

PART VIII

MULTIMEDIA PROJECTS

PART OVERVIEW

This part is pretty much the heart of this whole book.

So far we have been focussing on individual media elements and tools that enable different media content creation and editing. But multimedia cocktailing is all about combining different kinds of media together and delivering contents all at one go!

This has four detailed chapters - each riveting on the disparate aspects involved with multimedia project production. At the end of these chapters, you will understand what makes multimedia technology so wonderful and compelling and the challenges associated with producing the same.

We can pretty much write a whole book talking just about multimedia project production - but we will focus on all the important aspects to get a wholesome view of this topic.

Chapter 20

Project Conceptualization, Design and Development

CHAPTER OVERVIEW

This chapter focuses on the multimedia project design and development.

First, we understand what is meant by a multimedia project, followed by different stages that constitute the design and development of a typical multimedia project.

Each stage is explained in detail, followed by typical examples and discussions from real life projects. It is hoped that this important chapter will help all the students to understand and appreciate the actual project development process that happens in multimedia production houses.

20.1 Introduction

So far, we were concentrating mostly on individual elements of multimedia – like texts, audio, animations and video. We understood how to produce and edit them to specific requirements. In this chapter and subsequent chapters, we will try to assemble them as a single integrated multimedia project.

We will be discussing the different stages of multimedia project, what are all the different kinds of planning and resources required, how a project translates from vision to reality etc.

Let us begin our discussions by reviewing our understanding of multimedia projects.

20.2 Multimedia projects - definition

Multimedia project is a typical software project, making use of multimedia technology - with the specific aim of disseminating explicit information in an entertaining and compelling manner, to a well defined market segment - using various media technologies and interactivity.

Multimedia project distinguish themselves from all other types of information technology projects, in the following aspects:

- Creative and artistic capabilities become more important than the programming expertise required for the projects.
- The software suites, utilities and programming environment differs much from the conventional programming environments. The only common factor that can be sighted – in terms of software - is the operating system.
- The hardware capabilities and requirements are much higher, even during the development process.
- Conventional projects go through development, user acceptance test and production deployment. Multimedia projects also go through a similar cycle, but production deployment is often replaced by product distribution.

- Wide-ranging and heterogeneous mix of skills is required to effectively tackle different media utilized in the project.
- The market segment which multimedia addresses tends to be end-consumer market whereas conventional IT project are built for the business and enterprise markets.

20.3 Project conceptualization

Every project begins with a project concept or an idea. Multimedia is no exception.

Let us understand what it is.

A multimedia project concept is the concise definition of a project, that can be produced (or improved, if such a project already exists) and which will satisfy specific requirements of certain class of people.

Let me explain this with some examples.

- An interactive multimedia CD-ROM on places of tourist importance in India
- An interactive multimedia presentation of ABC Company and its activities
- An interactive multimedia website for an architectural firm

All these are multimedia project concepts. Each addresses the needs of different segments of people.

For example, the project on Indian tourism tries to present some useful information to all inland and foreign tourists who are interested in various tourist spots in India. The second project tries to project a proper image of ABC Company, probably to the eyes of potential investors, shareholders or offshore partners. The third one is meant for all visitors of architectural firm's website – to know their various offerings for them.

The project concept is perhaps the key decision taken, with respect to multimedia projects and enough thinking must go into it. Since multimedia is a relatively expensive affair, it is but logical to think of better options. The capabilities as well as limitations of multimedia technology should be fully understood, before adopting the same for certain requirements.

In case of multimedia presentation and websites, the decision making process lies with the corporate or business customers who should see whether there is any value addition by bringing in a new technology. For example, let us say there is an ABC software firm, which is eyeing on offshore projects from other countries. Now, it will make lot of sense and value addition for ABC to go for multimedia because the end consumers are IT literates and the presentation can boost the image of the company among their viewers.

But in case of multimedia CD-ROMs meant from end consumer market, the decision making becomes much more complex. In real life scenarios, lot of discussions take place - necessarily in the form of meetings... before a decision is taken to go ahead with the project.

If such a decision making process hangs before you, ask the following questions to yourself:

- Does the topic or concept enjoy innate ability to capitalize on multimedia and interactivity?
- Do we have enough information available or is there any research required?
- Do we have enough manpower and resources to execute a project of this magnitude?
- Have we rightly identified and understood the market for which we are developing this concept?
- Has the project been developed before? If so, what is the scope for a second project?

During these discussions, it is best to involve all would-be-customers or a sample group of potential customers and do some sort of market research.

It's the proper development and understanding of the concept that stands behind every successful project – apart from skills and resources.

- Information collection
- Analysis and filtering
- Organization
- Verification.

20.5.1 Information collection

At this stage, you start collecting all information relevant to the project at work.

The sources of information vary, depending upon the project under development.

For consumer CD-ROM projects, you have to rely on relevant books/library, magazines, video interviews and the Internet. It is better to pay some attention to the quality of information collected at this stage itself, as it will save time later. For reference multimedia titles – in particular, this exercise turns out to be rather extremely complex and some production houses prefer to outsource this task to agencies and individuals.

For corporate presentations and multimedia websites, the information has to be collected from the business establishment itself. There might be some brochures and pamphlets available, but in many cases, you have to talk to several individuals in order to collect the information you want.

For Cybervalley system's Tourist's India CD-ROM, we had to rely on the following information:

- Books, books and more books... reading the extensive range literature available on Indian tourism
- Collect all the different brochures, pamphlets and information material available from various regional tourism offices. This provided many interesting local information, not available in books
- Collect royalty free photographs and videos from, as many sources as possible – even friends and relatives were not spared!

20.5.2 Information analysis and filtering

Not all the information collected is going to be useful for the project. Data needs to be edited, modified and even deleted altogether!

Some information might be copyrighted and cannot be used as it is – it may have to be rewritten or rephrased. A good idea about the end product to be evolved will be very useful in deciding the volume and depth of information you need to have, under any given topic.

Filtering is the process of deciding which information is reliable / authentic and which is not. It is generally undertaken by the field expert - in coordination with the project manager.

The filtered data needs to be keyed into the computer for further processing.

20.5.3 Organization

The huge volume of information collected has to be organized in a logical and sequential manner. This organization forms the backbone for the navigation map structure, about which we will be talking in a short while from now.

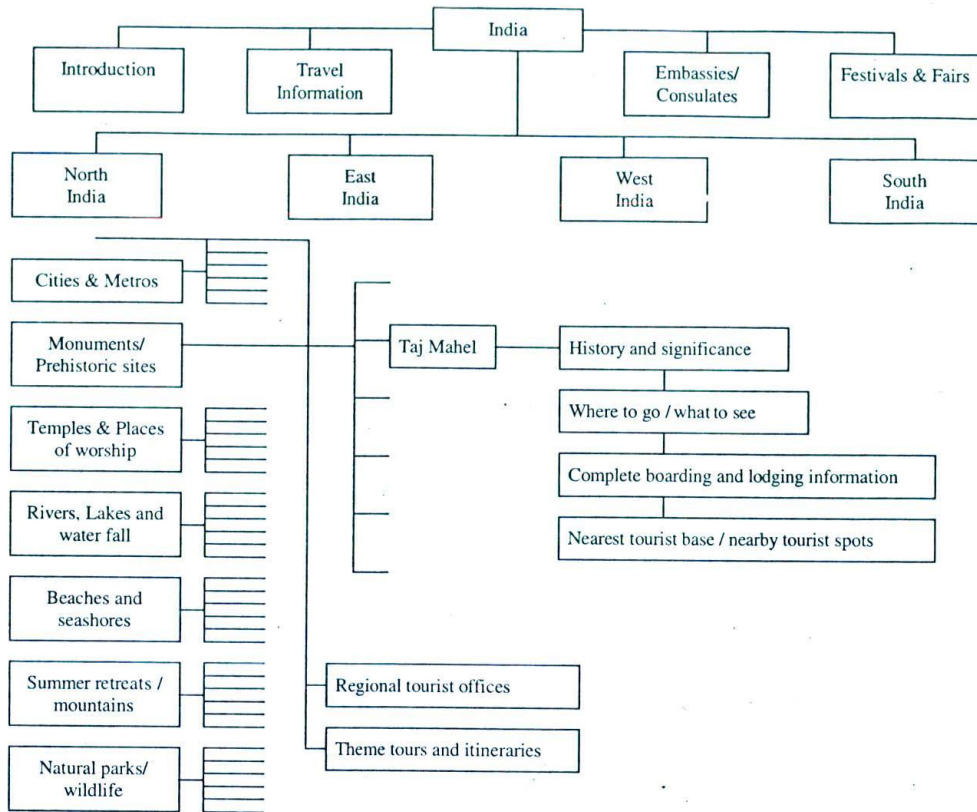


Figure 183: Organizing information for Tourist's India CD-ROM. Not even one fourth of the total information has been represented here – for sake of simplicity

The introductory topics will naturally get precedence, followed by the specialised topics.

For Tourist's India, the topics were arranged as shown in the diagram. As indicated earlier, in reference titles like this, the business could get extremely complex – as attested by this complex map. Not even one fourth of the information has been represented here – we have just depicted north India and just one tourist spot (Taj Mahal). Imagine how complex the actual data organization would have been!

20.5.4 Data verification and authentication

Once all the necessary information has been collected and organized, it needs to be verified and authenticated. It should also be checked for possible copyright violations etc.

For web-based projects, it is simple to make corrections – since web pages are always editable – but for multimedia CD-ROMs, this becomes a problem.

Once this operation is completed, we can arrange all the material into a master information booklet – which will serve as a blueprint for further development of the project.

20.6 Navigation maps

The end consumers usually browse through the multimedia project in stages. Not all information can be presented to them at any point of time. The power of multimedia is to provide different levels of information to different

types of users – based on their interest and other criteria. Hence, the sequential presentation of material via a navigation map – or a system that would allow the users to navigate across the project – becomes necessary.

Navigation facilities bring great value addition to multimedia projects.

- ❑ The users can interactively select and view those areas, which they wish to explore – a very unique advantage which only multimedia projects can offer
- ❑ Even complex information structures like encyclopaedias can be presented in a simple and methodical manner – in this way
- ❑ Traversing across the project – from one portion to another – becomes a child's play. This is also very unique to multimedia projects
- ❑ Users will not be bored with the volume of information presented – since it comes in capsules or manageable bits.

Navigation maps or simply Nav-maps can adopt any one of the following structures:

- ❑ Linear structure,
- ❑ Hierarchical structure,
- ❑ Non- Linear structure and
- ❑ Composite structure

Let us start discussing each of these structures, as all of your projects must fit into one of these nav-maps.

20.6.1 Linear structure

The linear nav-map structure is the simplest among the lot.

In linear structure, the user moves through a sequential straight lined path - one portion after another. There is absolutely no independence to move freely in between the portions. At the most, the user may be given the option to move one step, forward or backward.

It is quite constrained – but a powerful navigation structure that is widely used in many applications. For example, most of the corporate presentation programs adopt a linear structure - because, they are meant for a group and not individual. Moreover, such presentations are usually accompanied by a lecture, in which case, the navigation must be obviously simple. Also, some edutainment titles meant for kindergarten children go linear - because such a small child cannot be expected to navigate through complex routes and it may even be confused, with such an option.

Liner structure results in simplicity of the project – and brings down the overall budget as well!

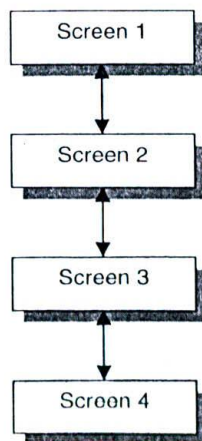


Figure 184: Linear navigation map structure

To some extent, a Microsoft PowerPoint presentation, without any hyperlinks to other slides, is also a good example for a linear nav-map structure.

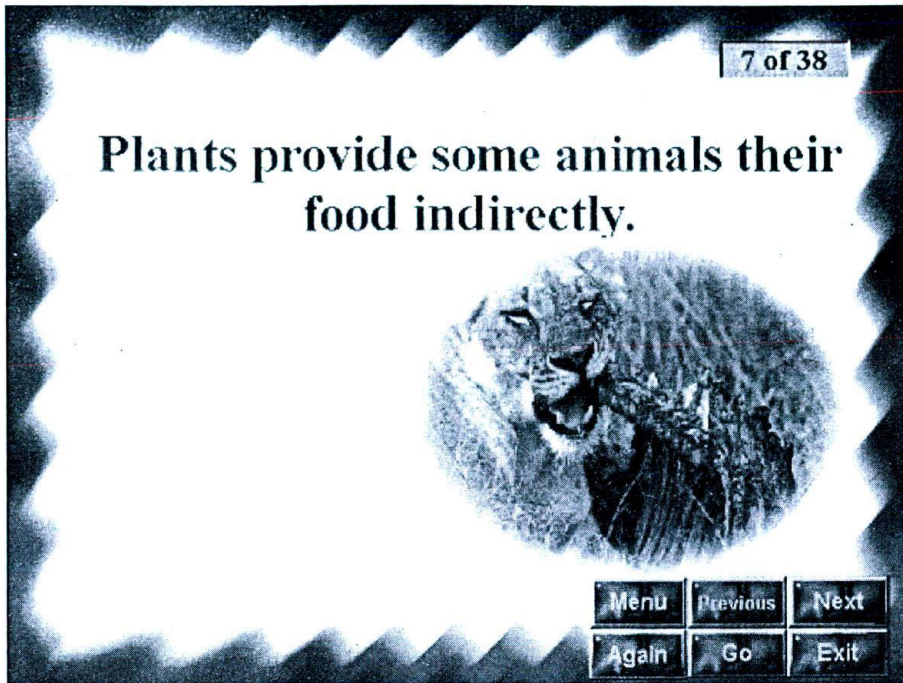


Figure 185: Take particular note of the simplicity of navigation provided in this edutainment project. Previous and next buttons (simple arrows would have been better?) allow the child to traverse either way. The menu item will take them to the main screen from where it all began...

