are sized, estimated, planned, tracked and measured.

### Tasks

#### *Revise project estimates*

Revise and document updated estimates of what is needed to satisfy the requirements for the entire life cycle.

#### *Revise work breakdown structure*

Revise and document the updated work breakdown structure incorporating the project tasks and sequence and relating them to the resources required to accomplish the work products associated with the tasks.

#### *Confirm infrastructure requirements*

Confirm the development environment and human resource elements needed to support the project performance.

#### *Establish project schedule*

Establish the project schedule, based on the life cycle model, work breakdown structure, estimates, dependencies, and infrastructure needs.

#### *Allocate responsibilities*

Identify the specific individual and groups contributing to, or impacted by, the project. Allocate them their specific responsibilities, and ensure that the commitments are understood and accepted, funded and achievable.

#### *Integrate project plans*

Provide a mechanism to ensure project plans are formally developed, documented, and maintained, and available to those involved with the project.



## Design

Identified risks are quantified and qualified and corrective strategies are validated.

### Description

Risk quantification involves evaluating risks and risk interactions to assess the range of possible project outcomes. It is primarily concerned with determining which risk events warrant response. It is complicated by a number of factors including, but not limited to:

- Opportunities and threats can interact in unanticipated ways (eg schedule delays may force consideration of a new strategy that reduces overall project duration).
- A single risk event can cause multiple effects, as when late delivery of a key component produces cost overruns, schedule delays, penalty payments, and a lower-quality product.
- Opportunities for one stakeholder (reduced cost) may be threats to another (reduced profits).

### Tasks

#### *Determine which risks warrant a response*

Use 'brainstorming' or Rapid Application Planning sessions to assess risks. The risk analysis model will assist this task. Expected monetary value may be used to quantify risks. It is the product of two numbers, the risk event probability and the risk event value. This information may then be used in a Decision Tree. All high risk factors which cannot be constrained or eliminated will have a Risk Memorandum created to document the condition.

#### *Identify opportunities and threats*

The major output from risk quantification is a list of opportunities to be pursued and threats that require attention. Document those sources of risk and risk events that the project management team has consciously decided to accept or ignore, and identify who made that decision.

#### *Implement risk management strategies*

Perform the defined risk management strategies.

#### *Apply risk metrics*

Use the risk metrics to measure the change in the risk state and the progress of mitigation strategies.

#### *Assess results of risk management strategies*

At identified checkpoints, assess the expected progress and level of success of the risk management strategies.

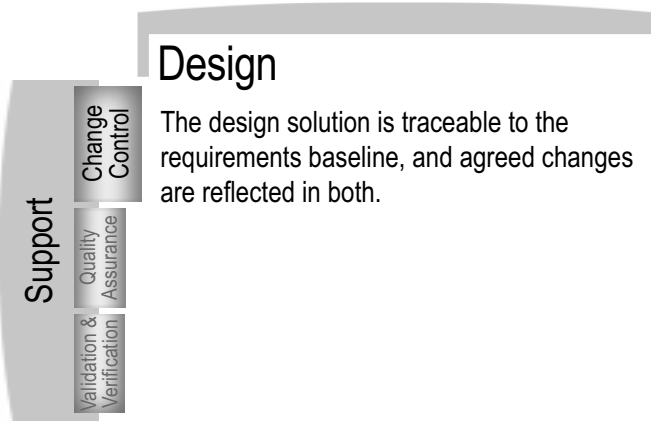
#### *Apply corrective actions*

When specified progress in risk mitigation is not achieved, take corrective action.

#### *Validate corrective strategies*

Examine the corrective action strategies to identify any unexpected consequences that may arise.





## Design

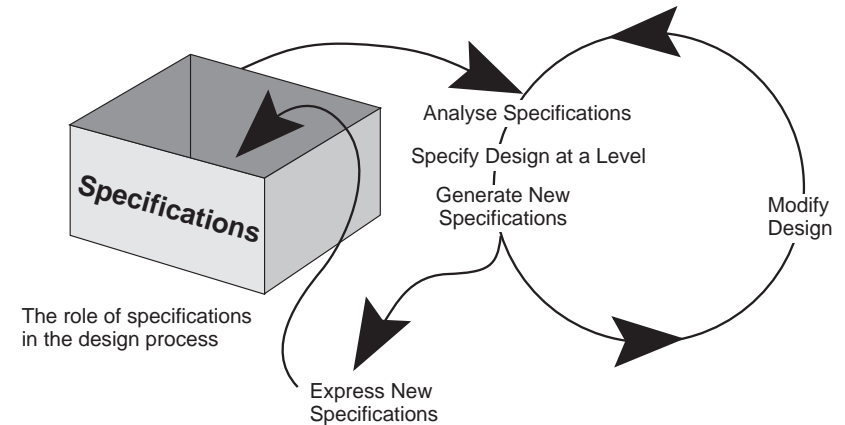
The design solution is traceable to the requirements baseline, and agreed changes are reflected in both.

