

Market Intelligence Report Digital Cinema

An initial study of the market for Digital Cinema, defined as: "A platform enabling the digital projection of any form of content in a cinematic environment, including Hollywood-style feature production and alternative types of content"

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Market Intelligence Report Digital Cinema



CONTENTS

EXE	CUTI	/E SUMMARY	. 1					
1	INTR	ODUCTION	.6					
	1.1	Document Purpose	. 6					
	1.2	Structure and Content	.6					
	1.3	Background: Intermediary Technology Institutes (ITIs)	.7					
	1.4	Definition of the Techmedia Sector.	. 8					
	1.5	Next Steps	. 9					
2	MAR	KET OVERVIEW	10					
	2.1	Market Definition	10					
	2.2	The Digital Cinema Market	11					
	2.3	Market Segmentation	17					
	2.4	Market Trends and Drivers	33					
	2.5	Value Chain Analysis	36					
3	MARKET ASSESSMENT							
	3.1	Market Opportunities	39					
	3.2	Drivers and Inhibitors	39					
	3.3	Functional Needs	40					
	3.4	Roadmap	41					
4	SUPF	PORTING MARKET DATA	43					
	4.1	Overall Digital Cinema Market	43					
	4.2	Digital Movie Market	44					
	4.3	Digital Alternative Content and Use Market	45					
	4.4	Digital Advertising Market	47					
APP	ENDI)	(1: THE MARKET FORESIGHTING PROCESS	49					
APP	ENDI)	(2: GLOSSARY	51					
APF	ENDI)	(3: FUNCTIONAL NEEDS DESCRIPTION	53					



EXECUTIVE SUMMARY

This document provides market intelligence into the sector defined as Digital Cinema by the Intermediary Technology Institute (ITI) in Techmedia. For the purposes of this document, the definition of Digital Cinema is:

"A platform enabling the digital projection of any form of content in a cinematic environment, including Hollywood-style feature production and alternative types of content"

The Report describes the future market opportunities, challenges, key drivers and the potential technologies in the Digital Cinema sector.

The Report does not consider other digital installations such as museums, art galleries. libraries, universities and schools. Activities relating to other goods and services offered in the cinematic environment are also excluded. It should be noted that this Report does not consider the production of digital content in any detail. However, this could form the basis for further analysis should opportunities be identified.

Using this acquired knowledge as the base input, the ITI will select those functional needs that have strongest potential market 'fit', and the greatest potential to be a success when utilised within the identified target markets. The functional needs will be used to define potential technology platforms which will then be used as input to ITI Techmedia's programme selection process.

During this process, ITI Techmedia will continue to report to its Membership on progress and results. Members are encouraged to provide comment and input to this process, and to become actively involved in programmes.

ITI Techmedia intends to further develop its knowledge base in this sector. In order that the Membership gains visibility of ongoing developments identified by ITI Techmedia, this Report will be subject to periodic review and re-issue.

Digital Cinema will represent between 3% and 27% of the box office cinema revenues, including advertising

Competitive pressures have forced cinema admissions into a decline for a number of years. As a result, the cinema industry has been exploring ways in which it can reverse this trend by differentiating the cinematic experience. In 2002, there were some 7 million admissions globally compared to around 19 million in 1992¹. It is estimated that global box office revenue (including advertising) was over USD21 billion in 2002, of which it is estimated that approximately 5% was generated by advertising and less than 0.1% was generated from content which was digitally screened in the cinema².

Source: Screen Digest: "Global Cinema Exhibition Markets; Box office revenue at record levels", October 2003 ² Source: ITI Techmedia, Screen Digest: "Global Cinema Exhibition Markets; Box office revenue at record levels", October 2003, Screen Digest: "Cinema Screen Advertising; A still developing billion-dollar sector", April 2004

Market Intelligence Report Digital Cinema Page 1



Going forward, Digital Cinema faces many of the same challenges as the celluloid cinema market. The future evolution of the Digital Cinema market is far from clear. Market development in the short to medium term will be driven by two key factors:

- The deployment of digital screens
- The production of digital content

As such, two groups of players will directly influence the evolution of digital cinema: Hollywood and Theatre operators. Digital cinema offers considerable advantages, such as reduced cost of distribution; however, the extent and the timing of the switchover to digital cinema is difficult to predict. It crucially depends upon agreement between several players across the value chain, regarding how the financial benefits that accrue from digital cinema are distributed between the various players in order that they are incentivised to invest in the technology necessary to enable the Digital Cinema opportunity. Since there is inherent uncertainty, three scenarios have been developed to illustrate how the market may develop over the next 5 years:

- Downside scenario: Digital Cinema remains a niche market and is only deployed in a small number of cinemas
- Upside scenario: Digital Cinema becomes mass market; deployed in a large number of cinemas, including city centre multiplexes and regional cinemas, and is the chosen evolution path for cinema
- Midway scenario: Digital Cinema evolution lies between the downside and upside scenario

Based on these scenarios, it is assumed that total global gross box office revenue will grow to around USD25 billion by 2010, with the proportion of revenue from digital content accounting for between 3% and 27% under the different scenarios.

The Digital Cinema sector exhibits a number of key trends

The Digital Cinema sector exhibits a number of key trends, including:

- Decreasing number of admissions per cinema screening
- Increasing deployment of low-end projectors for digital screen advertising
- Decreasing cost of digital projection equipment as more installations take place and more multi-unit deals are made
- Increasing number of independent films being mastered on HD for digital distribution
- Adoption of alternative content requiring the interactive technologies and software to make the experience more valuable
- Growth in the requirement for delivery of interactive content to screen in real time in many geographical locations requiring network distribution

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Market Intelligence Report Digital Cinema ...... Page 2
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Improved quality and lower cost display and playback equipment resulting in a growing home cinema market

Opportunities exist for companies to develop key elements of technology which become critical to the industry. Suppliers within each of the different technology markets, including projection, storage and distribution, will experience many barriers to entry when providing services to the various players across the value chain:

- Costs associated with creating a global presence and relationships
- Time required to build relationships with players across the value chain
- Time and cost to build credibility of product brand
- Risk and capital investment associated with introducing new business models
- Cost associated with acquiring the technical expertise required by high-end digital technology suppliers, including ensuring compliance with Society of Motion Picture and Television Engineers (SMPTE) standards

Market opportunities exist across all Digital Cinema market segments

Three major market segments comprising the Digital Cinema sector have been considered:

- Movies: the digital projection of movies using high-end digital projection equipment in a cinematic environment
- Alternative Content and Use: the digital projection of alternative content including Sports, Music, Stage, Documentaries and Games in a cinematic environment and the alternative use of the digital cinema infrastructure to host Corporate and Educational **Events**
- Advertising: the digital projection of pre-show advertising content in a cinematic environment

Figure 1 below summarises the global revenue and projected future growth for a number of these market segments in the midway scenario.

Revenue and market growth projections for different market segments [Source: ITI Figure 1: Techmedia]

Given the revenue and growth potential offered by the different sectors, ITI Techmedia will focus further analysis upon areas which offer strong growth potential.

Four main market opportunity areas, which are relevant across these three market segments, have been identified as follows:

- Secure transport and playback: technologies which provide efficient and secure • distribution of content to the desired recipients, reduce the potential for piracy of content and enable detection of any security breaches
- Presentation: technology behind the display and the audio environment within the cinema
- Interactivity: technologies which enable the cinema audience to interact with the content being displayed, themselves or other people outside the cinema they are situated
- Immersive systems: technologies which enhance the sensory experience of the cinema audience and which increase the impact of the content portrayed

Through market analysis, the functional needs which must be met to facilitate the development of these market opportunity areas have been identified, as illustrated in Figure 2.

Figure 2: Identified functional needs [Source: ITI Techmedia]

ITI Techmedia will use these functional needs to identify appropriate Programmes

Using the acquired knowledge in this Report as input, ITI Techmedia is undertaking further analysis of the functional needs to select those with the strongest Scottish 'fit' and the greatest potential to be a success when utilised within the identified markets. The selected functional needs may be used as input to define potential technology platforms as part of the ITI Techmedia programme selection process.

1 INTRODUCTION

1.1 Document Purpose

The purpose of this document is to provide a 'snapshot' view of the Digital Cinema sector in order that the ITI Techmedia Membership:

- has visibility of the market analysis activities undertaken in this sector by ITI Techmedia
- can gain access to market information relevant to the sector
- is provided with an indication of the functional needs that ITI Techmedia will explore further, to identify the technology platforms which may form the basis of ITI Techmedia research and development programmes

This document should not be considered as providing a comprehensive analysis of the competitive environment within the Digital Cinema sector.

1.2 Structure and Content

This document provides market intelligence into the sector defined by the Intermediary Technology Institute (ITI) in Techmedia as Digital Cinema (see Section 2.1 for the definition of Digital Cinema). The information captured within the document has been obtained following the principles of market intelligence gathering (otherwise known as foresighting) established by ITI Techmedia. This process is described in an abridged form in Appendix 1.