20.6.2 Hierarchical structure

Hierarchical structure provides a top down tree design - as shown in the figure. Typically, in this kind of mapping, the first main link branches out to different portions, which, in turn, branch out, further.

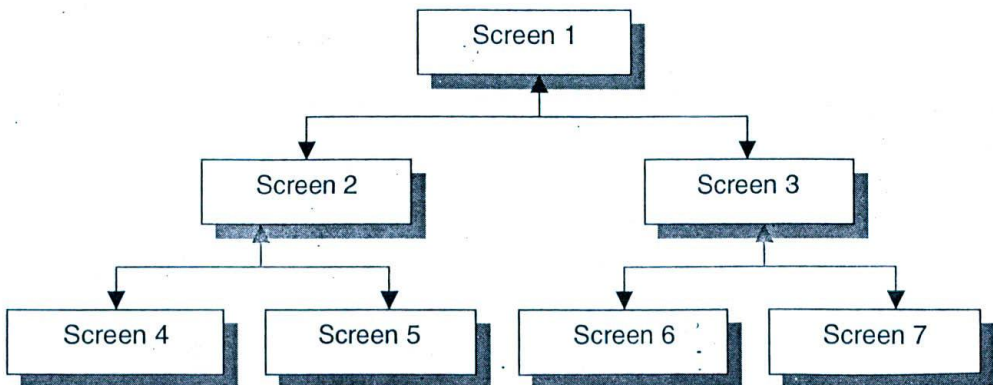


Figure 186: Hierarchical navigation map structure

Integrity is maintained by limiting the users movements within various branches. To move over from one branch to another, the users may have to come over to that portion where the branch starts and then make the next move. Many of the multimedia projects in the market today, are making use of this methodology.

Hierarchical design provides certain amount of freedom, and yet, retains certain integrity over the flow of information - by selectively restricting the pathways. With such a methodical structure in place, programming is also less complex. Professor multimedia CD-ROM, which was introduced in the first chapter - makes use of a simple hierarchical structure as its nav-map.

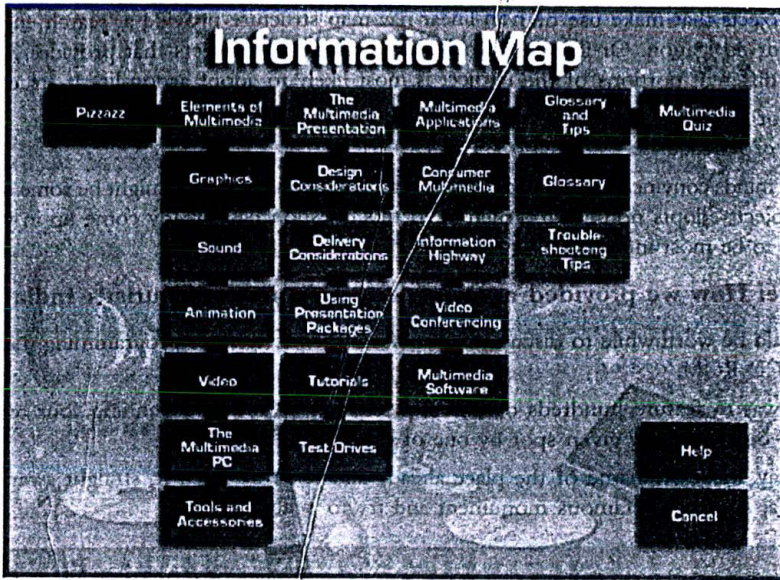


Figure 187: Professor Multimedia CD-ROM hierarchical navigation map structure

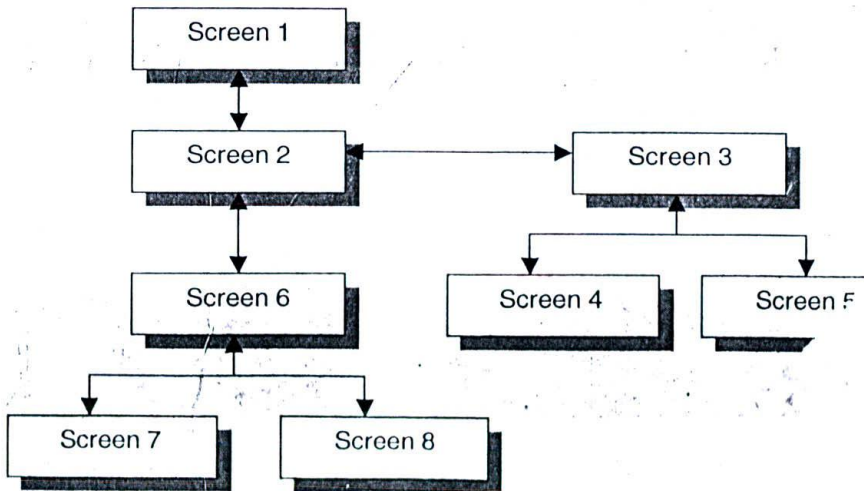


Figure 188: Non-linear navigation map structure - c

20.6.3 Non-linear structure

Non-linear structure is not bound by any restrictions and the users can freely navigate through any portion of the project - at their discretion. Navigation from literally any portion of the project - to any other portion, is very much possible, apart from the normal forward and backward options.

The underlying project that's adopting this type of navigation structure should be so designed that each and every portion of the project are not dependent upon each other and every single portion provides certain quantum of information -pertaining to the project.

The biggest advantage of non-linear structure is that it gives complete freedom to the end user – who can navigate freely across different portions of the screen.

As a rule, all projects that make use of non-linear nav-map structure provide a 'search engine' instead of the usual map structure for navigation. Or in other words, any multimedia projects that provides a search engine option to navigate across different portions of the project is most likely to adopt a non-linear structure.

Programming (or authoring) projects with non-linear structure is not simple and may demand proper strategy, knowledge and experience.

Having got your minds convinced with linear and hierarchical structures, there might be some difficulty in understanding what sort of projects adopts non-linear structure. If this question has already come up in your mind, then the next section is going to be most interesting.

20.6.4 Feature: How we provided a navigation structure for Tourist's India CD-ROM?

I thought it would be worthwhile to discuss the problems we faced while programming the navigation structure for Tourist's India CD-ROM.

The CD-ROM was to feature hundreds of tourist places across India – spanning four regions: north, south, east and west. Users can reach any given spot by one of these routes:

- They may know the name of the place already and wish to reach it, straight away (Example: Most people know Taj Mahal as a famous monument and try to search for it)

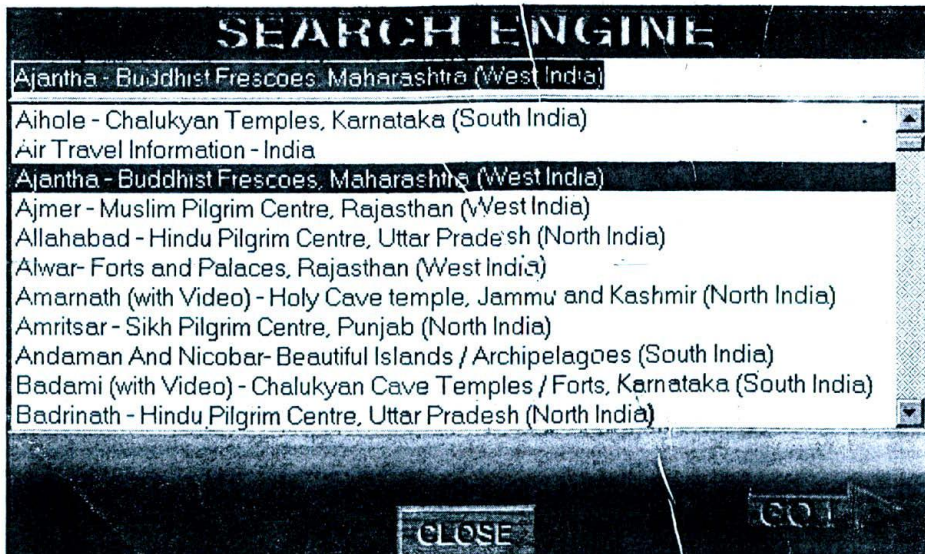


Figure 189: Tourist's India CD-ROM provides complete navigational independence via its search engine

- They may go through the regions and states, browse for specific categories of places and then reach the same (Example: North India → States → Monuments → Taj Mahal)
- They may look at some of the theme tours and itineraries page and reach the place (Example: North India → Theme tours → Golden triangle → Taj Mahal)
- They might be browsing some other place in the region, see that Taj Mahal is nearby, and hence try to reach it. (Example: North India → Cities → Delhi → Nearby tourist spots → Agra → Taj Mahal)

Thus, we understood that we had to provide room for multiple ways of accessing the same information!

And to add to this complexity, we had to provide room for a back button by which the user can go back by a few screens. With a non-linear structure, this is also complex because you should not only know the previous page – but should also understand the navigation route taken by the user! This ultimately resulted in the usage of a database to remember all the references to different bits of information.

20.6.5 Composite or compound structure

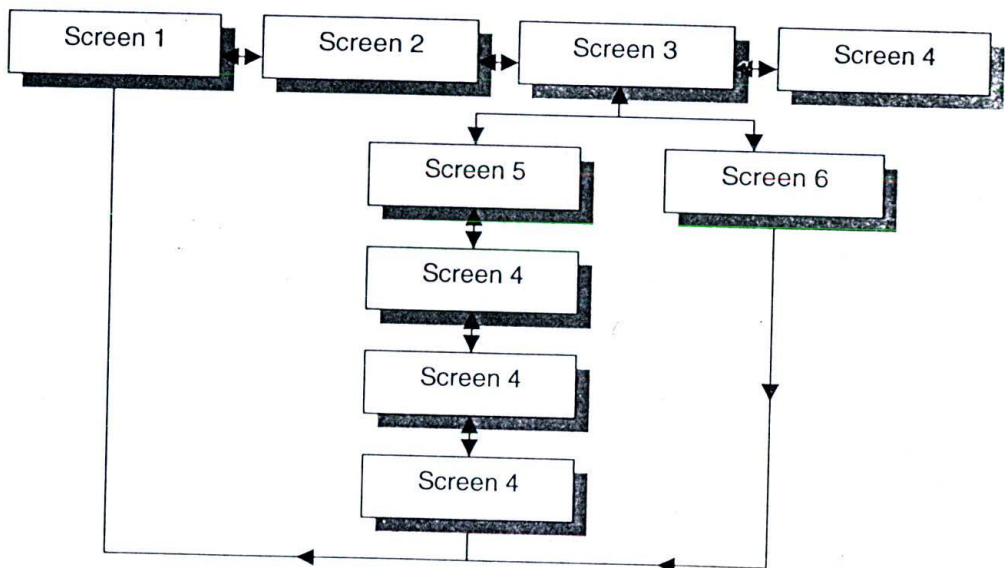


Figure 190: Composite navigation map structure

Composite structure is a combination of any of the three structures discussed above. The usual mix is linear and non-linear structures resulting in a nav-map that allows the users to navigate freely – but for certain portions, wherein, the movements need to be linear.

Composite structure enjoys the benefits of more than one structure – but programming is complex.

20.7 Developing media contents

Once we have the contents well organized and navigation structure ready, we are all set to develop various multimedia elements required for the project. This includes elements of audio, video, graphics and animations. The following table provides a summary of these elements to be produced, in a typical project.

Table 30: Various media elements to be produced for a multimedia

Media elements	Typical contents
Audio	Background voice over, music, button click sounds & project specific contents
Video	Mostly specific to given projects
Animations	Button movements, titling & project specific contents
Graphics	Backgrounds, Interfaces, Navigation menus, buttons etc.
Text	Project specific contents

Throughout this book, we have been discussing how to produce and edit various kinds of media elements for different kinds of applications. It is easy to develop media without any purpose, but when the requirements become specific, you'll realize that the task is not that simple.

For example, you may be doing some sample graphics or animations as a part of your day-to-day learning process and may think that it's all very simple! But only when you undertake a specific project and try to develop various media contents for the same – do you realize that, after all, media content creation is at least not as simple as you originally thought.

One interesting decision making process that comes up during media content development is this: Which media is best suited to present a given portion of the information? For example, what are all the different bits of information that need to be presented, as audio? What should be featured as text? What should go into videos & animations?

This is where storyboard comes into picture. If you look at the multimedia project development cycle illustrated in the beginning of the chapter, you will see that an arrow goes back from storyboard to media content development – indicating that storyboarding, interface design and media content development are sort of iterative process that influence each other.

Media contents that are readily available at hand or that could be procured gives us some idea of how we are going to present these elements. Later, when we draw storyboards using these inputs, we may find that we are running short of certain kind of media – say images, and may find ways to gather more images and photographs. Thus, storyboarding and media content development are interlinked with each other: story boards tell you what are all the media elements you might require and the available media contents may influence the way you draft the story boards for a project.