### Description

Traceability - the ability to track the achievement of the initial requirements through the documents and work products - is of fundamental importance in achieving a quality solution to a complex problem. This element is the key focus of change control in the Design phase.

In this phase, care is taken to maintain the integrity of the developing set of technical documents. Strict conventions for document and file names, and simple mechanisms for identifying incremental versions of the documents, can both contribute towards this. If tools are used to document the design, the developers should ensure that the change history of the evolving Design Document can be traced.

Changes to the requirements may be proposed during this phase, either as a result of design reviews, or following user reflection on earlier prototypes. Approval of changes must follow agreed procedures, with the necessary impact studies completed before approval is considered.



### Tasks

#### *Define standards for design documentation*

Standards for the documentation will include, not only the presentation requirements, but also the overall design approach, and conventions for graphical representations and other elements. The approach selected for design will vary between the principal components. This needs to be acknowledged in the selected standards.

Each of the multimedia elements (eg, text, graphics, video) can be designed differently, using, for example, outlines; conceptual drawings; storyboards; and flowcharts. The Design Documents will be of more value if standards for each technique are defined and enforced throughout the development.

#### *Confirm traceability of system design*

All current requirements should be able to be traced to elements in the proposed design solution. No elements should exist that do not contribute to the requirements. Successful demonstration of traceability requires adequate preparation in the early stages of a project. The initial requirements

should be 'allocated' to the various components of the system - that is, there should be an explicit mapping, that Requirement A will be addressed through the use of Video Component X, while Requirement B will be addressed through a combination of Text Component Y and Control Logic Z.

#### *Establish version control for design iterations*

Multimedia elements go through a series of iterations based on team feedback and discussion. Once an element reaches a stage where the team requires 'outside' feedback, it can be seen to have reached a stable form that is worth preserving. At this stage, it is assigned a version identifier and can only be changed by creating a new version.

#### *Apply change control procedures to proposed modifications to requirements*

Design reviews frequently identify possible changes to the requirements for the project. These changes may be on the basis of the incompleteness, ambiguity or inconsistency of the original requirements, or they may demonstrate a potential enhancement that should be evaluated.

## Design

The QA group confirms that the specification of user requirements has been reviewed for completeness and feasibility, and that any issues previously raised have been addressed.

### Description

In the Design phase, QA activities are focused on ensuring that the actions of change control, verification and validation in respect of the developed design solution have been performed properly and effectively.

The QA personnel confirm that the proposed design reviews have been conducted based on reasonable criteria which have been defined and agreed for all reviews. They then analyse the problems raised during design review, addressing each (where appropriate) during the production process as the design goes through each iteration. Not all problems may be resolved directly during the Design phase; however, on the following iteration, there should be evidence that attempts have been made to address all of the identified issues.

The QA team is also responsible for ensuring that the standards and techniques adopted for the project have been properly applied. This covers both documentation standards and design methods.

### Tasks

#### *Identify audit requirements for design*

Audits are required in each stage of the development process to ensure that the standards defined have been followed. The audit requirements for this phase will include developing checklists to identify all standards defined for the phase, and mechanisms to confirm that these standards have in fact been enforced. Audit techniques will include sampling of design documents and checking the review criteria to ensure that conformance to standards was one of the issues considered.

The audit requirements should be embedded in a series of audit and review tasks which can be scheduled for completion in the Quality Assurance Plan.

#### *Check results of design reviews*

The QA group should check the results of design reviews, to ensure that the checklists defined for use in the reviews have in fact been applied, and that problems and issues identified come as a result of a structured review process. In this way,

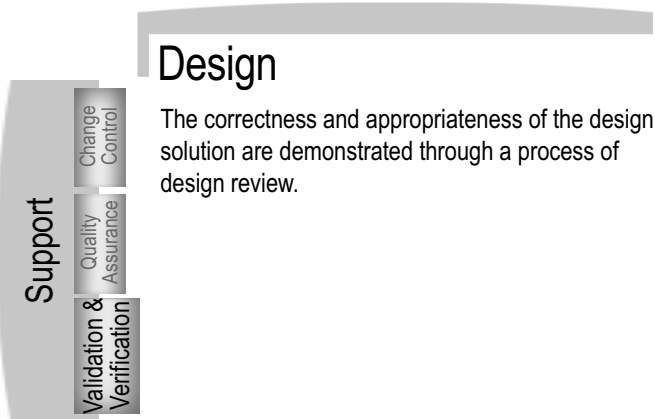
the effectiveness of reviews as a process for controlling design quality can be confirmed.