During the process of developing this market intelligence Report, both primary and secondary market data were acquired and collated. Primary data were collected during Market Intelligence Workshops, attended by experienced individuals from industry and academia, supplemented by face-to-face interviews with key organisations in the sector. The primary data gathering process was augmented by desk research which was used to obtain secondary data from internationally recognised market analysts. Where possible, the source of any data used in the Report has been identified.

Section 1: Introduction. This Section covers the background, aims and scope of the Intermediary Technology Institutes (ITIs). It also provides a high level description of the 'Techmedia' areas of focus. Further background information can be obtained on the website www.ititechmedia.com.

Section 2: Market Overview. This Section provides a working definition of the Digital Cinema sector, highlights the main characteristics of the sector, identifies the main trends, drivers and barriers, and describes generic value chains representing current business practice. The Section provides a framework for the subsequent presentation and analysis of data in Sections 3 and 4.

Section 3: Market Assessment. This Section provides an assessment of the market opportunities identified during the foresighting process. Each opportunity is defined and the main characteristics described in terms of drivers, inhibitors and the functional needs which will need to be met by any fulfilling technologies.

Section 4: Market Data. This Section contains the relevant market size data for each market opportunity identified in Section 3. This type of data is traditionally derived from historical figures, and therefore market projections are best viewed as providing a base reference level from which informed extrapolations can be drawn. Where possible and appropriate, the segments identified in this Report are matched to existing market data; where a new market opportunity is identified, a potential market size has been projected.

1.3 Background: Intermediary Technology Institutes (ITIs)

1.3.1 Economic Context

A global driver for economic growth is the development and exploitation of technology both for present needs and future requirements. Successful economies are underpinned by a vibrant research base which extends from basic science through to pre-competitive research and development, with a clear focus driven by global market opportunities. Scotland has a reputation for world class research in many fields and already undertakes significant research activity in several areas which have the potential to be strong future market opportunities. In addition to the research base, most developed economies have institutes or organisations that promote knowledge generation and increase commercial exploitation capacity. The establishment of such organisations has had significant economic impact over the long term.

1.3.2 ITIs

The creation of the Scottish ITIs is aimed at increasing the effectiveness of Scottish businesses in the key global market sectors of Communications Technologies and Digital Media ('Techmedia'), Life Sciences and Energy, all targeted to address the particular (research) strengths and (company) weaknesses of the local economy. The ITIs will also interact with each other to identify potential overlap or "white space" market opportunities between Techmedia, Life Sciences and Energy. The creation and development of the Scottish ITIs is a long-term initiative, and will be supported for a significant period of time.

The ITIs are, in essence, a centre or "hub" for:

- identifying, commissioning and diffusing pre-competitive research that is driven by an analysis of emerging markets
- managing intellectual assets to maximise commercial and economic value
- interacting with each other to identify potential overlap or "white space" market opportunities between Techmedia, Life Sciences and Energy

An active Membership is core to the Institutes; ITI strategy and operation will be actively guided and supported by its Members. It is essential to attract Members with a broad global perspective on markets and new technology directions, as well as a local focus to ensure that propositions can be transferred effectively into the Scottish economy.

1.4 Definition of the Techmedia Sector

ITI Techmedia is centred on the development and creation of commercial opportunities encompassing the communications technologies and digital media sectors. The activities of the ITI will bring Scotland's economy to the cutting edge of emerging markets by allowing local companies to access and build on pre-competitive technology platforms developed by the ITI.

The term 'Techmedia' arose out of the need to reflect the market evolution of communications technologies and digital media. The overall trend in the marketplace is one governed by a value chain which ranges from content/application generation through delivery to consumption.

The following elements are examples of areas which fall within the Techmedia remit. These elements are best viewed as illustrations and represent some of the over-arching philosophies. Nevertheless, these are global drivers which help to place the output of the ITI in context:

- broadcast content: ultimately, the product for which the customer is paying, either directly or indirectly
- service provision: the mechanisms for providing customer-driven content and applications
- delivery: technologies and infrastructure required to transport the digital content service to the end-user, as well as providing the feedback channels for interactivity
- enabling software and systems integration: technologies and infrastructure required to condition, control and manage the delivery of content/service to the end-customer

One globally accepted trend is the delivery of content and services over multiple channels e.g. the provision of same (or modified) content to be received over mobile devices, through TVs or via PCs. Content consumption is the key revenue generating stream in many of the markets, and thus is central to many of the drivers which affect future market evolution in the Techmedia sector.

The Techmedia sector is potentially very broad and, hence, a phased approach to market foresighting has been adopted. The first phase of foresighting has concentrated on five major market areas, defined as:

• **Communications Services**: the provision, management and delivery of voice, video, data and IT services over wired and wireless communication networks. These include consumer and business services, vertical sector industrial applications and broadcast content

- Learning: the provision, delivery and administration of learning through the use of new media and network technologies
- Health: the delivery of health services including clinical, education and administrative services through the processing, management or communication of information, including video, audio, graphics and signal data
- Retail Commerce and Finance: the conducting of business transactions and the provision of financial services using electronic means, generally involving digital computers, electronic communications and the application of information technology. It includes the buying and selling of goods and services, the transfer of funds and related internal company functions
- Online Entertainment and Leisure: the delivery of online digital entertainment and leisure to end consumers, specifically the market for online music, movie, games and gambling services over fixed and wireless networks

The Online Entertainment and Leisure Report referred to above focused exclusively on the business to consumer (B2C) market. As a result, it excluded Digital Cinema from the Movies segment since this is classified as a business to business (B2B) activity: the digital content is distributed to a commercial entity, the cinema, rather than direct to the consumer. Therefore, this Report is an extension of the market intelligence already gathered in the Online Entertainment and Leisure space and provides a first stage analysis of the Digital Cinema sector.

1.5 Next Steps

This Report describes the results of the market analysis activities undertaken by ITI Techmedia in the Digital Cinema sector. As such, the Report describes the future market opportunities, challenges, key drivers and functional needs.

Using this acquired knowledge as its base input, the ITI will select those functional needs with the strongest potential market 'fit', and the greatest potential to be a success when utilised within the identified target markets. The selected functional needs will be used as input to define potential technology platforms, and these platforms may then be used as input to the ITI Techmedia programme selection process.

2 MARKET OVERVIEW

This section presents an overview of the Digital Cinema market today and a view on its evolution in the context of the global cinema market together with the main drivers that will influence this evolution. As such, this section provides:

- a working definition of the Digital Cinema sector
- the main characteristics of the sector
- the high-level market segments within the Digital Cinema sector
- the main trends, drivers and barriers
- a generic value chain representing current business practice

The Section provides a framework for the subsequent presentation and analysis of data in Sections 3 and 4.

2.1 **Market Definition**

Competitive pressure has forced cinema admissions into a decline for a number of years. As a result, the cinema industry has been exploring ways in which it can reverse this trend by differentiating the cinematic experience. Expectations of the replacement of 35mm film with digital content have been around since the first commercial digital cinema screening in 1999.

There has been a growing desire from the cinema operators to increase admissions by showing alternative content to traditional movies and using the cinema during off-peak times for alternate uses. High-definition television (HDTV) and many of the Standard Definition formats have been used to produce alternative content for the cinema, which has led to a perception that digital cinema is television for the big screen. In order to distinguish the form of content delivered, the term Electronic Cinema has been introduced to encompass all the different types of alternative content screenings as well as the term Other Digital Stuff (ODS).

Since the idea was proposed that digital projection of feature films would replace traditional methods of film distribution and projection, there has been much debate over the exact definition of both Digital and Electronic Cinema.

The commonly accepted narrow definition of Digital Cinema is:

"The digital projection of Hollywood-style feature productions in a cinematic environment, either created on high quality uncompressed high definition video or on 35mm or 65mm film"

The generally accepted definition of Electronic Cinema is:

"The digital projection of any form of content other than Hollywood-style feature productions in a cinematic environment and at any quality either by its source material (SD/film/HD) or projector quality"

For the purposes of this document, the definition of Digital Cinema uses elements extracted from both of these definitions:

"A platform enabling the digital projection of any form of content in a cinematic environment, including Hollywood-style feature production and alternative types of content"

In the case where content was originally created on 35mm or 65mm film, a digital intermediate may be created. A digital intermediate refers to the process by which sections or all of a motion picture are digitalised and manipulated at the film lab in preparation for theatrical release. The introduction of high quality digital projection has allowed real-time colour manipulation of a digital intermediate, enabling the director of photography and producer to confirm the quality of their product and be sure that the distributed copy remains unchanged.

It should be noted that this Report does not consider the production of digital content in any detail: however, this could form the basis of further analysis should opportunities be identified.

The definition of Digital Cinema within this Report includes digital content projected in cinemas only. The Report does not consider other digital installations such as museums, art galleries, libraries, universities and schools. Activities relating to other goods and services offered in the cinematic environment are also excluded.

This Report presents an assessment of the global Digital Cinema revenue opportunity. Although a Digital Cinema value chain is identified, the Report does not attempt to present a distribution of value across this value chain.