We will be discussing the story boarding process, once we are done with the interface design.

20.8 Designing interfaces

The interface is the screen over which any multimedia project is presented. Interface consists of graphics, animations and background music – if any. In short, interface is the front-end of the project. Though it may sound fairly simple, proper interface design sometimes becomes the most complex part of the project to handle!

Interfaces should be simple as well as attractive: after all, the user is going to be looking at the interfaces all the time – irrespective of what portion of the project he is browsing through.

The primary inspiration behind an interface design should be to produce an ambience and an atmosphere that is most suited for the title. In order to really appreciate the role of interfaces, take a look at any of the multimedia games in the market: Look at the buttons, menus and the background music that flows out of the speakers – you'll understand what I mean.

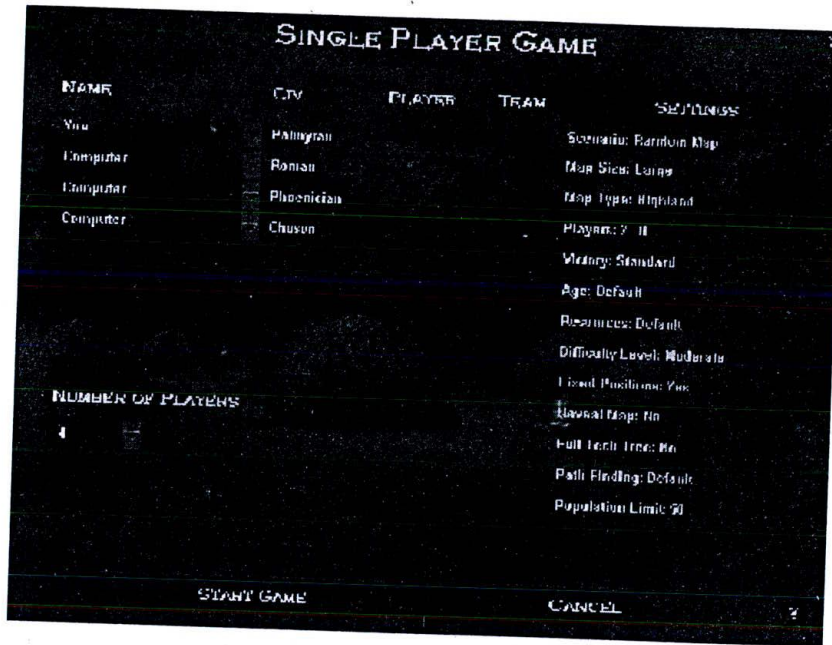


Figure 191: Multimedia gaming studios are particularly good at creating the ambience required for the game, by means of appropriate music, backgrounds and buttons. This interface is from Age of Empires from Microsoft.

Interfaces include the following items:

- Backgrounds (graphics / animations)
- Buttons and menus (graphics / animations)
- Background music (audio – wav/midi)

20.8.1 Backgrounds

Backgrounds provide a graphical platform or a backdrop, over which the whole project is presented. It is the plate that holds different media items that are being served to the user at different points of time. Backgrounds, along with buttons and menus – are visible the user throughout the project proceedings.

Backgrounds are mostly still images. A standard image may be used throughout the project or different backgrounds can be used for different portions of the project. It is not advisable to use animations as backgrounds – unless you have designed a very ingenious way of presenting it nicely.

Strategies for designing good background graphics were discussed in the earlier chapter on multimedia graphics, under the title 'Interface design graphics'. Here, we will just touch upon a few tips & techniques for designing good backgrounds.

- Let the title – and not the capabilities of the graphic designer at work - dictate the complexity of the background
- Children titles should necessarily have simple yet rich backgrounds.
- Multimedia kiosks and touch screen applications should have relatively simple backgrounds
- It is not necessary to have backgrounds at all stages. Look at the example provided from Tourist's India CD-ROM.

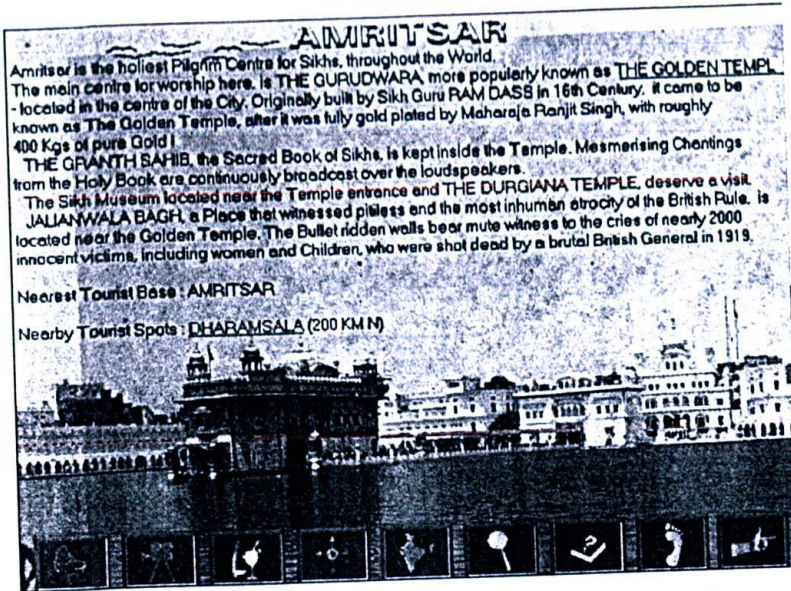


Figure 192: Backgrounds are not compulsory for multimedia projects – but buttons and menus are! This screen shot is from Tourist's India CD-ROM. The content itself provides a background over which information is presented.

20.8.2 Buttons and Icons

Buttons and icons help the user to navigate within the project.

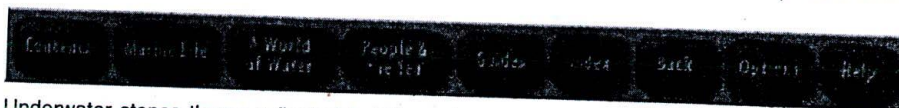


Figure 193: Look at the buttons and a rich graphical interface provided to Microsoft 500 Nations CD-ROM

Instead of providing the usual windows environment interfaces like grey menu bars and OK / Cancel buttons, most multimedia designers resort to fancy buttons and icons, as seen in many examples - throughout this Book. Buttons can be of plain colour; they can be simple rectangles / letters or graphics with three-dimensional effects. They may 'react' to a mouse over event or mouse click event - by glowing or by moving 'in' and 'out', with the help of shading effects.

Points to be kept in mind, while designing buttons are as follows:

- Button texts should be very clear and legible. Complex textures and font designs should be avoided
- Button design should reflect the mood and ambience of the title. Look at the examples provided
- Small animations can be added over the buttons for mouse over events
- Buttons should integrate well with the background graphics - in terms of theme and colour.



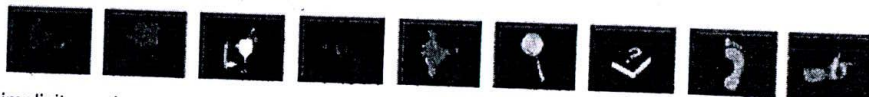
Underwater stones theme reflected in Microsoft oceans



Small wheel like buttons that rotate on mouse over adorn Magic software Mahabharatha



Prehistoric period inspires Microsoft Dinosaurs



Simplicity and ease of use were kept in mind for Tourist's India buttons

Figure 194: Examples of buttons from four different CD-ROMs

20.8.3 Background music

It will be good to have a theme music running in the background, throughout the proceedings of a multimedia project. This music can stop when the user starts exploring something or content related audio starts playing.

Backgrounds add lot more ambience and atmosphere to the titles and should be given a serious thought.

Since backgrounds must play on and on, it is not a bad idea to adopt a lengthy midi piece as the background. On the other hand, the limitations of midi over digital audio may force you to take up the latter, in spite of CPU and memory requirements.

20.9 Storyboarding

Media contents are ready. We have organised them with the help of a navigation map. Backgrounds, music, buttons and menus have also been designed.

Now comes the most important part of the project: presentation. How are you going to present the contents you have gathered? Navigation map and contents organisation help us to decide what should be presented first, and what should go next etc. But when the question becomes 'how' the contents should be presented, we need to resort back to the storyboarding technique, which we discussed earlier in multimedia animations.

Though the technique is very much the same, multimedia project storyboards differ significantly from animation

storyboards. Whereas project storyboards concentrate on how different media contents blend together in every screen, the latter, as you may remember, record the details objects, characters and textures featured in the animation. The following details must be discussed and finalized for each screen (or scene):

- Nature of background music
- Background graphics
- How menu and buttons should be featured
- Content graphics
- Content animations and videos – if any
- Hyperlinks
- Content audio
- Voiceover – if any

Let us look at a typical storyboard and you will understand what I mean.

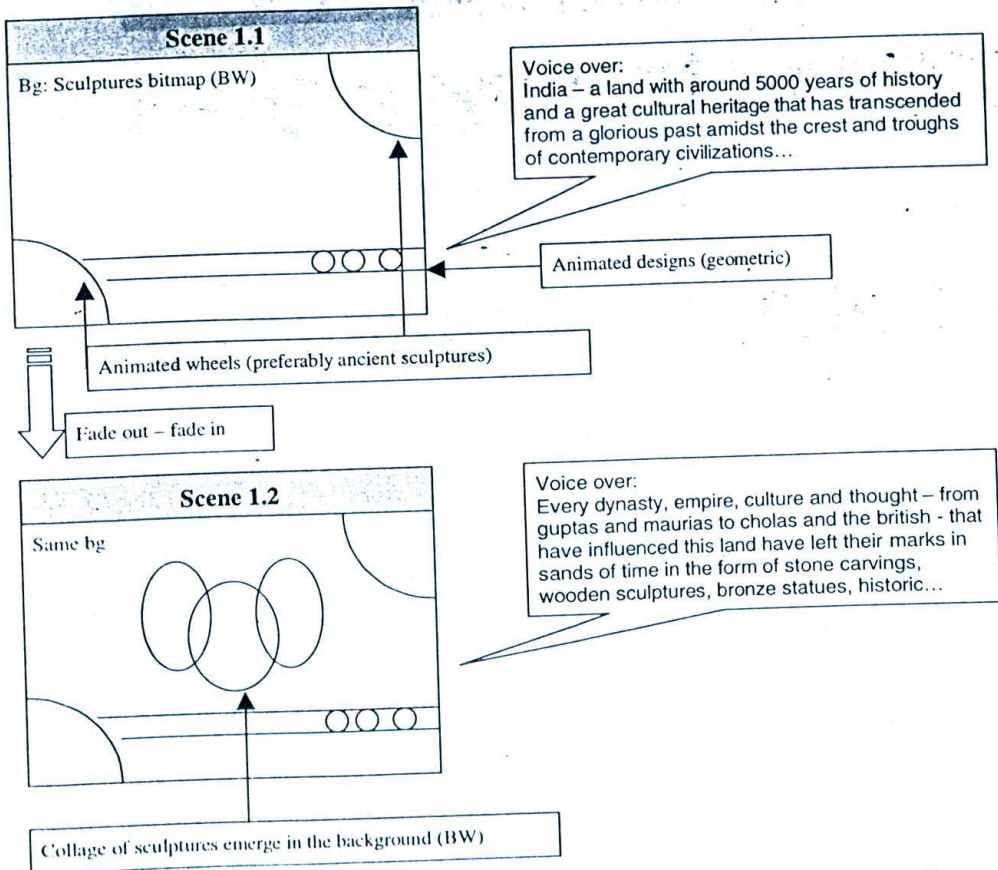


Figure 195: A sample storyboard from a multimedia presentation done at cybervalley systems

For the sake of simple discussions, I have just provided two shots from the storyboard. There are quite a number of things you should note, from this storyboard.

First, notice that the entire presentation has been arranged in the form of sequences and shots – 1.1, 1.2 etc. The first digit stands for a logical sequence and the second number represents the individual shot. To the eyes of the viewer, the entire movie will be a single sequence. The background voice over will be of immense use, in deciding which shot should go first, which should go next etc.

Secondly, take note of the skeletal animation details provided. This gives you some idea about the kind of animations that need to be developed for the project. Take note of the geometric animations that have been added – purely to enhance the visual effects.

The details of transition from one sequence to another have also been recorded. Sometimes this could be mouse click, but in this case, it is an automatic fade-out/fade-in transition.

Now, look at how this storyboard has been turned into a reality with the help of multimedia software.