#### *Confirm actions on review reports*

Through sampling of review reports, and tracking the identified problems, assurance can be provided that the necessary actions have been taken, in that problems and issues identified in design review /s have been addressed.

#### *Identify necessary corrective actions*

Where audit or other quality assurance actions have identified that the specified procedures have not been followed, some form of corrective action is necessary. Where the identified problems are few and minor, simple rework of the elements to correct the overlooked problems may be adequate. Where the omissions are major - reviews not being conducted, problems left unresolved - the corrective action required may be more substantial, involving a complete revision of the entire procedure. The basis for this is that, where the results of a process are consistently below expectations, the problem most likely lies in the process, rather than in the performers.



## Design

The correctness and appropriateness of the design solution are demonstrated through a process of design review.

### Description

Verification of the system design starts from the agreed specifications as a basis. The key task for this group of actions in the Design phase is the undertaking of detailed and comprehensive reviews of the design solution.

Criteria for these reviews must be developed. They will be more extensive than those used to review the specifications; they have to focus not only on the content of the design, but also on its form - that is, whether the selected design approach has been correctly applied.

As the design is progressively refined, more system components will be identified; appropriate design approaches should be defined for each of these components, and then reviews conducted to ensure, firstly, that the design represents a good application of the approach; and secondly, that it is a good solution to the user's requirements.

### Tasks

#### *Define criteria for design reviews*

Criteria for conducting reviews of design documents must be defined before the reviews are scheduled. The review criteria covers:

- the techniques and standards followed in design;
- the functional objectives of the system as defined in the specification;
- the educational and learning objectives for the system as defined in the user requirements.

Review comments will normally focus on ways in which the design fails to achieve specific criteria, so a comprehensive set of criteria is essential for effective reviews.

#### *Conduct reviews of high-level design*

The high level description of system design normally describes the major components of the system and the interfaces between them. Review criteria concentrates on the interface issues; as resolution of these matters is crucial to success in the final system implementation.

#### *Conduct reviews of detailed design components*

The detailed design documents specify the design of the fundamental elements of the components of the system; thus, they will specify the content of a single element of text, or the description of a single graphic element. Reviews of these components are as important as those of the high level description, because they document the details of the proposed implementation. However, reviewers must be careful to ensure that the system outcome remains the key issue in the development of design.

#### *Resolve problems and issues identified in review*

Problems identified in the design review may be simple errors of style or fact in the design; they may cover failure to enforce standards in the development of design documents; or they may indicate the need for a change in the overall specification. Each problem should be analysed to identify its root cause, and action taken to resolve the problem at its base.

# Design

## Work Products

### *Procedures and Practices*

All tasks to be performed are uniquely identified and rules established for the project team and client to operate.

### *Invoicing (billing) Plan*

Based on the project schedule, and project business case, a billing plan provides the basis for cash flow and cash management of the project.

### *Project Plan*

A formal approved document used to manage and control project execution. It will change over time as more information becomes available. Update procedures are contained in the plan.

### *Decision Tree*

A Decision Tree is a diagram that depicts key interactions among the decisions and associated chance events as they are understood by the decision maker(s). The branches of the tree represent either decisions (shown as boxes) or chance events (shown as circles).

### *Change Requests*

Documented requests for change should cover all documents that have been placed under formal controls.

### *Risk Memorandum*

Unresolved risk factors are recorded in the memorandum. It identifies the:

- Project
- Date recorded
- Risk Factor
- Impact of that risk on the project
- Risk minimisation strategies that may be used
- Contingency plan in the event of the risk.

### *Review Records*

These should provide the context information about all reviews conducted in the phase: the coverage of the review; the readiness for the review; and the required corrective actions.

### *Test Cases and Scripts*

Test Cases based upon the design can be developed during this phase.

### *Detailed Design Document*

The detailed Design Document is the blueprint for the development of the product and should provide as much information as possible.

# Design

## Questions to Confirm this Phase

Has a detailed Design Document been completed?

What traceability exists from the Specifications to the Design?

Do the design components address the agreed requirements?

Have the design documents been updated to reflect changes in the requirements with all successive versions identified?

Have the design documents been reviewed against agreed criteria?

Have all problems raised in the reviews been recorded and tracked to resolution?

Is the design appropriate to the educational/ instructional goals of the product?

Has a media allocation plan been established?

Has the online design taken full advantage of the WWW's uniqueness?

Is the hypermedia structure easy to use?

Is there an overall architecture for the multimedia product?

Has the target environment been determined?

Has the user interface design been agreed?

Has the client approved the design document?

Has the project scope been clearly established and agreed with the client?

Were measurements from previous projects used as a basis for size estimates?

Were estimates of project size corroborated by estimate verification?

Are estimates regularly updated to reflect multimedia development estimates?

## NOTES