The remainder of this section is structured as follows:

- Section 2.2 describes the Digital Cinema market in relation to the cinema market as a whole
- Section 2.3 describes the segments present within the Digital Cinema market
- Section 2.4 discusses the market trends and drivers present within the Digital Cinema market
- Section 2.5 outlines the value chain that frames the Digital Cinema market

2.2 The Digital Cinema Market

This section presents a summary of the Digital Cinema market today and its evolution in the context of the global cinema market. As such, this section provides:

- an introduction to the global cinema market
- a discussion of the benefits of digital cinema
- an overview of the current status of global digital cinema deployment

a forecast of the evolution of the Digital Cinema market

Introduction 2.2.1

The cinema market has changed significantly over the past decade. Consumers today are offered a variety of media to occupy their leisure time. These include:

- broadcast television
- videocassette and DVD rental and purchase
- broadcast and on-demand music
- cinema
- console and pc-based leisure software
- online surfing, games and email

All media markets face the issue that, however much the various activities increase in interest and appeal, there is a fundamental limit to the time available for such activities. The availability of an increasing variety of activities has contributed to a significant decline in the number of cinema admissions. In 2002, there were some 7 million admissions globally, compared to around 19 million in 1992³. It is estimated that global box office revenue (including advertising) was over USD21 billion in 2002, of which it is estimated that approximately 5% was generated by advertising and less than 0.1% was generated from digital content⁴.

Within the movie sector specifically, cinema has suffered from the emergence and success of alternative distribution channels for movie content. This is reflected by the dominance in revenue generated from video and DVD rental and sales over cinema admissions, as illustrated in Figure 3 below.

³ Source: Screen Digest: "Global Cinema Exhibition Markets; Box office revenue at record levels", October 2003 ⁴ Source: ITI Techmedia, Screen Digest: "Global Cinema Exhibition Markets; Box office revenue at record levels", October 2003, Screen Digest: "Cinema Screen Advertising; A still developing billion-dollar sector", April 2004

Figure 3: Movies and Entertainment market share by value, 2002 [Source: Datamonitor]

2.2.2 Benefits of Digital Cinema

Digital cinema services offer a number of primary advantages:

- The cost of distribution can be greatly reduced as the physical manufacture and distribution of film prints is no longer required
- In multiplexes, exhibitors (theatre operators) can adjust dynamically the number of screenings of a given movie to match demand
- Digital cinema offers the potential for incremental revenues from alternative content

It is doubtful that digital cinema will, of itself, increase the audience for movies, but it may have significant potential to expand the exhibitor's business. The new technology's greater flexibility could make it easier for the exhibitor to respond to market demand if arrangements with the studios allow for this, instantly switching more popular offerings to more screens or bigger auditoriums and doing the reverse with less popular ones.

Cinema market revenues have also been affected by the piracy of feature films, and claims at Cinema Expo 2004 were that the revenues from pirated versions of feature films equalled the revenue from legally distributed titles. Digital distribution offers opportunities to introduce more stringent piracy prevention measures.

Although digital cinema offers considerable advantages, the extent and the timing of the switchover to digital cinema is difficult to predict since it crucially depends upon agreement between exhibitors and producers (if they are distinct organisations). For such an agreement to be reached, there needs to be settlement on how the financial benefits accruing from digital cinema are distributed between distributor and exhibitor in order that both groups are incentivised to invest in the technology necessary to enable the Digital Cinema opportunity.

Market Intelligence Report Digital Cinema Page 13

2.2.3 Digital Cinema Market Today

Within the context of the cinema market, Digital Cinema is a young industry: the first commercial digital cinema screening took place in June 1999. By November 2003, there were some 175 cinemas worldwide equipped with high-end digital projection technology.

This level of take-up is significantly lower than initial expectations. In 2000, Screen Digest published its first Digital Cinema report⁵ where it was predicted that, by 2004, there would be over 3,000 digital screens worldwide.

2.2.4 Evolution of Digital Cinema

As previously described, the future evolution of the Digital Cinema market remains unclear. Market development in the short to medium term will be driven by two key factors:

- the deployment of digital screens
- the production of digital content: both new material and digitally mastered existing titles

As such, two groups of players have been identified who will directly influence the evolution of digital cinema: Hollywood and Movie theatre operators. In addition to the actions of these key players, cinema as a whole faces a growing threat from the home cinema environment. It was announced in late 2004 that pay-per-view channels Preview (Germany), Sky (UK), Canal Plus (France) and public broadcaster TF1 (France) intend to move to HDTV by 200, which may accelerate the home take-up of HDTV-ready widescreen plasmas and LCDs.

The threat from home cinema becomes more significant if the pay-per-view movie distribution channel could compete in the same release window in which cinema currently dominates. Within all of the scenarios, it is assumed that this does not occur and the cinema market operates in a market consistent with current trends and threats.

Since there is inherent uncertainty, three scenarios have been developed to illustrate how the market may develop over the next 5 years:

- Downside scenario: Digital Cinema remains a niche market only deployed in a small number of cinemas
- Upside scenario: Digital Cinema becomes mass market; deployed in a large number of cinemas, including multiplexes, and is the chosen evolution path for cinema
- Midway scenario: Digital Cinema evolution lies between the downside and upside scenario

The assumptions which frame the downside and upside scenarios are outlined below.

Downside scenario

- After significant delays and revisions, the SMPTE and Digital Cinema Initiative (DCI) reach agreement on the appropriate standards for digital cinema
- Hollywood is still unhappy with the security proposition and remains unconvinced that it will be able to retain the control that it wishes
- Final standards require expensive high-end equipment, resulting in the cost of converting a cinema to digitally project Hollywood movies being inhibitive and the skills required to manufacture the equipment are only present in a niche number of suppliers
- Following the finalisation of standards, Hollywood reluctantly releases a small number of Blockbusters in digital format. They fail to adopt digital capture and remain determined to continue the traditional film production culture
- The digital cinema business model remains unattractive to the theatre operators
- Deployment of digital cinema is low. Deployment of high-end equipment remains driven primarily by national initiatives. The low volumes result in costs staying high
- Initiatives succeed in serving niche markets using lower end digital equipment however investment in interactive technologies and innovative content is slow
- Whilst delays in digital cinema continue, the home cinema market benefits
- Consumers who are quality driven, and disappointed with the lack of Digital Cinema, purchase HDVD equipment. Home-based technologies dampen consumer demand for a shared digital cinema experience

Upside scenario

- The SMPTE and DCI promptly reach an agreement on the appropriate standards for digital cinema
- Hollywood is happy with the security proposition, considering it to be more secure and less open to piracy than traditional methods. It believes that it will at least retain as much control over the value proposition as it has historically whilst saving money through efficiency gains and file handling costs
- Final standards are consistent with the equipment which has been developed, allowing reasonably rapid manufacture and deployment of equipment
- Deployment of digital cinema grows rapidly
- Developments such as affordable leasing options, with an option to buy, significantly increase the attractiveness of the digital cinema proposition to theatre operators
- Supply industry reaches critical mass, and higher volumes result in equipment costs falling
- Following the finalisation of standards, Hollywood adopts digital quickly
- The main studios begin to release all of their Blockbusters in digital format as well as in traditional format

- To incentivise the theatre operators to convert to digital, they pass on some of their cost benefits by subsidising the releases in digital format
- To maximise the cost benefits, they adopt digital methods throughout the production process
- High definition production equipment continues to reduce in cost, which results in an increasing number of independent film producers recognising a financially viable distribution outlet
- Alternative content applications are adopted within most digital cinemas
- Investment in technologies and innovative content promotes take-up
- The release of HDVD equipment drives theatre owners to migrate to digital to compete successfully against the threat of the home cinema market

The midway scenario is assumed to lie between the upside and downside scenario where it is assumed that digital cinema will become mass market in time; however, adoption is not as rapid as that assumed within the upside scenario.

Within the remainder of the Report, the results for all three scenarios are presented with a more detailed breakdown provided for the midway scenario where appropriate.

Based upon these scenarios, it is assumed that total global gross box office revenue will grow to around USD25 billion by 2010, with the proportion of revenue from digital content accounting for between 3% and 27% under the different scenarios (see Figure 4 below).

Figure 4: Global box office revenue [Source: ITI Techmedia]

As illustrated in Figure 5 below, the Digital Cinema market is expected to grow to between USD0.7 billion and USD7 billion by 2010.

Figure 5: Digital cinema revenue [Source: ITI Techmedia]

2.3 Market Segmentation

In this Report, the Digital Cinema market is considered to consist of three market segments as illustrated in Figure 6 and defined below:

- Movies: the digital projection of movies using high-end digital projection equipment in a cinematic environment
- Alternative content and use: the digital projection of alternative content including Sports, Music, Stage, Documentaries and Games in a cinematic environment and the alternative use of the digital cinema infrastructure to host Corporate and Educational Events
- Advertising: the digital projection of pre-show advertising content in a cinematic environment

Figure 6: Digital Cinema market segmentation [Source: ITI Techmedia]

In the remainder of this section, an overview of each of these high-level market segments is provided. For each of these segments the following is provided:

- an introduction to the segment
- a discussion of the benefits of digital cinema
- an overview of the current status of digital cinema in the segment
- a view of the evolution of the segment

2.3.1 Movies

Introduction

The digital movies segment is a direct competitor to the traditional celluloid cinema market which has been in existence for over 100 years. As such, there is a high degree of sensitivity and detailed political considerations related to the introduction of digital technology in to this well-established and mature market. For the last 8 years, most of the movies produced have contained a high proportion of digital content, have been posted digitally by digital intermediate and then transferred back to 35mm film. There appears to be reluctance from many players in the celluloid cinema market to migrate to a full digital process, comprising complete capture of content digitally, digital distribution and digital projection.