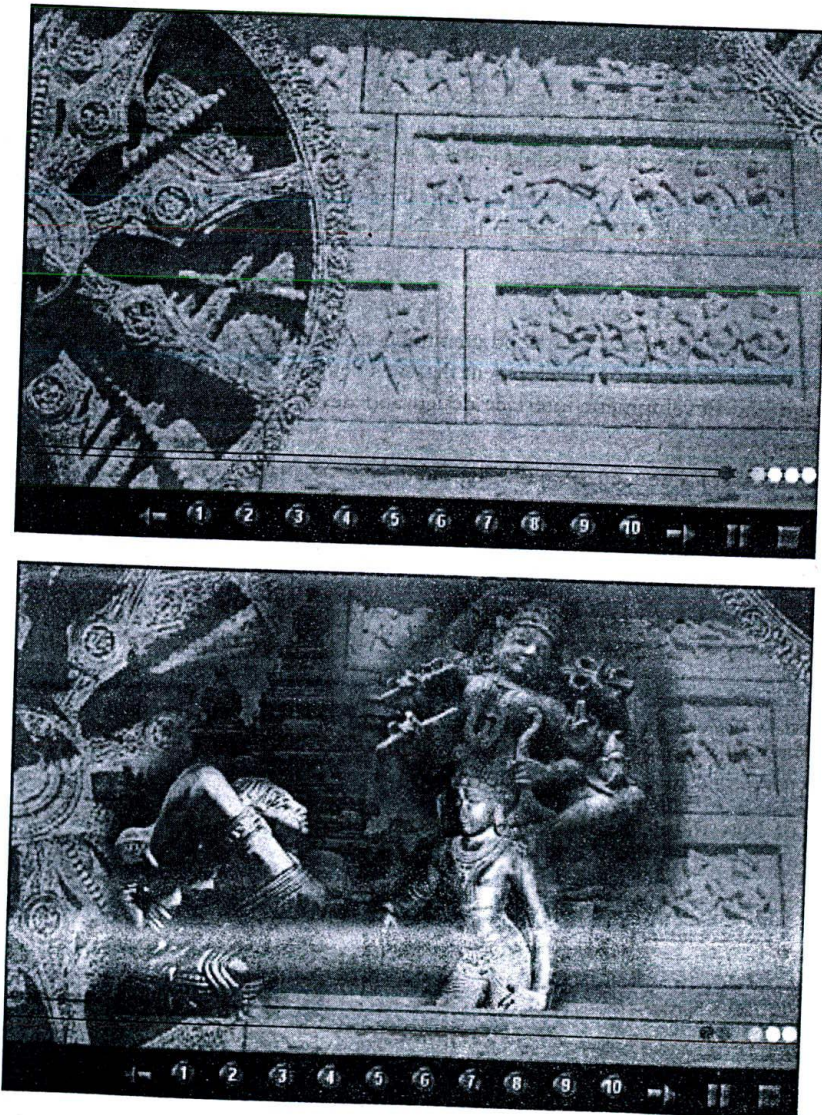


Figure 196: Compare these screen shots with the storyboards we prepared earlier and you will understand how ideas translate to reality

As you look at more and more real life multimedia projects, you will begin to appreciate the art of developing compelling storyboard. I have termed it as an art, rather than a technique or a tool – because storyboarding requires enormous imagination and creativity to visualize the blending of different media in right proportions.

Good storyboards can tell you how the project is going to look like – after production. Lot of time can be saved in revisions, if sufficient time is spent in creating good storyboards...but, alas! Nearly half of multimedia projects produced do not do complete this exercise properly – resulting in wastage of time and resources at a later stage.

20.10 Multimedia programming (authoring)

Multimedia authoring is the process of making use of software tools, to assemble the media contents and deliver them as a single integrated project. We are going to discuss this topic in the next chapter – in detail.

20.11 Delivery

The media, in which the project is going to be delivered, also forms a part of project design. In most cases, the choice is limited to CD-ROMs - because of the sheer volume of the project material. However, if the project is based on Flash and is without huge videos, it is possible to host the same on the web.

If the project is going to be distributed as CD-ROMs, due considerations must be given to the file sizes, compression schemes to be adopted etc. Details of the CD replication have been included in the chapter on CD-ROMs.

20.12 Summary

Multimedia projects require creativity, artistic as well as programming skills. The project needs to be conceptualised first. Then it has to go through various stages of development that includes data gathering, navigation maps structure design, media contents design and development interface design and development, storyboarding authoring and delivery.

Data gathering includes information collection, analysis, filtering and organizing. Navigation maps represent organization of data and could follow linear, non-linear, hierarchical and composite structure. Interface design includes background design, buttons, menus and background music. Storyboarding is the process of putting ideas in paper, which will help us to organise and present media contents.

Multimedia project could be delivered as a CD-ROM or via the web.

20.13 Keywords

- **Multimedia project:** A typical software project, making use of multimedia technology - with specific aim of disseminating explicit information to a well defined homogeneous or heterogeneous market segment - using various media technologies and interactivity.
- **Navigation Maps or Nav-maps:** A map containing all possible navigation paths of the project.

Chapter 21

Multimedia Authoring

CHAPTER OVERVIEW

Multimedia authoring is the software capability to stitch different media elements together.

Authoring can be achieved with the help of dedicated tools or you can do your own programming to assemble different media elements together. This chapter details both the approaches, highlighting the pros and cons of each approach.

In depth discussions on how to select the right tool for the given project - proceeds to give a very good coverage of all of the fundamental characteristics that can be expected in a typical authoring system. The chapter also contains a curtain raiser for some of the leading authoring tools, available in the multimedia market today.

21.1 Introduction

Multimedia authoring comes at the tail end of the project, after all the media contents have been produced and storyboard has been developed. It is important that you understand various stages of project management cycle at this juncture. Hence, please ensure that you have gone through the earlier chapter on multimedia project design and development first – before exploring this topic on authoring.

Like media development, authoring is also accomplished with the help of various software tools available in the market. These tools adopt different strategies for assembling media contents – we will be looking at these different strategies as we go along.

All alterations, modifications, revisions, reconsiderations and redesigning - ends with this phase of the project. So, maximum attention has to be bestowed on every stage of multimedia authoring.

Let us begin our discussions, by getting to know what exactly do we mean by multimedia authoring.

21.2 Multimedia authoring - definition

Multimedia authoring can be defined as the process of assembling or integrating different types of media contents like text, audio, animations and video - as a single stream of information – with the help of various software tools available in the market. The output of authoring process is mostly a multimedia software program that can be executed on any client machine with required libraries installed.

21.3 Multimedia programming versus Multimedia authoring

It is worthwhile to spend some time understanding the difference between multimedia programming and multimedia authoring. Though these terms are used interchangeably in many contexts, I think there are significant differences between the two – that sets them apart.

Multimedia programming refers to the process of writing codes - using one or more programming environments, languages and/or tools - that will handle multimedia contents and present them in an interactive manner to the end user.

Example: A multimedia CD-ROM done exclusively using languages like C++, C# or Java can be termed as a multimedia programming project.

On the other hand, multimedia authoring refers to the process of compiling multimedia projects using specialized software meant for handling various kinds of multimedia and presenting the same as a single integrated project.

Example: A multimedia presentation done with Macromedia Flash authoring environment.

The confusion between the two arises mainly because of one reason: Most authoring environments support some kind of programming using one or more scripting languages! For example, Macromedia Director comes bundled with a scripting tool called lingo. Similarly, Macromedia Flash supports Action script. But you should always remember that these are scripting tools meant for adding some sort of logic into the package and are not full fledged programming languages like Java and C#.

21.3.1 When to go for multimedia programming?

For all normal applications, it is best to make use of one of the multimedia authoring environments. They provide great flexibility, adaptability and give you the ability to change the flow of contents at any point of time. It is easy to compile and distribute multimedia data with the help of authoring tools.

On the other hand, multimedia-programming languages require tremendous initial effort and exposure to system level APIs. Of course, the degree of flexibility is great - you can literally do whatever you want, but this comes at the cost of extra knowledge and effort.

In spite of these arguments, multimedia programming is still preferred in certain occasions - particularly when you want to have first hand control over system level resources. For example, most multimedia games are developed using programming and many adopt their own rendering engine for better performance.

21.4 Authoring methodologies

Every authoring tool, package, environment or platform, makes use of some fundamental methodology, for assembling different media elements together. Some even go one step above the rest and offer flexibility to switch over from one methodology to another - whenever the need arises.

Based on the methodology they adopt, authoring tools can be classified as:

- Frame or page based authoring tools
- Time based authoring tools and
- Icon based authoring tools.

21.4.1 Frame or page based tools

Page based tools visualise every multimedia project as a sequence of *frames* or *pages* - which contain media elements embedded in them. And a whole multimedia project is nothing but a collection of pages or frames - often called as a *multimedia book!*

Every page of the book may contain many media elements - sounds, videos and animations. As the user starts viewing the project, the pages present themselves - one after another, in sequence. One page may have a hyperlink to another page that comes at a much later stage - and by clicking on the same the user might have effectively skipped several pages in between.

Like a physical book, these multimedia books can also be organized into different chapters. The navigation map may contain links to different pages or chapters of the book.

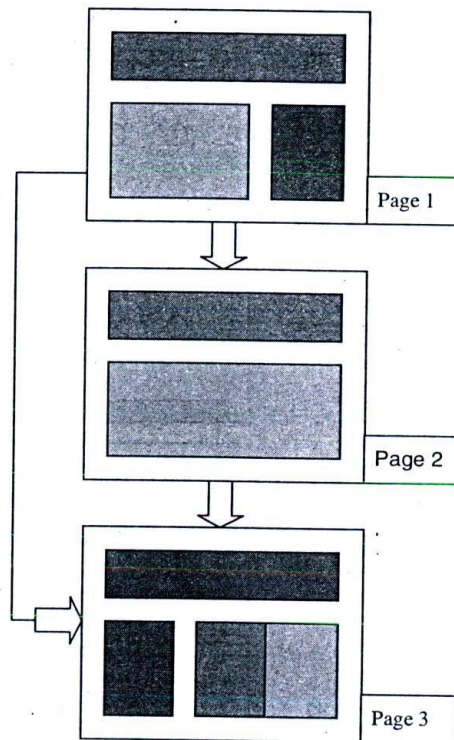


Figure 197: Page based multimedia authoring methodology

This authoring methodology is best suited for those projects, whose contents can be conceived as a sequence of pages or frames.

Asymetrix Multimedia tool book is a commercial authoring tool that makes use of this methodology. Microsoft PowerPoint, though not a full-fledged multimedia authoring environment – is another very good example for page based authoring tool.

21.4.2 Time based tools

Time based authoring tools allow the designer to arrange various media elements and events of the multimedia project - along a well-defined time line. By time line, we simply mean the passage of time – very similar to the timelines we saw earlier in our discussions on video post-production concepts. As the time advances from zero seconds (which will be the starting point of the project) - the events begin to occur, one after another.

The events may include media files playback as well as transition from one portion of the project to another. The speed, at which these transitions occur, can also be accurately controlled. These tools take the help of a software timer - which is a typical clock - that starts at the beginning of the project and graduates - minute after minute. The events happen, one after another - following this timer.

This type of authoring methodology can be very well adopted for those projects, wherein the information flow can be directed - from beginning to end - much like the movies. Macromedia's Director and Flash are excellent examples for time based authoring tools.

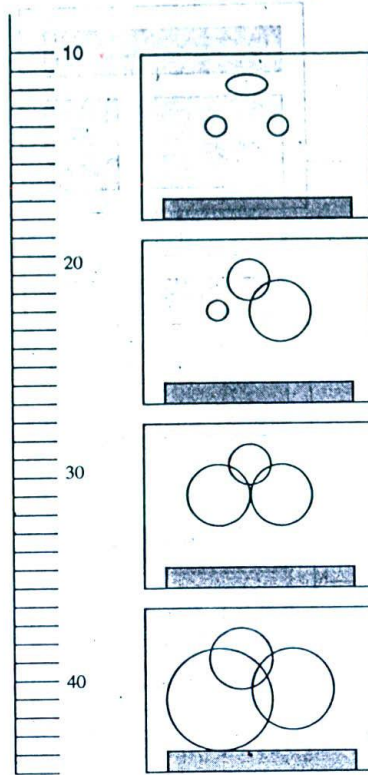


Figure 198: Time based multimedia authoring methodology

21.4.3 Icon based authoring tools

These tools allow each and every event and elements belonging to a particular multimedia project, to be arranged sequentially in the form of icons. These icons are arranged as per the basic navigation map structure adopted - and are driven from one phase to other, by means of events.

Icon based tools can effectively handle even complicated flow of information, with conditional loops. The projects can be quickly created and delivered. One of the leading products in this category is Macromedia's Author ware.

21.5 Characteristics of authoring tools

Apart from the methodology they adopt for integrating media contents, authoring tools also distinguish themselves from each other by means of other features. These include:

- Ability to handle different kinds of media
- Bundled multimedia library
- Mapping features
- Programming features and environment
- Segmentation functionality
- Compilation capability and runtime players
- Media embedding capabilities

To locate the right tool for a given project, we need to look at all these different features as well. Let us briefly discuss them.

21.5.1 Ability to handle different types of media

Most authoring environments and packages exhibit capabilities to edit and transform different kinds of media they support. For example, Macromedia Flash comes bundled with its own sound editor and manipulation utilities, which is satisfactory for most projects. This eliminates the need for buying another dedicated software to edit sound data. Another advantage of using these bundled utilities is that they enjoy better coherence and understanding with the main authoring environment and can eliminate duplication of work. Turning back to the same example of Macromedia Flash, sound embedded into Flash projects can automatically be transformed to mp3 files during compilation. This eliminates the need for buying dedicated mp3 encoders etc.

Certain other authoring tools come with external media editors bundled with them. These are separate editing programs, but are bundled with the authoring environment as a package. These programs may not have all the capabilities of a dedicated media-editing environment, but their basic features can still be put to best use.

While evaluating the media editors and the ability of the tool to handle different media, keep the following points in mind:

- How many different types of media editors are bundled with the tool? Most tools come with sound editors, so look at the other media – how about MIDI editing? Any video / animation editing capabilities are available?
- How effective is the media editor(s) – when compared to professional editors in the market?
- Does the authoring tool come packaged with some of the professional media editors, instead of their own editors?