In March 2002, the DCI (Digital Cinema Initiative) was formed, and comprises seven major distributors (Disney, Fox, MGM, Paramount, Sony Pictures Entertainment, Universal and Warner Bros). The aim of the DCI is to drive the development of universal standards related to the quality of digital cinema. Although work led by Chuck Goldwater was expected to terminate in September 2004, it was announced at IBC 2004 that work would continue for a further year. The focus will be on providing further detail as to the specifications, particularly with respect to security and interoperability tests with the interchange of digital cinema files across equipment of multiple manufacturers.

The influence of DCI on the future of digital cinema is clear when historic box office revenues are analysed. Of the 50 top-grossing motion pictures at the domestic box office (ranging from Star Wars in 1977 to Spider Man 2 in 2004), 80% of the revenues came from films produced by members of the DCI, as illustrated in Figure 7 below.

Figure 7: Share of domestic box office revenues from the 50 top-grossing motion pictures in nominal U.S. dollars [Source: www.boxofficeguru.com]

The Society of Motion Picture and Television Engineers (SMPTE) and major studios are in the process of developing Digital Cinema technology standards, and this process is expected to continue into 2005.

The standards will specify the technical requirements across a number of areas, including:

- Projectors
- Servers
- Compression technologies, including performance and interoperability requirements
- Encryption technologies and anti-piracy measures in order to ensure secure distribution of content

Benefits of Digital Cinema

Once the standards are finalised, there is the potential for distributors to adopt the digital process in a timely fashion. Digital projection per viewing is substantially less expensive than using 35mm film. A relatively fragile 35mm print copy can cost a distributor an average of USD1000 per print. In the US alone, it is not unusual to require 4000 prints for first release. For a long 'run', additional prints may be required to keep the print free of physical defects such as scratches.

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Market Intelligence Report Digital Cinema ...... Page 19
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By moving to digital, the studios can reduce the cost of film distribution. However, it is the exhibitors who must make investments to support digital technology in the cinema, and the consequent risks to the business. As a result, the business case for investment in digital cinema projection equipment has not been favourable.

Digital cinema also gives the cinema operator the opportunity to optimise yield. Digital cinema may make it easier to respond to market demand as it enables dynamic switching of screens to show more popular offerings.

Current Situation

Sine the launch of digital cinema, the major studios have limited the numbers of digital releases. In 2003, only 42 films were released in a digital format, 20 of which were from the Hollywood studios (see Figure 8). This accounts for only just over 1% of total feature films released in that year. The reluctance to produce digital releases has its exceptions; entrepreneurs like George Lucas have advocated HD acquisition for his recent Star Wars productions and plans to make only digital prints available for Star Wars: Episode III, due for release in Summer 2005.

Figure 8: Numbers of digital releases [Source: Screen Digest]

One of the key differences between the digital movies segment and the other segments considered in this document is the quality of the digital projection equipment used to display digital movies. It is likely that the Hollywood studios will insist on high-end projection equipment, with a resolution of at least 2K (2048 x 1080 pixels) or possibly 4K (4096 x 2160 pixels), as the standard for digital cinema-grade projectors for movies.

A number of different technologies already offer this quality of projector:

• DLP: A technology developed by Texas Instruments, which uses a reflective approach to projecting digital images. Also know as a Digital Micro-mirror Device

(DMD[™]), the DLP chip is about the size of a thumbnail and contains rows of mirrors. Each mirror modulates the light coming from the lamp creating a single pixel on the screen. The licence is granted to projector companies: Christie Digital, Digital Projection, Barco and NEC. Currently, DLP Cinema projectors are limited to 2K images.

- D-ILA: A direct image light amplifier with an LCD modulator with light absorbed or reflected from individual pixel elements used by JVC.
- Sony SXRD (Silicon x-tal reflective display): 2K and 4K (4096 x 2160 pixels). Sony has introduced two new "4K" large-venue projectors. One is a 10,000 ANSI lumen model (SRX-R110); the other is a 5,000 ANSI lumen model (SRX-R105). Both projectors use a SXRD imaging device that enables them to achieve nearly four times the pixel count of current HD displays. The projectors are capable of simultaneously displaying multiple high-definition images. In single-screen mode, the full 4096 x 2160 pixel image is projected. In dual-screen mode, two 1920 x 1080 images are projected and in quad-screen mode, four 1920 x 1080 images are projected. This multi-image capability makes the projectors ideal for applications where multiple, simultaneous high-definition views are required.
- Liquid Crystal Display (LCD): Sanyo has introduced the PLV-HD10 High Definition (HD) LCD projector. With a native resolution of 1920 x 1080 pixels the PLV-HD10 dramatically reduces the cost of true HD projection, while maintaining the very high quality standards required. PLV-HD10 uses a unique four lamp system and 3 x 1.65" polysilicon LCD panels with micro lens arrays, to give a brightness level of 5,500 ANSI lumens and a contrast ratio of 1000:1. The PLV-HD10 is less than half the weight and size and one third the cost of the only other projector capable of displaying true 1920 x 1080 resolution.

The relatively high cost of the projection equipment required has been, and is likely to remain, a key barrier to the growth in digital cinema until such times as critical mass in the supply of equipment has been achieved. A traditional film projector will cost in the region of USD35,000 and USD50,000. A cinema quality digital projector, on the other hand, could cost between USD100,000 and USD150,000. In addition to the capital cost, there is:

- a higher risk of digital equipment obsolescence
- an expectation that the maintenance costs of digital equipment will be higher than that of traditional equipment
- the staff skills required for the digital equipment (operation and maintenance) will be more demanding compared to essentially mechanical film projectors.

The identification of who pays for the installation of digital projectors and who benefits from the installation has created substantial debate. To date, no mutually viable business model to enable large-scale deployment of digital cinema has been implemented, which is likely to continue to hamper the deployment of digital cinema services.

In addition to a digital projector, the cinema owner would be required to invest in a server to store, decompress digitised film (potentially) and interface with the digital projector.

QuVis have already developed a server capable of delivering 4K. Standards such as for the compression format and digitised film file format will be required to reach acceptable economies of scale. At present compressed, digitised files are delivered to a theatre, usually on servers, DVD or tape and individually loaded onto each projector's server.

In the future, it is likely that non-physical delivery mechanisms such as satellite or fibre will be used to deliver the content to networked servers that will deliver content to specific screens as appropriate. There is also the potential for the projection equipment to evolve such that it will include the storage, decryption and decompression capabilities of the server, removing the requirement for a link between the devices.

Evolution of the Digital Cinema Movies Market

Until standards have been agreed, it is likely that future Digital Cinema deployments are likely to be driven by national initiatives. One such example is funded by the U.K Film Council to introduce a USD24 million programme to equip theatres with digital projection capabilities. The UK Film Council plans to upgrade around 200 screens in 150 theatres with digital projection equipment. In return, the digital cinemas are being asked to commit to showing a broader range of films on a regular basis, such as smaller-budget productions and films made by local filmmakers, film clubs and schools.

Once the standards have been ratified, it is expected that cinema owners will increasingly deploy digital high-end projectors. The level and speed of deployment will depend on:

- the development of a proven business case
- reduction in the cost of digital equipment
- whether it becomes more favourable to show digital content as distributors offer a cost advantage

Under the different market evolution scenarios, the number of screens utilising high-end digital projection equipment by 2010 varies, from 11,000 in the downside scenario to 48,000 in the upside scenario, as illustrated in Figure 9 below. These figures correspond to 7% and 30% of screens respectively.

Figure 9: Screens using high-end digital projection equipment [Source: ITI Techmedia]

The Asia-Pacific region, dominated by China, is expected to remain the largest single region for cinema screens. The China Film Group, the government-run film agency in China, plans a test-bed evaluation of 100 screens prior to the wide-scale deployment of a Chinese Digital Cinema solution. The animated production "Finding Nemo" was shown in 2003 with both film and digital versions at Huaxing, one of the best-equipped theatres in Beijing. It has been quoted by the China Film Group that 85% of the film's total box office in Huaxing came from the digital version. It is possible that the offer of pristine digital images at every digital showing led to the digital version being the favoured option. With the Olympics Games scheduled for Beijing in 2008 and much of the production being planned in HDTV, the event could be a driver for the uptake of digital cinema in China.

Based on the expected growth in deployment of digital screens and the increased availability of feature films in digital format, digital cinema revenue from Movies is forecast to grow to between USD100 million and USD5.6 billion by 2010, as shown in Figure 10 below.

Figure 10: Digital cinema revenue from movies [Source: ITI Techmedia]

As in the traditional cinema market, North America is forecast to retain the single largest share of box office revenues, as illustrated in Figure 11 below, driven in the main by the highest admissions per head of population globally.

Figure 11: Digital cinema revenue from movies - Midway scenario [Source: ITI Techmedia]

It should be noted that Bollywood has begun to embrace the digital projection of movies, often using low-end projection equipment. In India, lower cost systems have been successfully deployed and this has enabled increased access to first-run releases in rural cinemas. Since high-end projection equipment is not used, these revenues are contained within the overall forecast of non-digital box office revenue.

2.3.2 Alternative Content and Use

Introduction

The big screen entertainment experience is not confined to the projection of movies. Digital alternative content developments have been proceeding more rapidly than digital movies. In many countries, particularly in the US, less expensive and more readily available digital projectors are being deployed. These projectors are lower resolution than would be required by the standards of Hollywood motion picture studios. These projectors are used with lower cost servers to display digital advertising content and alternative content, where the quality of projection may not be seen to be as important as in the movie space.

Benefits of Digital Cinema and Alternative Content

Alternative content and alternative use will not, by themselves, pay for any large-scale conversion of cinemas to digital. However, cinemas which have deployed low-end digital projectors for cinema advertising are using alternative content as an additional revenue stream to help pay back the investment.

In some cases, the cinema does not charge for admission, but imposes a minimum spend on concessions. Many live events are being captured in HDTV providing a wide range of content to suit a larger audience than perhaps would be applicable to movies alone. The addition of interactivity within alternative content events, such as question and answer sessions, interactive gaming or chat capabilities, will increase the appeal and proposition of the cinema to view these types of alternative content as it will build on the social aspect of the cinema environment.

Investment in appropriate alternative content and technologies to support the interactivity will dictate the propensity of the cinema operators to develop this alternative revenue stream. Although Hollywood rejects HDTV as a viable movie output for display, the higher resolution HDTV formats could be appropriate for smaller screens in city centre and rural locations.

Current Situation

Several exhibitors today are actively involved in the deployment of alternative content in their cinemas, including UCI, Regal CineMedia and Emagine Entertainment. Alternative content spans a number of different genres:

- Sports
- Music

- Stage
- Documentaries
- Games
- Corporate Events and Education

Each of these genres is discussed below.

Sports

Sports events have been the most popular genre of alternative content to date, as illustrated in Figure 12 below.

Figure 12: Alternative content screenings [Source: Screen Digest, ITI Techmedia]

Many US sporting events are now being captured in HDTV– basketball (NBA), football (NFA), wrestling, boxing and soccer. In Europe, football screenings account for a significant proportion of the alternative content events screened; German UCI Kinowelt has regular screenings of World and European Cup matches, as well as the national football league. These events are primarily SDTV content projected using low-end projectors on to a big screen, more commonplace in a city centre sports bar than in a cinema. There are, however, a number of issues associated with cinema as a venue for screening sports events:

• The environment for viewing soccer and other sports is associated in most cases with drinking, eating and viewing in a communal environment such as sports bars or in private homes. Cinema operators foresee problems as these sports are also associated with vandalism and violence

• Rights issues have caused big problems in the past. UCI spent 6 months negotiating the rights for screening of the 2002 World Cup. Media rights owners such as Sky already provide licences for the screening of sporting events in communal venues such as pubs and clubs hence these arrangements could be extended to cover the cinema environment

However, despite these issues, there has been a reasonably high number of screenings and high attendance for events, which suggests demand for such content. By their nature, sporting events are shown primarily as live events and hence the timing of the screening is generally outside the exhibitor's control. One exception is Extreme Sports. This type of event is appealing in that there is a high expectation of quality, where digital offers a differential over alternative media, and Extreme Sports do not necessarily have to be broadcast live to appeal to audiences.

Music

Musicals and concerts have an established reputation for success on 35mm film and hence appear a logical attractive form of alternative content. Concerts can be displayed live or pre-recorded, allowing the cinema owner to schedule at times to maximise profit opportunity. Examples include:

- In September 2003, a David Bowie concert was broadcast live and exclusively to a number of European cinemas to launch his latest album. This was followed by screenings in the Asia-Pacific region, the US, Canada and Brazil. In some cases, a Q&A session with David Bowie followed the screening. In total, 86 cinemas in 22 countries were involved
- HDTV content creators such as 'Done & Dusted' have pioneered live HDTV pop music concerts for broadcast to cinemas
- HDTV content creator Euro 1080 offers live musical events such as:
- Jean Michel Jarre from The Forbidden City, Tianamen Square in Beijing (October 10th 2004)
- Musikverein New Year Concert Live from Vienna (January 1st 2005)

Classical concerts have a wide international appeal and, in most cases where dialogue is not involved, they have no language barriers. Audiences are able to see more at a cinema screening than they would at a rock concert, but will, of course, lose out on atmosphere. Demand for simultaneous live broadcasts is likely to grow, but the increasing popularity of music DVDs may spoil any chance of developing a market for recorded concerts.

Stage

Approximately forty million people see Broadway shows in the United States each year⁶. Other theatrical presentations at regional theatres, including not-for-profits, have attendance of approximately 29 million people. In the UK, for example, London West End

⁶ Source: www.Broadwayonline.com

theatres see attendance of over 11.5 million people per annum. There are many more people who would like to experience a Broadway show, but geography and seating capacity prevent them from doing so.

Broadway Worldwide (formerly known as Broadway Television Network) is involved in high definition, surround-sound production and worldwide distribution of Broadway musicals captured live-in-performance for digital cinema, pay-per-view (PPV) systems, DVD, Internet video on demand, cable and broadcast television. They offer digital cinema exhibition concurrent with each production's initial release as illustrated when they premiered with the exhibition of Jekyll & Hyde in seven cities around the US in March 2001, concurrent with the show's international PPV telecast.

Relatively high admission charges appear to be possible with examples ranging from £5.50 (USD8.20) in the UK to USD20 in the US. Audience surveys indicate that over 90 per cent rated the experience as 'excellent' or 'good'.

Documentaries

Major documentary productions such as Michael Moore's controversial Fahreheit 9/11 and Blue Planet from BBC and Discovery, where a variety of formats including high quality IMAX 65mm and standard definition VHS have been employed, offer an exciting programme genre in the cinema. In these examples, any lack of quality in the image is overlooked due to the compelling nature of the content. Docuzone, an initiative in Europe, is promoting the digital projection of documentaries but, to date, there are no figures to show whether this will generate a high return as documentary content has niche attraction. The aim of European Docuzone, started in 2002, is to create an environment whereby the quality of many documentaries can be appreciated by a wider audience in a cinema environment. They initially started the venture with 10 cinemas by persuading cinema managers to take equipment at no charge in return for 6% of their annual programme time.

Games

Interactive games events normally take the form of enthusiasts in an auditorium playing against each other in a series of games, down to a finalist. This can take the personal game or a multi-player Internet game to another level by adding the communal feeling of competition and camaraderie. Interactivity in cinemas can be integrated using installed game pads or the individuals' mobile phones. The potential exists to extend this communal multi-play to multi-centres and build on the growing interest in online games which is becoming increasingly popular, particularly in Asia-Pacific.

This environment is particularly appropriate to large multi-player games such as Counterstrike or Quake III as it allows lots of players to interact. There is an obvious limitation in the audience sizes where the game is not multi-player. Future demand for the use of cinemas will depend on the general growth in the adoption of multi-player games and the willingness of cinemas to invest in the required interactivity hardware or input devices.

Corporate Events and Education

In addition to alternative content, cinema exhibitors have begun to exploit alternative uses of cinema facilities, primarily at times which are not prime time for viewing movies but appropriate for education or corporate events.

Motorola Corporation has been using Warner Brothers theatres to deliver corporate messages from its head office in Chicago since the mid-nineties and so the idea of renting out a cinema to provide a corporate platform is not a new opportunity. However, the emergence of digital equipment has widened the number of applicable applications. Following the effect on international business travel of the terrorist activities of 9/11, using a digital cinema for a corporate "download" has proved to be an ideal way to simultaneously deliver a serious corporate message to a global staff. The appeal to the cinema owner is the opportunity to generate revenue during office hours when consumers tend to not attend the cinema and hence the opportunity cost is negligible.

Evolution of the Digital Cinema Alternative Content and Use Market

It is expected that the number of low-end digital screens in all three of our envisaged scenarios will grow; however, eventually it is likely that any new digital deployments will be high-end, to exploit the digital movie revenue opportunity in addition to the alternative conten,t as illustrated in Figure 13 below. It should be noted that several cinemas which have deployed high-end digital projection equipment have started to show alternative content to try to recoup some of the investment while digital movie content is scarce.

Figure 13: Screens with low-end digital projection equipment [Source: ITI Techmedia]

However, under all three scenarios, alternative content is expected to remain a relatively small but valuable revenue stream, reaching between USD86 and USD474 million by 2010, as illustrated in Figure 14 below. This reflects digital alternative content and use, allowing the mainstream cinema operator to exploit time slots which are less popular with

viewers of movies and allowing non-mainstream cinemas to show innovative and culturally significant content.