21.5.2 Bundled multimedia library

Almost all authoring tools - contain lot of royalty free media clippings. These clippings are particularly useful for many occasions and are certainly value additions to the package. As a bundle, they are known by a common term multimedia libraries.

Multimedia libraries usually contain:

- Digital audio clippings under different themes
- Photo libraries – arranged under various topics
- Clip arts
- Animations
- Videos

The combination and quantity of clippings offered in each category may vary from vendor to vendor. The more the clippings are the better.

21.5.3 Mapping features

As discussed earlier, various media contents have to be arranged as per the navigation map structure adopted, and the storyboard has to be developed.

Some authoring environments provide features to develop navigation maps and structuring of contents with ease. Instead of starting this exercise from the scratch on a paper, these tools provide some interface - with the help of which - a flow chart or a storyboard can be easily developed.

This feature is nothing short of a boon, because the navigation structure so developed can then be used for the project directly. It saves time, results in ease of work and permits revisions and additions without much taboo. Do look out for this feature with the eyes of an eagle!

21.5.4 Programming features and environment

Earlier in this chapter, we discussed the differences between multimedia programming and authoring. We also saw that some of the authoring environments support scripting languages. The nature and capabilities of this scripting or programming environment is also a feature to be considered for evaluating various multimedia-authoring tools.

As the scope and capabilities of the scripting language increases, it invariably becomes complex. Also, there is a learning curve associated with their usage. This is particularly a challenge, because multimedia programmers often have difficulty learning conventional programming languages. They are usually good at making the best use of ready-made tools and features – rather than bothering about classes, instances and inheritance!

While evaluating the scripting environments, keep the following questions in your mind:

- How easy is the scripting language to use?
- Is it capable of performing low level system calls and APIs?
- How difficult it is to teach this language to a new bee?
- Is the scripting language available outside the authoring environment?
- Is it possible to do authoring without this scripting language?

The following table lists all the scripting languages supported by different authoring environments:

Table 31: Scripting languages supported by different authoring environments

Tool	Script
Macromedia Director	Lingo
Macromedia Flash	Action script
Asymetrix Tool book	Open script

21.5.5 Segmentation functionality

No multimedia project can be completed in one go - because of the sheer volume of work involved and the complexity associated with authoring.

In actual multimedia production environments, the projects progress - from one stage to another - in a sequential manner. These individual groups of frames or elements of a project are called *segments* of a project. The number of segments in a project is determined by the size of the project and the professionals involved in authoring.

Now, these different segments have to be compiled and tested individually, and then, they have to be integrated as one seamless stream of content. Also, the segments that work well as individual sequences should be consistent in their behaviour - when integrated with other segments.

In the authoring environments, these segments can be understood as sub-projects, which are ultimately integrated to deliver the bigger project. How efficient the tool is, in supporting this kind of segmentation and integration is the point to be considered.

21.5.6 Compilation features and runtime players

Once the project is done, it has to be compiled and delivered. Compilation is the process of generating machine specific codes and compressing the program. Authoring environments compile multimedia projects in three formats:

- As a stand-alone executable program
- As an executable program with dependent libraries
- As proprietary compilations with run time player programs

A stand alone executable is the best among the three. It is very easy to distribute and maintain. It does not need

dedicated installation programs. Also, it can be distributed on the net as a single download. A good example for such a program is Macromedia Flash whose compilation results in a single .exe file.

The second choice is not as good as the first. These tools also compile the project as an .exe file – but these executables require certain libraries to be present on the client machine. To make things more complicated, windows requires that some of these libraries be registered under windows registry so that they are available to the operating system as and when required. An installation program is necessarily required for installing and registering the dynamic link libraries (dlls). All these complexities can be tolerated, if the authoring tool itself provides features for creating an installation program; otherwise, we need to buy external installation programs like Install shield – which is going to cost money.

The third choice is a stand alone run time player, which actually plays the compiled project. These players come with the authoring software and are freely distributable. The compiled project will be in a proprietary file format and only the run-time player can understand and comprehend this data. This is preferable for corporate presentations etc. and not for large-scale consumer level distributions.

21.5.7 Media embedding feature

Multimedia projects make use of many audio, video, animations and graphic files. These content files can be bundled into the project by two ways: Linking and embedding.

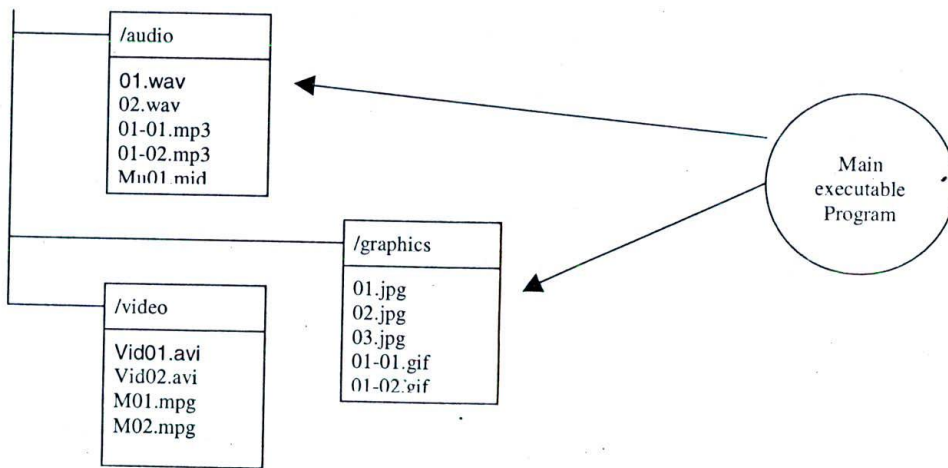


Figure 199: Schematic representation of linking process

Linking is the process of keeping the media contents as separate files in independent directories and calling them as and when required. In many projects, you can see directories like audio, video, graphics etc that contain independent media files. The problem with linking is that the end user will be able to see all these different media elements and start using them for their own purposes. If you don't mind this, then it's OK but if you want to safeguard the copyright of your media elements, linking is not a preferred choice.

Embedding is the process of compressing all the different media files and bundling it either with the exe or keeping it as an asset file and distributing it with the project. Media files embedded into the project are not visible to the end user as independent files – and it is not possible to decompress and decipher them. Windows provides cab files, which are files of similar nature. Embedding provide watertight security over the media content files.

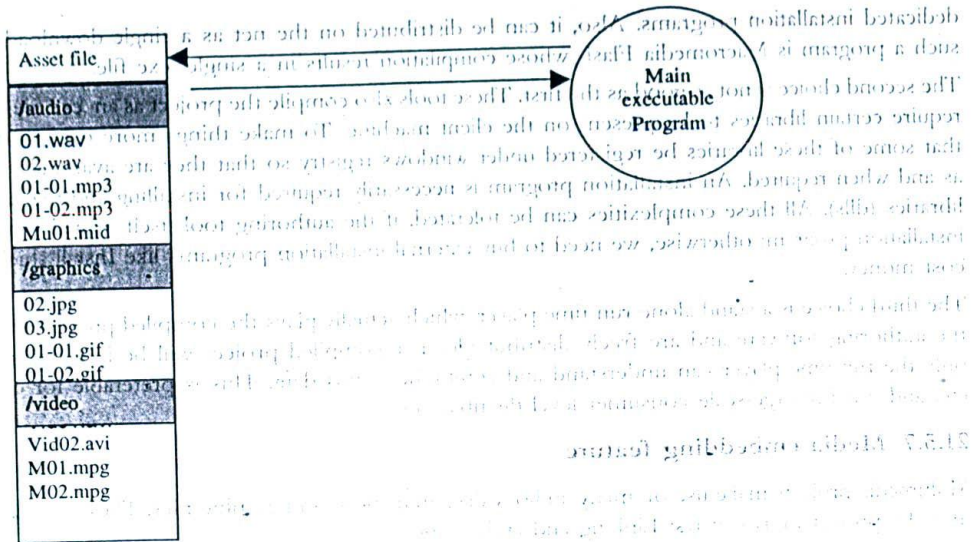


Figure 200: Schematic representation of embedding process

21.6 Tips for selecting the right authoring tool

It is better to specialize in one authoring tool and use the same for all projects. Either you are an individual or a consultancy, choose a tool that will suit you best and try to use it for most if not all projects that come to you. This will help you to specialize in all the advanced features supported by the tool and also realize the limitations of the tool.

Now the question is: How to select the right authoring tool?

The tool should be chosen based on the following criteria:

- The general features of the tool
- Your own capabilities (what's available and what could be developed in the near future)
- Your requirements (present and future)

We already saw what are all the general features of multimedia authoring tools. Some of these features may be more important to you than the rest – so the tool that supports those features must be given precedence over the rest. For example, you may think that you can collect all the different media elements required for the project by other means – hence the bundled media library may become less important or less useful. On the other hand, your specific project may require some sort of device handling capabilities which are available only in certain advanced scripting tools – in this case, scripting becomes very important feature to be considered and so on.

Whatever may be the features available with the tool, you – as a user – must have the capability to take advantage of those features. For example, if you have little or no exposure to programming languages and think that programming is too difficult for you – then obviously all the scripting features lose their importance. You should then concentrate on ease of usage and the power of auto compilation and so on. On the other hand, if you are already familiar with technologies like object oriented programming, then you would naturally like to take advantage of that knowledge and try to capitalize on it. In this case, all the scripting and system level capabilities of the tool assume importance.

And lastly, you should consider what sort of projects you are trying to do and what sort of activities you are likely to be engaged in the future. Are you trying to specialize in corporate multimedia presentations or multimedia websites? Do you want to hit the commercial multimedia market or are you satisfied with specialized market segments? Are you product oriented or service oriented? All these questions need to be answered clearly. There is no harm in

not knowing very clearly what you are going to do – in most cases that will be the situation! In that case, specialize on a tool that is most versatile and adoptable to different kinds of projects.

21.7 Commercial authoring tools - a curtain raiser

Few years before, when multimedia made its appearance in the horizon, there were at least a dozen big time players offering authoring solutions – apart from countless small players. Now, during the passage of time, the industry has settled down and market leaders have emerged.

Macromedia is the company leading the show, with its group of authoring solutions. Its Flash MX, originally indented to be a vector based animation system, has revolutionized the way multimedia contents are created – particularly for the web.

In this section, we will try to have a brief preview of the authoring solutions currently available in the market. As you can understand, the data presented here is very much volatile and was verified at the time of this writing. Please double confirm the information I've presented with that available on the web.

Table 32: Preview of some of the multimedia authoring tools available in the market

Tool	Company	Platform	Website
Director MX	Macromedia	Windows / Mac	http://www.macromedia.com
Flash MX	Macromedia	Windows / Mac	http://www.macromedia.com
Author ware	Macromedia (Playback only for Mac)	Windows	http://www.macromedia.com
Tool book Instructor	Asymetrix	Windows	http://www.asymetrix.com/en/toolbook/toolbook_instructor.asp
X Builder	Acrux Software	Mac	http://www.acruxsoftware.com
iShell 3	Tribe works	Windows / Mac	http://www.tribeworks.com/products/ishell/index.asp

I will be highlighting only the salient features of the product. In order to have better understanding, it is best that you download a trial copy of the tool you want and start playing around. IT magazines publish periodic reviews of authoring solutions from time to time. Do check them up for a comparison on various features between the products.

21.7.1 Macromedia Director

A heavy weight industry leader in multimedia authoring, Director has been in existence for several years and has maintained its leadership in both Windows and the Macintosh worlds. Though its positioning has somewhat been disturbed by the introduction of Flash, Director continues to be one of the most comprehensive solutions for multimedia authoring.

Director works through Lingo, a well-advanced scripting language that lets you add logic to the flow of contents. Automated effects like transitions are aplenty. But the working environment and the tool as a whole is slightly complex and requires reasonable time to master.

Table 33: Director functional specifications

Specification	Detail
Developer	Macromedia(http://www.macromedia.com)
Supported platforms	Windows 98, 2000 or XPMac OSX10.1.2 and above
Latest version (at the time of writing)	Director MX
Media support	Around 40 + media types including all graphic formats, WAV, mp3, AVI, AIFF, QuickTime, mpeg, Shockwave, Flash, Real Media etc
Scripting language	Lingo

Director works in two modes. In overview mode, elements are arranged as icons in the required sequence and executed - without user interaction. In studio, all the media elements - called casts - are arranged in different channels and played back in the stipulated time period. The tempo of playback can be controlled. The scripting language allows us to add interactivity and navigation control.

Lingo contains built in script editor for debugging the user code. Once written for a particular element - or cast - it can be copied and pasted across different casts, thus making transfer of behaviour across the elements easy. Apart from this, Lingo also uses special code segments called X objects - that can control external media devices.

All director documents can be linked or imported and the same elements can be shared amongst the casts, in one project.

Studio is the environment wherein the assembly takes place. Media elements or casts can either be created exclusively using director's tools or can be imported. Once the casts are ready for a segment, then they are assembled in a sequencing environment - called the score, which arranges different media elements in different channels and plays them back on the stage - at required speeds.

The synchronisation of various channels, results in sequential flow of information.