Figure 14: Box office revenue from alternative content and use [Source: ITI Techmedia]

2.3.3 Advertising

This section describes the digital projection of advertising content in a cinematic environment. This summary includes:

- an introduction to the advertising segment •
- a discussion related to the benefits of digital cinema in the advertising segment
- an overview of the current status of digital cinema advertising
- a view on the evolution of the digital advertising market segment over the next 5 years

Introduction

Digital advertising is an area where the cinema owner can make an immediate return on their investment. Cinema advertising was worth over USD1 billion in 2002 and digital advertising does not suffer some of the barriers of the digital projection of other content. As with alternative content, projectors used for advertising are lower quality and could even use Liquid Crystal Display (LCD) technology: consequently, they are much cheaper.

Benefits of Digital Cinema

Digital acquisition, post-production and projection of advertising content offer substantial advantages to the advertiser. In addition to the cost savings from digital prints, full motion digital cinema advertising allows for a shorter lead time from production to 'on-air' thereby reaching the audience quicker than with the traditional film production route. Local advertising produced digitally is able to reach an audience within a few days rather than weeks for an equivalent film production.

Current Situation

Many countries have already started to switch to digital pre-show advertising in cinemas. However, the main effect has been seen in the US. Historically, cinema advertising was not pushed in the US due to perceived consumer resistance. In addition, unlike in Europe, the US cinema advertising industry was based on slides rather than rolling-stock advertising (filmed pre-show commercials) and, in comparison, undeveloped. In 2002, Europe accounted for 68 per cent of screen advertising revenue. In 2003, however, US screen advertising revenue grew significantly, eroding that share to around 60%. Some of this growth is the result of a push towards rolling-stock advertising; however, US cinemas have been at the forefront of conversion to digital. Major players such as Regal CineMedia are driving this conversion to digital, with Regal converting over 4,000 screens to have low-end networked digital projection capability by end of this year.

As of April 2004, there were 7,135 digital screens of which the USA accounted for over 75% of these⁷.

Evolution of the Digital Cinema Advertising Market

The proportion of screen advertising revenue which will be realised from digital content will clearly be driven by the rollout of digital (high-end and low-end) projectors. Combining the forecasts from the previous two sections it is forecast that between 13% and 45% of screens will have digital projection equipment by the end of 2010, as shown in Figure 15 below. It is likely that advertising will evolve from the current 30-second spot to a more "mini-movie" or "episodal" approach. As production costs are reduced and delivery times shortened, this could provide a new attraction to the digital cinema screen.

Figure 15: Global digital screens [Source: ITI Techmedia]

Revenues from digital screen advertising are expected to reach between USD340 million and USD947 million by the end of 2010 (see Figure 16 below), with the dominant regions being USA and Europe (see Figure 17 below).

Figure 16: Digital screen advertising revenue [Source: ITI Techmedia]

Figure 17: Digital screen advertising revenue (midway scenario) [Source: ITI Techmedia]

2.4 Market Trends and Drivers

A number of drivers and trends will affect the development of the Digital Cinema market.

A **trend** is a discernible pattern of change, which can be linear, accelerating or decelerating. An example of a trend is: the increasing average age of the UK population.

A **driver** is a factor that directly influences or causes a change in a specific market. An example of a driver based on the above trend is: the need for easier to use interfaces in mobile phones making them accessible to the ageing population

The overall major trends and drivers impacting on the sector are discussed below.

2.4.1 Current Trends and Drivers

Important trends and drivers in the Digital Cinema sector include:

- 1. Improved quality and lower cost display and playback equipment resulting in a growing home cinema market.
- 2. Growing quality and reduced cost of HDTV production, playback and display equipment resulting in more cinemas finding digital cinema increasingly affordable.

- 3. Increasing number of broadcasters planning to transmit high definition images.
- 4. Decreasing number of admissions per cinema screening.
- 5. Increasing dissatisfaction with transporting content on a server device to the exhibitor.
- 6. Increasing deployment of low-end projectors for digital screen advertising.
- 7. Adoption of alternative content requiring the interactive technologies and software to make the experience more valuable.
- 8. Growth in the requirement for delivery of interactive content to screen in real time in many geographical locations requiring network distribution.

2.4.2 Key Trends and Drivers – Identified by an Expert Foresighting Group

The general sector trends identified in Section 2.4.1 above have been complemented by the opinions of experienced individuals from industry. ITI Techmedia used surveys, oneto-one-interviews and focus groups to identify the following issues which will have an impact on the overall sector.

Trends:

- 1. A growing older population and a growing single population will influence the types of content which will be attractive in the future.
- 2. Increasing trend for high earners (aged 25-50) to return home from work during the early evening cinema programme slot, reducing the number of admissions in these screenings.
- 3. The number of screens globally has reached a plateau with growth driven mainly from the introduction of further multiplexes.
- 4. Applications are trailing the technology.
- 5. Growth in the use of HD in the production of film and in television content.
- 6. Decreasing cost of digital projection equipment as more installations take place and more multi-unit deals are made.
- 7. Increasing number of independent films being mastered on HD for digital distribution.
- 8. Global distribution of major products the ability to have a simultaneous opening premiere all over the world.
- 9. Audience become programmers and cinemas become commissioners.

Drivers:

- 1. Benefits shown by digital projectors (image, quality, stability, lack of degradation etc) and reducing distribution and delivery costs.
- 2. Experimental marketing with interactive Web marketing, membership schemes and loyalty cards will be important in growing the cinema market.
- 3. The quality of the films will determine the success of cinema in the future.

- 4. Cinema as the value creator for subsequent release windows (video/vcd/dvd rental, video/vcd/dvd sale, pay-per-view, pay TV, free TV, etc) implies that the major studios will continue to support, foster and protect the exhibition sector.
- 5. Potential to make use of the cinema at off-peak times by alternative use and by showing alternative content.
- 6. Early deployment of high-end digital projection depends on different countries markets motivations and political agenda.
- 7. The emergence of HDVD resulting in the availability of a higher quality cinematic experience in the home than in traditional cinemas. Cinemas will need to differentiate themselves from the HD Home Theatre which most people will be able to afford within 10 years.
- 8. Availability of content in digital and whether it will still be supplied on 35mm.
- 9. New content such as rock concerts may require changes within the cinematic environment; new viewing, seating, standing, dancing etc.
- 10. Major sporting events such as Formula One, World Cup Soccer and the Olympics create the significant milestones for new hardware product introduction, consumer take up of display devices, attendance at cinemas for screenings, opening of sports bars, manufacture of concessions at public sites etc.

2.4.3 Barriers to Market Entry

The digital cinema sector is an industry which inherits a significant amount of the characteristics observed within the traditional cinema environment:

- Projector and acquisition market is dominated by a number of large players such as Christie, JVC, Sanyo, Sony, Texas Instruments and Sony
- Acquisition equipment for cinema production is primarily rented
- Growth in multiplexes and subsequent closure of many smaller cinemas have consolidated the customer base
- Players operate on a global scale
- The major studios have a heavy influence throughout the value chain
- Security is a significant issue
- A significant proportion of the theatre operator's profit comes not from content but from concessions such as food and drink, branded toys and personal items purchased by cinema goers

However, some key differences apply:

- Server equipment is now required bringing new players into the value chain such as Doremi and DVS
- Distribution technology will migrate from physical medium (DVD, tape or server) to network delivery
- Live distribution internationally for alternative content will become increasingly important

The business model for the projector market may migrate to something closer to that observed in the acquisition market currently

Suppliers within each of the different technology markets will experience many barriers to entry when providing services to the end customers:

- Costs associated with creating a global presence and relationships: A global presence and relationships will be a key requirement of a successful provider which may be very challenging and costly for a new entrant. This will require a new entrant to invest in global marketing and distribution channels to achieve the necessary product reach
- Time required to build relationships with players across the value chain: Existing relationships across the value chain will give existing players significant advantage in the digital cinema market. New entrants will need to invest to establish such relationships
- Time and cost to build credibility of product brand: The durability and life-expectancy of the Digital Cinema technology is as yet unproven and hence established brands may be more trusted. New entrants will need to invest to establish the necessary credibility in their product
- Risk and capital investment associated with introducing new business models: The introduction of new business models are risky and will require capital investment. It will be difficult for new entrants to raise the necessary funds against an unproven business case
- Cost associated with acquiring the technical expertise required by high-end digital technology suppliers to ensure ongoing compliance with SMPTE standards.

2.5 Value Chain Analysis

Value chain analysis is a widely applied technique which is used to explore the specific activities through which entities can generate revenue within a particular industry sector. The techniques of value chain analysis can be applied to all sectors of the economy, although the nature of the value chain will differ between sectors. In this analysis, the value chain concept is used to illustrate the way in which:

- the introduction of new services creates opportunities across value chain elements
- functional needs can have impact across different value chain elements.

A generic Digital Cinema value chain is shown in Figure 18 below, together with examples of key players.

Figure 18: Digital Cinema [Source: ITI Techmedia]

The elements in the value chain are briefly described in Figure 19 below.

Content Creation	Origination of the content within the application which will be viewed by the end user
Content Capture	Capture of the content digitally or using traditional film cameras
Post-production	Process to prepare the content from its raw format such that it is ready for distribution
Distribution	Arranges the marketing and distribution of content to the exhibitors
Delivery	The network provider or technology provider over which the content file is delivered
Storage	Provides ability to store content following delivery to the exhibitor prior to projection
Projection	Technology that supports the projection of content to the consumer

Figure 19: Elements in the Digital Cinema value chain [Source: ITI Techmedia]

Digital Cinema is a market where no one manufacturer, content owner or content creator can deliver a product alone. To succeed, partners offering these services must work together providing complete solutions and on a global scale.

The value chain described above is too complex for an initial analysis of functional needs as described in this Report. As a result, a simplified value chain has been produced, comprising three key segments:

- Production, encompassing the content creation, content capture and post-production .
- Distribution, encompassing the vehicles to link content creation with the end-viewer . and delivery activities
- Display, encompassing the storage and projection.

The mapping of the key segments of the Digital Cinema value chain to the elements in the simplified value chain is illustrated in Figure 20 below.

Service	Content Creation	Content Capture	Post- production	Distribution	Delivery	Storage	Projection
Production	\checkmark	\checkmark	\checkmark				
Distribution				\checkmark	✓		
Display						\checkmark	\checkmark

Figure 20: Simplified value chain mapping [Source: ITI Techmedia]

The application of the simplified value chain to the analysis of functional needs is provided in Section 3.

3 MARKET ASSESSMENT

This section summarises the identified market opportunities over the next 3 to 10 years. These summaries have been developed based upon:

- the views of experts who were asked to consider a ten-year horizon
- market research reports from 'conventional' analysts assessing a five-year horizon

In addition to the market opportunities, the following three issues are addressed:

- Specific market growth drivers and inhibitors
- The technologies, or "functional needs", that are likely to assist in addressing market opportunities (a brief description of these technologies is provided in Appendix 3.)
- A "roadmap" indicating ITI Techmedia's view on the probable timeline for the introduction of the new technologies, mapped onto the revenue development path for the market segment

3.1 **Market Opportunities**

Four main market opportunities which are relevant across the digital cinema sector have been identified as follows:

- Secure transport and playback: technologies which allow the efficient and secure . distribution of content to the desired recipient(s), reduce the potential for piracy of content and enable detection of any security breaches
- Presentation: technology behind the display and the audio environment within the cinema
- Interactivity: technologies which enable the cinema audience to interact with the content being displayed, with others in the cinema audience or with other people outside the cinema in which they are situated
- Immersive systems: technologies which enhance the sensory experience of the cinema audience and which increase the impact of the content portrayed

3.2 **Drivers and Inhibitors**

Major drivers and inhibitors which will affect the take-up of digital cinema are described in Figure 21 below.

Drivers	Inhibitors
Major studios acceptance of digital format leading to a wide range of content	Little consumer desire for digital cinema
Introduction of an attractive business model to cinema owners for the migration to digital projection	No core driver for migration to digital for cinema owners
Effective security proposition implemented	Relative cost of projection equipment compared to traditional film projectors
Supply industry reaches critical mass, and higher volumes result in equipment costs falling	Unproven technology in terms of lifetime and reliability
Cost savings related to efficiency gains and file handling costs	Difficult to justify the cost of expensive digital equipment for the use of alternative content projection alone
Potential for a more flexible programming environment and remote programming and management	Interactivity requires the need for interactive devices
Easier and cost-effective localisation options	If interactivity requires a choice, say in the potential ending of a film, there is potential consumer dissatisfaction if their choice is not reflected
Initiatives drive deployment of digital equipment and screening of alternative content	
Cost and time advantages of digital advertising increases the viability of low-end digital equipment which can be used for alternative content screening	
Ability to use off-peak cinema hours for revenue generation	
Ability to build on the social atmosphere in the cinematic environment to differentiate the cinema setting in relation to alternative venues	
Increased digital capture of alternative content events	

Figure 21: Digital Cinema; drivers and inhibitors [Source: ITI Techmedia]

3.3 **Functional Needs**

Functional needs which support the development of digital cinema, together with the application within the simplified value chain, are illustrated in Figure 22 below.

Appendix 3 defines the scope of each functional needs identified below together with an overview of the technical considerations associated with meeting each functional need.

Functional needs	Market opportunity	Production	Distribution	Display
Secure distribution of content to theatres	Secure transport and playback		1	
Secure content distribution within theatres	Secure transport and playback			*
Compression technologies	Secure transport and playback	1	~	*
Logistics and screen management systems	Secure transport and playback		~	*
Asset (Content) Management	Secure transport and playback		~	*
Access Control	Secure transport and playback		*	*
Secure Storage	Secure transport and playback		~	1
In-cinema piracy prevention	Secure transport and playback			*
Distribution piracy prevention	Secure transport and playback		*	
Improved projection technology	Presentation			1
Improved lamp technology	Presentation			1
Cost effective multi-versioning for localisation	Presentation	1		*
Audio techniques	Presentation	1	1	1
Integrated server/projector equipment	Presentation			*
3D content distribution	Immersive	1		
Head Displays	Immersive			1
Presence	Immersive	1		1
Interactive user devices	Interactive			1
In-cinema audience communication networks	Interactive			1
Interactive control system	Interactive			1
Intra-location communication	Interactive			1

Figure 22: Identified functional needs [Source: ITI Techmedia]

3.4 Roadmap

Figure 23 below illustrates the timing of the market opportunities and related key functional needs to 2010 and beyond.

Figure 23: Digital Cinema market roadmap 2004-2010, Midway scenario [Source: ITI Techmedia]

4 SUPPORTING MARKET DATA

In this Section, market data, where available, are provided for the market areas identified in Section 2.3. As before, three scenarios are considered: downside, upside and midway.

4.1 Overall Digital Cinema Market

The digital cinema market is forecast to grow from around USD140 million to between USD700 and USD7,000 million between 2004 and 2010, at a compound annual growth rate (CAGR) of between 30% and 91%.

Revenue (USD Million)	2004	2005	2006	2007	2008	2009	2010	CAGR %
Downside scenario	146	196	257	346	534	639	692	30%
Midway scenario	146	277	472	753	1,453	2,246	2,967	65%
Upside scenario	146	368	749	1,346	2,899	4,975	7,026	91%

Figure 24: Digital cinema market size, 2004-2010 [Source: ITI Techmedia]

The cinema market is forecast to grow by 2% over the period from 2004 to 2010. The share of the market accounted for by digital content is forecast to reach between 2% and 27% by 2010.

Revenues (USD Million)	2004	2005	2006	2007	2008	2009	2010	CAGR %	
Total cinema market (Midway scenario)	22,109	22,597	23,237	23,828	24,434	24,963	25,503	2%	
Digital cinema as % of total									
Downside scenario	0.7%	0.9%	1.1%	1.5%	2.2%	2.6%	2.7%		
Midway scenario	0.7%	1.2%	2.0%	3.2%	5.9%	9.0%	11.6%		
Upside scenario	0.7%	1.6%	3.2%	5.6%	11.8%	19.8%	27.3%		

Figure 25: Filmed entertainment market size, 2004-2010 [Source: ITI Techmedia]

North America and Europe are consistently the largest regions for digital cinema revenue; however, Asia Pacific and Latin America experience higher growth rates. It should be

noted that Asia-Pacific have on average significantly lower cinema admission charges than the other regions considered.

Revenue (USD Million)	2004	2005	2006	2007	2008	2009	2010	CAGR %
Europe	32	76	126	196	391	636	858	73%
Asia- Pacific/MEA	4	14	44	100	238	387	515	125%
Latin America	0	1	4	11	26	50	78	140%
North America	109	186	298	446	799	1,174	1,516	55%
Total	146	277	472	753	1,453	2,246	2,967	65%

Figure 26: Digital cinema market size, Midway scenario, 2004-2010 [Source: ITI Techmedia]

4.2 **Digital Movie Market**

The revenue from digitally-projected movies is forecast to grow at between 68% and 180% CAGR, reaching in the midway scenario over USD2 billion by the end of 2010.

Revenue (USD Million)	2004	2005	2006	2007	2008	2009	2010	CAGR %
Downside scenario	12	18	31	63	163	230	266	68%
Midway	12	30	107	289	827	1 485	2 081	137%
scenario	12	00	107	200	021	1,400	2,001	107 /0
Upside	10	45	227	670	1 092	2 000	E 605	1000/
scenario	12	40	221	0/0	1,903	3,609	5,005	100%

Figure 27: Digital movies market size, 2004-2010 [Source: ITI Techmedia]

In total, the Movies market remains relatively constant, resulting in digital Movies accounting for between 1% and 24% of the overall market by 2010, compared to less than 0.1% in 2004.