21.7.2 Macromedia Flash

If there is any tool that is groundbreaking and which has revolutionized multimedia - particularly on the web, it is Flash. When companies were struggling to pull different types of media contents and effects over the web, Flash made web multimedia a reality. Apart from web, flash has also become a tool of choice for multimedia presentations, CD-ROM projects and kiosks.

Table 34: Flash functional specifications

Specification	Detail
Developer	Macromedia(http://www.macromedia.com)
Supported platforms	Windows 98 SE, 2000 or XPMac OSX10.2.6 and above, 10.3
Latest version (at the time of writing)	Flash MX, Flash MX Professional
Media support	Most graphics formats, videos (AVI & Quick time), audio (mp3, ADPCM Wav etc.), Adobe Pdf, EPS
Scripting language	Action script

In flash, different media elements are arranged along the time line in different tracks. As the timeline advances, events occur and contents migrate or change. Most of the animations are done as vector graphics, so that they are not heavy for the processor. It is also possible to animate bitmapped graphics. Flash has advanced capabilities for organizing media contents in the form of libraries. One of the most powerful features is to store independent vector animations and drag and drop them over the main project.

Events are controlled with the help of action script. For example, in order to react for a mouse click event over a button object, one has to invoke action script and write few lines of code.

Transition effects are accomplished using alpha channels (fade-in / fade-out etc.). Videos can be manipulated and rendered online. All the various audio tracks can be rendered as mp3 during compilation.

In short, flash is a wonderful tool that is hard to resist.

21.8 Summary

Multimedia authoring is the final stage of multimedia project production.

Multimedia programming offers a slightly different approach to assembly – as compared to authoring tools. Different methodologies adopted for multimedia authoring can be grouped as Frame or page based authoring, Time based authoring and Icon based authoring.

Characteristics to look forward in an authoring tool or environment are: Media handling features, bundled media library, mapping features, programming features and environment, segmentation functionality, compilation feature and runtime players and media embedding feature.

Some of the famous authoring tools, available in the market are: Macromedia's Director, Macromedia Flash and Macromedia Author ware.

21.9 Keywords

- **Multimedia authoring:** The process of developing a software program, that will accept all of the media elements involved with the multimedia Project under production, put them up in their respective places - as advocated by the Storyboard of the Project and evolves as an integrated source of Information - many times supplemented by the interactivity, provided by means of Navigation paths.

Chapter 22

Project Planning and Costing

CHAPTER OVERVIEW

So far, we have been laying heavy emphasis on technology and technical aspects. Let us take a break and take a look at the managerial aspects involved with multimedia project design.

To some extent, most of these discussions are relevant for not just multimedia – but even for all other kinds of projects. But there are few things that are very specific to media development and we will be uncovering the same.

It is interesting to compare this chapter with an earlier chapter on multimedia project conceptualisation and design. They take different approaches to the same project development – one concentrating on technical aspects of the same and the other looking at the same from a managerial perspective.

22.1 Introduction

This chapter differs from all the previous ones in that it is not very technical in nature. Instead, it talks about multimedia project planning, execution and costing strategies. It is particularly meant for managers and team leaders who are handling multimedia projects.

However good may be the technology, a project will fail without proper managerial strategies. Enough time should be spent on aspects, which normally miss the attention of technical manager. Improper project planning is noticed even in large corporations and millions of dollars are wasted due to poor managerial decisions.

Apart from discussions on various issues that need to be taken care of, the chapter also provides some mathematical approaches from operations research methodologies to effectively manage multimedia projects.

22.2 Multimedia project planning

Multimedia project planning involves the following phases:

- Idea generation
- Market definition and segmentation
- Planning the required skills and resources
- Building the team
- Planning the project phase: Pert and CPM techniques
- Time estimates and cost estimates.
- Pilot projects and prototyping
- Production – design and development

- ❑ Alpha and beta testing
- ❑ Delivery planning

Each phase can again be subdivided into several distinct stages. A schematic representation of these stages has been provided in the diagram.

Let us start discussing them one by one.

22.3 Idea generation

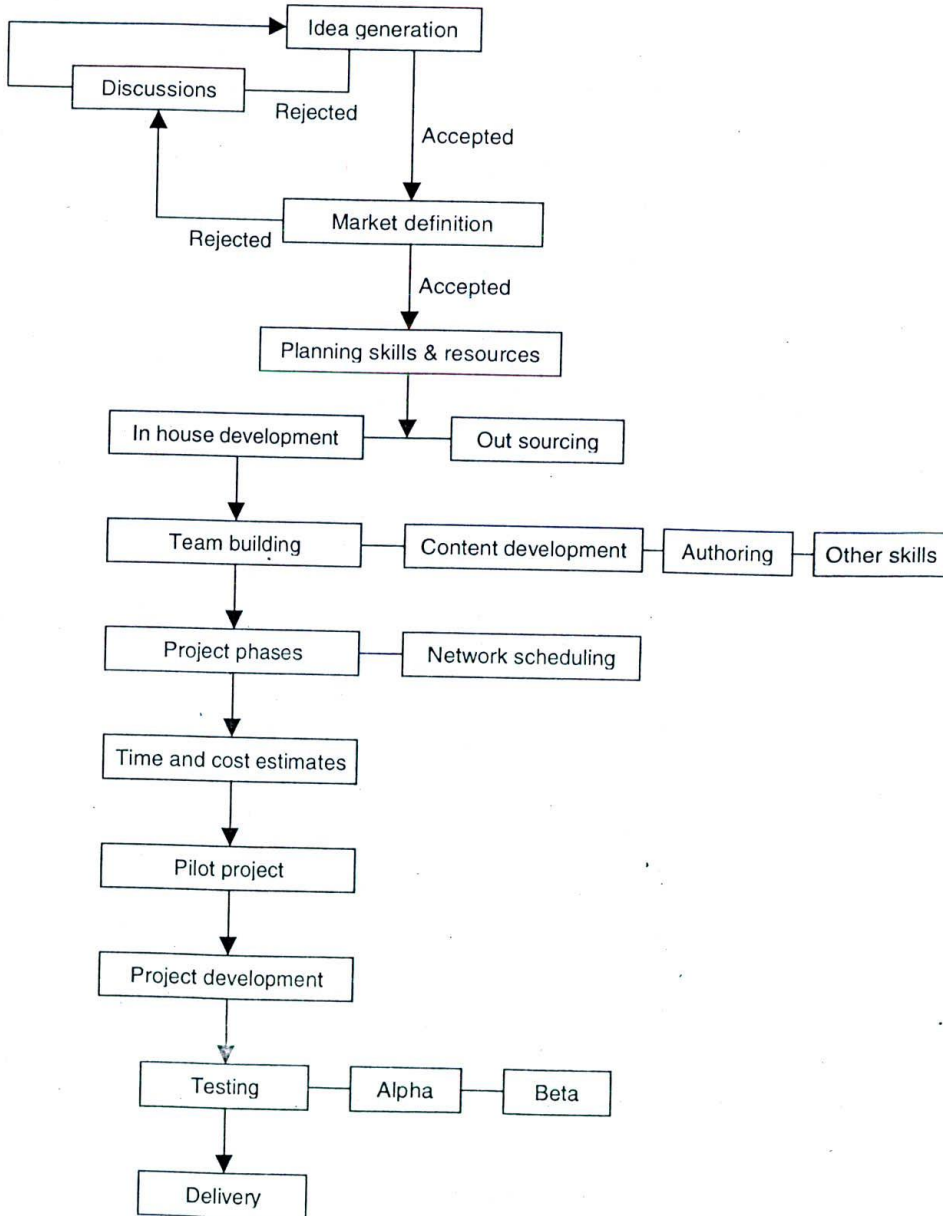


Figure 201: Different phases of project planning

Every multimedia project originates with an idea or concept. We already dealt with this earlier during our discussions on project design, but here, we look at it from a slightly different perspective.

For those projects, which are developed for specific customers, the concept is available from the customers themselves. For example, if we are designing a multimedia touch screen kiosk for a five star hotel - the hotel authorities themselves will give you some idea as to what they expect out of that project. Of course, the concept has to be polished and improved by interacting with them – but the basic idea is available.

On the other hand, if the project is product oriented, i.e. say if it is a multimedia CD-ROM meant for public at large, then idea generation becomes very critical and complex.

The success of the product starts with the idea. However captivating may be the design and programming work, if the theme of the project is not of interest to the end user, the product miserably fails. So the central theme of the project or idea becomes extremely important for the success of the project.

How to bring out a successful idea?

Well, this question is obviously very difficult to answer - for if the answer had been known to all, there would not have been such a huge number of unsuccessful projects...! It's like selecting a story for a movie – nobody can predict in advance how well the concept will go, though we can do some sort of projections based on logical thinking.

Having said that, do take care of the following points while fishing for ideas – they will try to guide you in the right path.

- Try to think of new and fresh ideas that have not been tried before. Particularly if you are a start-up or someone new to business world, new ideas are your greatest strengths. Old and established companies always have problem breathing fresh air. New and fresh ideas always shake up the industry.
- If there is already a product available in the market, see if there is scope for accommodating another one. See how far you improve upon the idea. Analyse whether the existing product is fully capitalizing the market potential.
- When ideas come and go, think about the market segments they address, Market segmentation is detailed in the next section.
- Let not the individual interests and perceptions come into picture - while deciding upon the idea. Topics, which are of great interest to you, might not be very captivating for the majority of people. Be rational and unbiased.
- Try to concentrate and specialize on certain specific areas or titles rather than addressing vast and unrelated areas. If you specialize in edutainment, let not your focus be drifted by other kinds of opportunities.
- Be realistic. Think about your own capabilities, resources and budgets and choose those ideas that can be practically implemented.
- Let the ideas pour out from all quarters of the society - not only from your organisation, but also from the market segments for which you are generating the title. For example, if you are producing products for children, speak to children first – not to your marketing manager! *You will be surprised to see that what you think they want is not exactly what they really want!*
- For the regional market, it's better to concentrate on ideas that reflect the culture of the land etc. and for international market - try to think of topics of general interest.
- Engage in brainstorming discussions and take as much time as you want for idea generation. There will come a stage wherein a potential idea will convince you and the team, much more than the rest! Debate till you reach that point!

22.4 Market definition and segmentation

Once the idea is generated, the expected market segment must be identified, so that the title can be designed and

produced accordingly. Market segment refers to the group(s) of people with certain basic traits/characteristics or tastes - who may be interested in the product.

For example, let us try to identify the market segments for a CD-ROM that will teach English nursery rhymes to schoolchildren.

Shall we say 'all kids aged between three and eight' are our end users?

Ushhh... wait!

The kids who are going to buy our product should have access to computers either at home or at school. Hence we need to modify our definition of end users: 'All kids aged between three and eight, who have access to computers'.

Even this seems to be rather vague. How do we know how many children in a particular country are having access to computers? It will be difficult to project any figure. Let us see if we could be more specific.

First, children who have access to computers only at schools will hardly buy a CD-ROM. They need to have a computer - that too, a multimedia PC at home. Now, we need to search for newspapers and magazines for some statistics on these areas.

Looking at the last year sales figures of multimedia computers, let us assume that we have the following figures:

- 60 % of those families, whose monthly income is above Rs.30, 000 have purchased multimedia computers at home
- 40 % of those families, with monthly income above Rs.20, 000 have purchased computers at home, and 10% more are seriously considering a purchase in the near future
- Less than 10% of those families with monthly income less than Rs.10000 have purchased a computer.

Note: These figures have been provided purely for illustration and do not represent any real statistics available from market research.

Now, the mist begins to be getting cleared and you are beginning to get more and more specific. Let us assume another set of statistics, for the sake of our discussions:

- Around 50% of those who own multimedia computers, purchase multimedia CD-ROMs
- Around 30% are content with free CD-ROMs that are distributed with magazines and those that are available from friends
- Around 20% do not use multimedia CD-ROMs at all

Now, the scenario is much more clear - than it was, when we began this discussion. Let us try to redefine our user: 'Kids aged between three and eight, whose family income is above Rs.30000'. You can go on like how many of those will be learning English and how many will be interested in learning rhymes via a multimedia CD-ROM and so on.

Though kids might be interested in our product, unfortunately, the purchasing decision is going to be made by the parents! This is where the second statistics comes handy - remember that only 50% of those who have computers are prepared to spend money on CD-ROMs!

We can go on with this exercise until we can arrive at a ballpark figure as to how many people will be really interested in purchasing this CD-ROM. The actual purchase - in a most pessimistic projection - will be less than 25% of the total purchasing potential available.

If the market segment is not big enough or too big to address, then you have to go back and take a fresh look at the idea you are exploring... may be it needs to change.

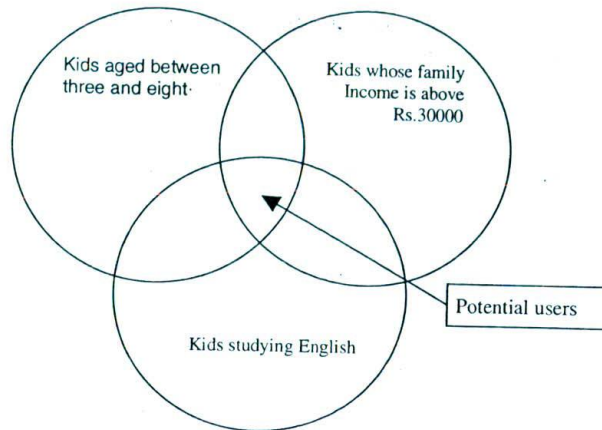


Figure 202: Identifying the right market segment

22.5 Planning skills and resources

Once the idea of the project and been conceived and proper market understanding is done, it is time to think about how to make the idea a reality. This is the stage where we critically evaluate the skills and resources required for the project.

Do we have sufficient skill set, resources and bandwidth required for the project? Will it be economical to do the project in-house or should we outsource it? If we were to take up this project in-house, what is the delivery schedule we are looking at?

These are some of the questions that come up at this stage. Many companies and individuals who are undertaking multimedia project work for the first time, under estimate the amount of effort and time involved. This is mainly due to lack of experience. There is no harm in consulting the experts who have prior experience in handling such projects – in fact their inputs will be of great use.

Some projects may demand intricate programming or authoring skills while certain others may demand more artistic skills. Skills required to develop a project meant for teaching music is almost certainly different from the skills required to develop a project on – say touch screen shopping kiosk.

All these things need to be given proper thought, at this stage.

22.6 Building the team

If we decide to do the project in-house, then we need to form a project team, identifying the professionals who will be involved in the project. This topic will get detailed coverage in the next chapter and hence will not be discussed here.

22.7 Project planning: Pert and CPM techniques

Project planning is a very detailed topic and there are people who specialise in just this topic. The mathematical approach that's available on this subject is called 'Operations research' and it offers highly scientific approach to project management.

Operation research, as a subject, is a vast area - encircling wide varieties of theories and techniques. Most of the theories are available in the form of mathematical models. Here, we shall concentrate on some of the models that'll be of direct use to those involved in project planning.

Direct costs are those that are consumed directly by the project. For example, the cost spent for the technical manpower engaged for the project or for the rental charges associated with the computers used etc. - can be called as direct costs. One distinctive characteristic of direct costs is that, if we increase the same, the multimedia project time consumption can be reduced.

Following the above example, if we engage more man-power and / or more machines on the project - the project time consumption is sure to come down. On the other hand, indirect costs are the standard overheads associated with the project, including the loss of revenue due to delayed completion of the project. This cost will decrease directly with the project time.

22.13.2 Crash cost

Crash time is the minimal possible time duration, in which a given activity can be successfully completed. The cost associated with crash time is called crash cost.

22.13.3 Normal cost

Cost incurred by the activity, under normal time duration. For economising the project costs, the sum of direct as well as indirect costs should be minimised.

22.13.4 Optimum project time

The time duration, for which the sum of direct and indirect costs will be minimum, is called optimum project time.

22.13.5 Project crashing technique

The technique of finding the direct activities cost - when project duration is reduced by one unit time, each time and thus arriving at the optimum time duration - is called the project crashing technique.

The cost of crashing a given activity, by a unit time, can be calculated as follows:

$$[\text{Crashing costs} - \text{Normal Costs}] / [\text{Normal time} - \text{crash time}]$$

Crashing technique calculations are complicated and beyond the scope of this work. Those who want to know more can refer any good books operation research or network scheduling.

22.14 Pilot projects and prototyping

In case the project is of new type, it's better to go in for a prototype of the project. The prototype should include all intricacies of the project - as far as possible. The interface designs can be tested for their appeal, or the performance of the project - under a variety of hardware platforms - can be tested.

In many cases, the work done for the pilot project can be very well utilized for the actual project also, and thus, prototyping cost can be justified.

22.15 Project design and development

We had already seen all phases of project design and development - in an earlier chapter. This phase has been purposely included in project planning to emphasise that - after all, the design and developmental activities are, but a part of the overall project planning activities.

22.16 Alpha and beta testing

Once the project is over, it has to undergo rigorous testing. Testing identifies bugs; check whether the performance of the application is good across heterogeneous systems etc. Testing is undertaken in two stages.

22.16.1 Alpha testing

Alpha testing is the first phase of project testing. The alpha-testing group usually consists of colleagues (from other

departments / projects), friends and those who are known to the organisation.

The tests are conducted under all possible conditions that can be expected in the client's workplace. The bugs generated are called 'alpha bugs' and are generally of more serious nature - if any.

The output of alpha testing is generated as a report, and the identified bugs / modifications are fixed by the programmers and fed to beta testing.

22.16.2 Beta testing

A wider and more heterogeneous circle of people does the beta testing. You can usually find many programs in their beta testing stage - in the Internet. A typical beta testing group should be a true representation of the expected user community. The test report of beta test should be given equal importance - as that of alpha test.

22.17 Delivery planning

Depending upon the size of the project and the user community, the delivery mode of the project has to be planned. The most preferred choice is a CD-ROM.

The finally distributed material should contain the following material, apart from the main project program:

- A friendly installation program - that'll install the project modules, on the user's computer.
- A printed user guide /manual
- The product registration card
- Certificate of authenticity, if any.

22.18 Summary

Project planning and costing are mainly concerned with the managerial and financial implications of multimedia project. The processes involved are: Idea generation, Market definition and segmentation, Planning skills and resources, Building the team, Project planning, Time and cost estimates, Pilot projects and prototyping, Production - design and development, Alpha and beta testing and Delivery planning.

Market segment refers to the well-defined group of people, who may be interested in the product. Identification of Market segment helps the producer, to develop the title, accordingly.

Operation research theories such as Pert and CPM can be used to plan the project time and activities. Project crashing method can be used to strike the optimum balance between time and money.

22.19 Keywords

- Critical path:** The path of the Project - wherein, any delay in execution of activities will result in overall delay of the Project.
- Critical activities:** Activities that are lined along the critical path.
- Optimum project time:** The time duration for which the sum of direct and indirect costs will be minimum.

Chapter 23

Multimedia Skill Sets and Career Opportunities

CHAPTER OVERVIEW

This chapter is also relatively non-technical in nature.

It provides a preview of multimedia as an industry and talks about various careers that have sprung up around multimedia technology. It talks about careers in each and every discipline, tools that need to be learnt, attitudes and talents required and so on.

The later part of the chapter is about the multimedia team that is at work. Each team member is introduced and the responsibilities they handle are detailed. The last part contains approaches a student should take, in order to launch a successful career into the world of multimedia.

23.1 Introduction

The skill sets required in the multimedia industry are widespread and heterogeneous. When I say multimedia industry, I'm talking about an industry spread across the globe and not restricting myself to specific regions or countries. There are tremendous career opportunities available and the industry is growing at reasonable phase.

Having laid such a broad scope, let us see what are all the different skill sets required and who are providing them.

Every other media involved with multimedia demands specific kind of expertise to handle. And that makes multimedia a truly heterogeneous industry, providing opportunities to a wide variety of people. On the other hand, not all companies can recruit and maintain all these different classes of people; hence, outsourcing is most common. This provides opportunities for entrepreneurs, who can concentrate on specific kind of service and make them available to multimedia production houses.

23.2 Multimedia companies

Before we start discussing on the skill set requirements, let us try to understand something about those companies, which are involved in multimedia business.

Multimedia has affected and continues to affect a wide variety of businesses. Multimedia technologies have revolutionized the way these industries were functioning and have created deep impact on a global scale. Some of the industries that make extensive use of multimedia include:

- Magazine and newspaper publishers
- Book publishers
- Web publishers
- Television stations

- Audio companies and studios
- Video and cinema production houses
- Advertising companies
- Training & development companies

Apart from these, there are numerous multimedia consultancy firms, which dedicate themselves to core multimedia development. One thing to note here is that not all of the above businesses involve themselves in exploiting all kinds of media. For example, publishing companies will be interested mostly in graphics and layout design software. Similarly television stations will be interested in video editing and three-dimensional software.

If so, then who are all the people, who involve themselves in true multimedia development? What sorts of companies are involved in the development of multimedia CD-ROMs, websites and games?

- Many publishing houses have started involving themselves in producing multimedia contents, through their multimedia division.
- Few international television stations like BBC are also involved in multimedia development
- Traditional software development firms have spun off multimedia division
- Few of the advertising firms have started doing multimedia presentations for their clients
- Quite a number of consultancy firms are also involved in the development of multimedia

All of the above-mentioned businesses provide opportunity for a budding multimedia professional to shape up a career in this exciting and creative world of information technology.

23.3 Multimedia skill sets and careers

A professional involved in multimedia development can specialise in any of the multiple media offered by multimedia. Depending upon the skill set, several titles and careers have sprung up over these years. These include:

- Graphics developer or Digital imaging specialist
- Graphic artist
- Digital audio specialists
- Animators – two dimensional and three dimensional
- Animators – Modelling and texturing specialists
- Character animators
- Video post production specialists
- Multimedia authoring / programming specialists
- Multimedia web content developers or Web designers

This is not really an exhaustive list, but it is enough to show that multimedia has been creating opportunities for countless individuals with creative talents and exposure in information technology. Down the line, as multimedia hits mainstream and becomes a part of everyday life like video and audio, more and more opportunities will spring up for professionals as well as entrepreneurs.

In the following paragraphs, we will look at the skills in which one should specialize – in order to become a professional in the selected area. I've also provided a glimpse of software that need to be mastered, in order to get decent career opportunities.

23.4 Careers in digital imaging

Digital imaging is expanding at a rapid phase. From publishing industry to advertising its impact is widespread and deep. Hence career opportunities are naturally in abundance in this field.

Graphics specialists are usually expected to work with digital imaging software like Adobe Photoshop and Corel Draw / Photo paint to create the desired effects and layout. Depending upon the industry, the nature of work might vary. For example, if you are working for a publishing house, the nature of work might be to produce decent layouts for the articles, create compelling graphics for the features and covers etc. if you are in an advertising field, you will be asked to create visuals that convey the message with strength.

Graphic artists are also required for many other industries like multimedia consultancy firms, architectural firms, engineering consultancies etc.

In order to specialize in digital imaging, a student must be highly proficient with the following tools:

- Adobe Photoshop
- Corel Draw / Corel Photo paint
- Any publishing and layout software
- Scanning and digital photographic software / process

Apart from the above-mentioned tools, specialization in any of the following tools / areas is most desirable:

- Vector illustration tools like Adobe Illustrator and Macromedia Freehand
- Three dimensional software like Maya and 3D studio max

Very strong senses of colours, a taste for artworks and preferably a conventional artistic background are the desirable qualities of a good graphic designer.

23.5 Careers in digital audio

Most recording studios have started adopting digital audio because of quality, flexibility and adoptability. These studios make use of state of the art hardware and software to do professional recordings. Career opportunities are available here for professionals who specialize in digital audio.

Since many of these studios are related to entertainment industry like cinema or television, it is good to have some background or contacts with that industry, in order to make out a successful entry here. Recording facilities attached to cinema studios in particular, offer lot of opportunities for creative individuals. Many special audio effects are required for movies, which are increasingly adopting international theatre standards like DTS and Dolby digital.

Students aiming at a career in digital audio need to specialize in the following software:

- Cakewalk Professional
- MIDI synthesizer pro
- Digital Orchestrator
- Voyetra Music Write

A formal knowledge of classical music – western or otherwise – is highly desirable.

23.6 Careers in animation

Two dimensional animation and more importantly, three-dimensional animations are evolving into a multi billion dollar industry across the globe. The need for creating imaginary characters and environments is on the increase at a feverish phase due to the exploding number of television channels and cinemas that are packed with digital special effects.

You will be surprised to know that this industry is very seriously in shortage of skilled professionals. True that we see hundreds of students taking up a course in three-dimensional animations – but their skill sets unfortunately fall behind the industry expectations.

Several specialised careers have evolved over these years, around three-dimensional software. Companies are prepared to hire dedicated professionals who are highly specialised in modelling or even texturing. Opportunities are widespread

– from Bollywood to Hollywood. The only thing is that you should really be a master in the field you specialize.

The following carriers are offshoots of 3D:

- Digital animators
- Three-dimensional / Character modellers
- Three-dimensional texturing / painting specialists
- Character animators
- Three-dimensional Environment specialists

Since this field is becoming increasingly popular among the professionals, I've dedicated a few paragraphs later in this chapter – as to how one can approach professional companies for careers in three-dimensional software.

Let us discuss the skill set requirements for this field. Total expertise is required in any one or preferably more than one of the following software:

- Alias / Wave front Maya
- SoftImage
- 3D Studio max

Along with them, it will be great if you could get exposure to one or more of the following tools:

- Rhinoceros 3D (Modelling software)
- Pixar Render man (Rendering software)
- Painter 3D / Deep paint 3D

Apart from this set of three-dimensional tools, if you can train yourself in video post-production techniques, then you could specialize in composing i.e. the art of mixing three-dimensional images over live video footages.

What are all the attitudes desirable for a successful animator? First and foremost requirement is that you should be an artist who can draw good pictures in paper or at least possess great interest in doing the same. Most professional animators can draw characters and objects extremely well on paper. The attitudes seem to go together. A sense of rhythm and movements, keen observation, an appreciation for colours and some knowledge of human and animal anatomy are all the desirable qualities.

23.7 Careers with video post-production

Many cinema studios have now installed video post-production facilities within their premises. Apart from them, there are also dedicated companies that specialize in the art of video post-production. These places offer opportunities for multimedia professionals who are sufficiently trained in the art.

As a post-production specialist, you will be mostly working on video footages, editing them, mixing them with audio and doing the necessary composing work. Apart from these regular works, opportunities may come up for composing special effect or three-dimensional simulations with live footages – which can be much more interesting to work with. While top-notch studios make use of dedicated hardware / software for the purpose, middle range studios do make use of personal computers and workstations.

To be able to launch a successful career in video post-production, you should have good knowledge of the following solutions:

- Avid range of non-linear video post-production suites
- Adobe Premiere
- Adobe After effects
- Any good software that can add special effects to videos like Flint and Flame

Apart from the above, good knowledge of three-dimensional animation and composing is desirable.

23.8 Careers in multimedia authoring

Multimedia authoring and programming is required for those companies involved in producing multimedia websites, presentations and multimedia CD-ROMs. As a multimedia author, you have to stitch different media contents into a sequential stream of multimedia and present it as an integrated project.

Expertise in the following software is compulsory:

- Macromedia Director
- Macromedia Flash
- Macromedia Author ware

Apart from that, good knowledge of media editing tools like Adobe Photoshop, Premiere or sound editors is desirable. Also, when it comes to multimedia programming, it is good to have knowledge of GUI tools like Visual Basic or Visual C++ and installation utilities.

23.9 Careers in multimedia web design

Hundreds of websites are being developed every day using multimedia and web design tools. Opportunities are available for part-time and full-time work.

As a web designer, one has to conceive compelling web designs for their clients. Depending upon the choice of the client and budget available, the media exposure in the website may be increased or decreased. When it comes to web-based multimedia, one has to rely heavily on tools like Macromedia flash – whose multimedia contents can be directly embedded into web pages.

Apart from that, knowledge of java script can help one to write small titbits of code that will control the events happening in a website like mouse move and mouse click.

23.10 The multimedia team and its responsibilities

A number of people with varying skill set come together to form a multimedia team.

The team usually reports to a project manager who is usually the team leader of the project. A number of people and agencies report to him. In the following paragraphs, we will look at the people involved in a project and the responsibilities they shoulder.

23.11 The project manager

The project manager takes the overall responsibility of developing the product. He is the top man, as far as the team is concerned and is responsible for the total quality as well as the timely delivery of the project. Thus, his role becomes critical - as far as the success of the project is concerned.

The project manager is expected to carry rich experience in handling similar projects. He must not only handle the main design specifications of the project, but should also shoulder managerial responsibilities.

Responsibilities of the project manager include:

- Develop the multimedia concept of the chosen topic
- Co-ordinate and direct media content developers for developing the right contents
- Develop the storyboard, with inputs from the whole team
- Plan and schedule the project along a timeline and fix up the project network
- Allocate individual responsibilities for various team members
- Co-ordinate and direct the external agencies involved - if any
- Co-ordinate with the product manager or marketing manager for developing the product - as per the market segment's expectations

- Co-ordinate and direct multimedia authors or programmers - for developing the core program
- Monitoring the progress of the project - in all its phases, on day- to- day basis

Because of these multiple responsibilities, a project manager is not expected to co-ordinate with more than one project - at any point of time.

23.12 Content experts

Content experts are hired to develop the basic material for the projects. For example, if you are doing a project on biology, you need to have all the basic material that need to be presented. You need a subject expert to do this.

It is better to hire the services of the expert for a specific period or for specific number of pages. Their responsibilities include:

- Delve deep into the chosen topic and coming out with the required pool of information
- Understand the concept of the project and gather information - accordingly
- Edit the raw information collected and organize it into a logical sequence of data
- Co-ordinate with the copywriter to produce the general contents booklet

23.13 Copywriters

Copywriters are usually engaged by advertising agencies for writing out advertisements.

Generally, they are good writers who enjoy a decent command over the language. In many cases, the content experts themselves may well handle copywriting job as well.

Responsibilities include:

- Develop the crude information pool provided by content experts into a material with good flow of thoughts
- Rewrite the entire information - adding notes, deleting unnecessary details and editing data - in co-ordination with content experts and evolve the master contents booklet.

As in the case of content experts, their services are mostly hired on project basis.

23.14 Media content designers

Media content designers take up the responsibility of evolving media contents for the original material provided by content experts. This is a very important responsibility and mostly, the project managers themselves take up this job, instead of entrusting the same to somebody.

Media content designers should understand every implications of the multimedia concept of the Project. They should have a very high degree of creativity and imagination - to identify the multimedia project that hides itself in the otherwise 'collected' form of data and information... it really demands a lot of experience!

The responsibilities shouldered by media content designers include:

- Co-ordinating with the project manager and content experts to develop the multimedia concept
- Decide which media is best suited to present specific piece of information
- Design the media contents and sequences
- Co-ordinate with designers and animators for possible modifications and revisions
- Co-ordinate with the project manager in evolving the storyboard

23.15 Graphic designers and artists

Graphic designers develop all the still graphics required for the project - including content design graphics and interface design graphics. They should be a master of at least one photo editing tool and one digital drawing tool. They have

to perceive the graphics contents from the media designer's point of view and develop them accordingly.

Their responsibilities are:

- Develop all the required the graphics contents of the project - in co-ordination with the team
- Develop the interface designs and backgrounds
- Develop all auxiliary graphic material - like 3D Buttons, tool bars etc.

They are mostly employed full time by the company and handle more than one project at any point of time.

23.16 Audio developers and artists

Audio developers develop all digital audio and synthesised audio (MIDI) files required for the project. They usually possess very good knowledge of either classical or western music...and in many cases - they are players of one or more music Instruments.

Responsibilities of audio developers are:

- Developing the digital audio clippings, including voice-overs - as directed by the media designer
- Develop the music pieces for the project - including the background audios, either compiling from royalty free files available or by actual recordings
- Edit the raw audio data and convert them suitably, so that they can be embedded in the project

Their services may be full time or part time - depending upon the organisational strategies and the volume of work involved.

23.17 Animators

Animators develop the two-dimensional and three-dimensional animations for the project.

Animators should possess a very good sense of visualisation and artistic abilities. They should also be conveniently good at mathematics - particularly if complicated work is involved on three-dimensional platforms.

Responsibilities of the animators are:

- Develop the animation sequences involved in the project, in coordination with the media content designers
- Decide which type of animation – two dimensional or three dimensional - must be adopted for the specific sequences and develop them accordingly

23.18 Video professionals

Video professionals develop the necessary digital video sequences required for the project.

Their responsibilities include:

- Digitise the video sequences shot by cameramen for the project
- Edit the raw digital data and provide all necessary effects and transitions
- Deliver the video files in the prescribed format

23.19 Launching a career in multimedia

Like all other graduates, people who want to start-up a career in multimedia face the uphill task of getting an entry into the industry. The major problem is that the supply of professionals seems to be much more than the demand. I've used the term 'seems to be' because, in reality, companies are still hunting for talented people and are faced with the challenge of picking the best from hundreds and thousands of applications they receive.

While there are no quick or ready-made solutions to this, let me share some of my thoughts in this respect— based on my experience in interviewing students as well as being interviewed by other professionals.

Launching a career in multimedia consists of at least a few steps, in my opinion. They are:

- Training yourself in the general concepts of multimedia
- Specializing in the discipline which inspires you most
- Presenting yourself to prospective employers
- Beginning your career
- Career growth path

The initial problems start with proper training. Many students develop a wrong notion that joining a multimedia training school is more than sufficient to launch them into the professional world. Unfortunately this is not true. While training schools can teach you some of the concepts, the overall knowledge provided by them falls short of what is required in the industry.

This is one of the main reasons why industry people hesitate to employ new bees and prefer experienced people – because they think new bees need to be trained for at least a few months before they can be productive. Unfortunately this is true in most cases.

So, what is the solution?

First, be very clear that the training provided by training schools is but a starting point. You may have to work above and beyond what is being taught – because things are changing so fast. Gaining an overall knowledge on all aspects of multimedia is a major step. Books like this one are just meant to do that. Try to read different books on multimedia and gain an overall understanding of the field.

See whether this is the field you really want to spend the rest of your life or not; there is no more danger than attempting to enter multimedia without proper interest or real aspiration – you are bound to fail sooner or later. Take as much time as you want to make this important decision – but once decided, do not be wavered by opportunities that may come up in other fields.

Once you have decided that you are going to make out a career in multimedia, you need to select specific discipline in which you can specialize. Paragraphs in the earlier sections of this chapter should give you some idea about the various choices available. There is no point in trying to be jack-of-all-trades – it is not only counter-productive but also dangerous in the eyes of a prospective employer. Hence, select a specific career in multimedia that will best suit your talents and attitude. It is also beneficial to look at your contacts and backgrounds in the given industry and see where you have brighter chances of success. For example, if you have good contacts in the film industry, try exploring three-dimensional animation or video post-production and special effects. If your circle includes publishing industry friends, try becoming a graphics designer or layout artist.

Once you have selected your discipline in which you are going to specialize, try to gather as much material as possible on the topic – books, magazines, product manuals, web pages – all of them. Select the tool or set of tools in which you need to specialize and get comfortable with it – working day and night. Take care not to become too dependent on a specific tool – concentrate on the concepts, rather than what menu has which effect and so on. This very book is a good example for learning concepts, which are independent of specific tools, as much as possible. The reason why I'm stressing this point is that a prospective employer may ask you whether you have exposure to certain tool which you may not have heard of. You must be confident enough to answer him that most of your knowledge is concept oriented and not product oriented – and hence you will be flexible enough to pick up any tool in which you have no exposure. This increases your chance of being employed.

After getting comfortable with the tools, it is time to think about a project or projects that will show case your talents. Unfortunately, most students attach little or no importance to this very critical step, which results in very weak demonstration of capabilities in the eyes of a prospective employer. It is sad to note that many training schools and even regular colleges do not provide enough guidance to complete a good project that will look professional and is of industry standard. Projects continue to remain as a mere academic formality whereas they can potentially become your gateway to successful entry into multimedia companies.

Whether it is a group project or an individual project, it is important to assign yourself a specific role and try to do

justification to your work. The project should showcase all the potential talents you have gathered – it can probably speak more about you rather than your ten-page resume. It is a concrete proof of your capability.

Project concepts should be very unique and should stand out in the crowd as much as possible. Many professional studios around the globe are receiving hundreds of videotapes every day that show case the specific talents of the individual. Prepare one for your own, preferably in a CD-ROM and keep it ready before you start applying for jobs. If you are ever called for an interview, go with a laptop and ask for some time (not more than three to five minutes) to showcase what you have done. Rather than looking at your papers, a prospective employer will be much happier to see a live work in front of them.

Within these few minutes, you must demonstrate all you know – your creativity, unique way of looking at things, an impressive project concept as well as your command over the tool. Hence you can see very well how important the project concept is. This project to be demonstrated could well be a flash web page, a three-dimensional rendering or a video post-production work. If possible, do host a portion of your project on the web and give the URL reference on your resume.

Once your project is ready, it is time to score a few points above the rest so that you stand out from hundreds and thousand others who have applied for jobs. One good means of scoring is to participate in international competitions. Many magazines across the globe, which specialize in multimedia subjects, conduct periodic competitions and showcase the best entries. For example, there are at least a dozen magazines on three-dimensional computing and these magazines conduct monthly and annual competitions for the best three-dimensional images / animation entries. There are also national and international fairs in which you can showcase your work. Whether you win a prize or not, it is important to show that you had participated in these events. That adds lot of weight to your potentials.

Please do not wait for an application to be posted in papers. Paper advertisements are seen by thousands of people and there is a heavy rush always. Hence, be pro- active and collect all the addresses of your prospective employers or those companies in which you want to work – and start sending resumes and your works.

Phrase a decent covering letter and do not draft the usual “sir I am a student who graduated in so and so institution and I will be grateful if you can give me any job in your company” etc. Be specific on your talents and the job you would like to undertake. Sound confident and let neither pleading nor arrogant tone come into your letter. List out what are all the talents and capabilities you possess and detail how useful you will be for the said company. If you have hosted your projects on the web, do reference it in the covering letter itself – apart from bio data.

Please do not draft a generic “all-purpose” covering letter, Xerox it and send it to all companies. Your resume can be the same – but not the covering letter. Be very specific about the company and try to substantiate why they should employ you. A good covering letter cannot be written if you do not have a decent knowledge of the different activities of the company – this is no difficulty, since most of them have a web presence. Get the URL of the company you are going to apply and learn all their different business activities before sending the application.

Whether you are a student or a professional, whether you have industry experience or-not, your bio data should necessarily contain the details of at least a few projects. Detailing a single project done at the fag end of the semesters – as a part of academic curriculum, is unlikely to impress the employers. Instead, involve yourselves in solid projects as and when you find time and try to tell what you did in your bio data. Project should involve reasonable work – any work that spans below one month of man-days is not a serious project at all. Hence try to think of unique concepts and work to complete it.

Remember that your skill sets and creativity are the greatest assets. It may take a while before it catches the eyes of the right person – hence be patient till you get the right opportunity. If you have already got quite a few opportunities but were not recruited in, then you need to do a serious analysis of how things can be improved for better prospects. If you can implement even 50% what I have detailed in these paragraphs, your opportunities of success are pretty bright!

23.20 Summary

The growth of multimedia technology has resulted in a number of careers in different sectors. These include careers

in digital imaging, animation, video postproduction and authoring. A number of existing businesses like publishing and broadcast, advertising, entertainment and movie studios offer opportunities to creative professionals.

A multimedia team is a heterogeneous mix of people with varied talents - it includes graphic designers, media content developers, copywriters, animators, video professionals, multimedia authors and programmers - all reporting to the project manager.

Launching a career in multimedia depends on proper training, attitude, presentation and project experience.