Revenues (USD Million)	2004	2005	2006	2007	2008	2009	2010	CAGR %
Total Movies market (Midway scenario)	20,710	21,043	21,470	21,853	22,233	22,678	23,132	2%
Digital Movies as % of total								
Downside scenario	0.06%	0.09%	0.15%	0.29%	0.73%	1.02%	1.15%	
Midway	0.19/	0 10/	0.5%	10/	10/	70/	09/	
scenario	0.1%	0.1%	0.5%	1%	4%	7%	9%	
Upside	0.1%	0.2%	1%	3%	0%	17%	24%	
scenario	0.1%	0.1% 0.2%	1%	3%	9%	17%	24%	

Figure 28: Filmed entertainment market size, 2004-2010 [Source: ITI Techmedia]

The digital cinema market in terms of box office revenue, as with the conventional celluloid cinema market, is expected to continue to be dominated by the US and European market accounting for 50% and 28% of the market by 2010 in the midway scenario.

Revenue (USD Million)	2004	2005	2006	2007	2008	2009	2010	CAGR %
Europe	2.4	8	30	80	227	410	577	149%
Asia- Pacific/MEA	3.3	6	21	57	164	292	406	123%
Latin America	0.3	0.8	2	6	17	38	63	139%
North America	5.7	15	54	146	419	745	1,035	138%
Total	12	30	107	289	827	1,485	2,081	137%

Figure 29: Digital movies market size, Midway scenario, 2004-2010 [Source: ITI Techmedia]

4.3 **Digital Alternative Content and Use Market**

The digital alternative content and use segment is forecast to grow at between 35% CAGR and 68% CAGR, reaching between USD92 and USD522 million by the end of 2010. It is expected that genres such as sports, music and theatrical performances will continue to dominate with alternative uses such as corporate events and education providing a lucrative additional revenue stream during off-peak hours.

Revenue (USD Million)	2004	2005	2006	2007	2008	2009	2010	CAGR %
Downside scenario	37	40	47	56	69	79	86	15%
Midway scenario	37	65	94	117	154	198	243	37%
Upside	27	00	150	202	070	267	474	F20/
scenario	31	99	158	202	213	307	4/4	53%

Figure 30: Digital alternative content and use market size, 2004-2010 [Source: ITI Techmedia]

North America and Europe remain at the forefront of revenue generated from the screening of alternative content, accounting for almost 80% of the market between them.

Revenue (USD Million)	2004	2005	2006	2007	2008	2009	2010	CAGR %
Europe	7	16	22	27	38	52	65	46%
Asia- Pacific/MEA	0	5	13	21	32	42	48	119%
Latin America	0	0	1	2	3	4	6	126%
North America	30	44	58	67	81	99	125	27%
Total	37	65	94	117	154	198	243	37%

Figure 31: Digital alternative content and use market size, Midway scenario, 2004-2010 [Source: ITI Techmedia]

Digital Advertising Market 4.4

The digital advertising segment is forecast to grow at between 52% CAGR and 73% CAGR, reaching between USD340 and USD947 million by the end of 2010.

Revenue (USD Million)	2004	2005	2006	2007	2008	2009	2010	CAGR %
Downside scenario	96	138	179	228	301	329	340	23%
Midway scenario	96	181	271	347	472	564	643	37%
Upside scenario	96	224	364	465	642	799	947	46%

Figure 32: Digital advertising market size, 2004-2010 [Source: ITI Techmedia]

In total, the cinema advertising market is predicted to grow from around USD1.3 billion to USD2.2 billion between 2004 and 2010, a compound annual growth rate (CAGR) of 8%, resulting in digital advertising accounting for between 16% and 44% of the overall market by 2010, compared to 7% in 2004.

Revenues (USD million)	2004	2005	2006	2007	2008	2009	2010	CAGR %
Total screen advertising market (Midway scenario)	1,361	1,488	1,673	1,857	2,046	2,087	2,129	8%
Digital advertising	g as % of to	otal						
Downside scenario	7%	9%	11%	12%	15%	16%	16%	
Midway scenario	7%	12%	16%	19%	23%	27%	30%	
Upside scenario	7%	15%	22%	25%	31%	38%	44%	

Figure 33: Cinema advertising market size, 2004-2010 [Source: ITI Techmedia]

North America continues its high adoption of digital advertising compared to the mature advertising market of Europe.

Revenue (USD Million)	2004	2005	2006	2007	2008	2009	2010	CAGR %
Europe	23	52	74	89	126	174	216	46%
Asia- Pacific/MEA	0	3	10	22	42	53	61	155%
Latin America	0	0	1	3	5	7	9	164%
North America	74	126	186	233	299	330	356	30%
Total	96	181	271	347	472	564	643	37%

Figure 34: Digital advertising market size, Midway scenario, 2004-2010 [Source: ITI Techmedia]

APPENDIX 1: THE MARKET FORESIGHTING PROCESS

The foresighting process for market identification, which is at the heart of the ITI activity, has been established to meet three main objectives:

- to identify and define the potential for new and emerging global markets, over a three to ten year horizon
- to provide an objective basis for assessment and comparison of any defined markets
- to identify and define key functional needs and platforms which will support market development.

A market foresighting process has been created and adopted by ITI Techmedia. Using the experience and expert advice of organisations recognised as having best practice capabilities in this field, it is designed not only to meet the objectives detailed under 'Market Identification' above, but also to take into account other relevant factors including sector specifics, timescales and resource needs. The main elements of the process are shown in simplified format below.

Step 1 identifies a vision for the market opportunity, the challenges, key drivers and market and technology barriers. This is achieved using specialist market knowledge, input from expert individuals in organisations across the sector, product and service companies, research organisations through to regulatory and other government offices. This is then enhanced by existing market knowledge to estimate the possible market size, timing, geographies and demographics to create views of the value chain, the main stakeholders and resultant business models.

Step 2 creates a long technology list relevant to the individual sectors, which is in turn reduced in Step 3 to a shortlist, using input from technology experts. The process so far identifies the functional needs that best fit the market characteristics and hence highlight the most likely technology winners.

The functional needs and markets are validated in Step 4 via a process of scenario planning, a common tool used in foresighting environments. This uses example events to test if market and functional needs meet overall objectives and targets.

Step 5, the final step, identifies a resultant technology platform. A technology platform is defined as a cluster of connected technological capabilities comprising discrete technologies which together define a system with multiple potential applications.

The market foresighting process and the usefulness of functions within it are subject to ongoing evaluation and refinement throughout, based on experience gained in the first phase.

APPENDIX 2: GLOSSARY

Analogue	A continuously varying action or movement that takes time to change from one position to another. An analogue signal has an infinite number of levels between its highest and lowest value.			
Bandwidth	The speed at which data can be sent across a network			
Brightness	The lightness value from black to white			
Composite video	An all-in-one video signal comprised of the luma (black and white), chroma (colour), blanking pulses, sync pulses and colour burst.			
Contrast	The range of light to dark in an image helping us determine differences between objects such as their size, edges and relative distance.			
DCI	Digital Cinema Initiative, comprising the group of seven major distributors			
Decoder	 A device used to separate the RGBS (red, green, blue and sync) signals from a composite video signal. Also called an NTSC decoder. The device in a synchronizer or programmer which reads the encoded signal and turns it into some form of control. 			
Decryption	The process of converting encrypted data back into its original useable form.			
D-ILA™	Direct Image Light Amplifier a technology developed by JVC			
DLP™	A technology developed by Texas Instruments, which uses a reflective approach to projecting digital images.			
DMD™	Digital Micro-Mirror Device. See DLP™			
Encryption	The converson of data to a form that cannot be easily understood by unauthorised viewers			
HDVD	High-Definition Digital Video Disk			
HDTV	High Definition Television			
IMAX	Image Maximum. A film projection system which has the capacity to display images of far greater size and resolution than conventional film display systems			
LCD	Liquid Crystal Display. A display technology involving optical glass panels whose opacity can be controlled by electrical signals.			
Lumen	The amount of light that falls on a unit area at a unit distance from a source of one candela			
Luminance	The intensity of light perceptible by the human eye			
NTSC	National Television Standards Committee			
PAL	Phase Alternating Line is colour encoding used in the television systems in Europe, Australia and some Asian countries			
Pixel (picture element)	The smallest discernible element of the composition of an image on a display device or a image generating device.			
Resolution (Projector)	The maximum number of pixels that the projector can display horizontally and vertically across an image, such as 1024 x 768 (called XGA).			
RGB	The video output (analogue or digital) of most computers.			
Market Intelligence Report Digital Cinema Page 51				

SDTV	Standard Definition Television. Term used to signify a digital television system in which the quality is approximately equal to NTSC
SMPTE	Society of Motion Picture and Television Engineers - A global organisation, based in the United States, that sets standards for baseband visual communications.
SNMP	Simple Network Management Protocol
Stereoscopic Solution	A projection solution that displays three dimensional images.
SXGA	Super Extended Graphics Array. A graphics standard with a resolution of 1280 x 1024 (1,310,720 pixels)
SXRD	Silicon Crystal [X-tal] reflective display
Sync	This term refers to the part of the video signal that is used to stabilise the picture
TFT	Thin Film Transistor LCD panel. A type of LCD flat panel display screen in which each pixel is controlled by one to four transistors.
XGA	eXtended Graphics Array Card.

APPENDIX 3: FUNCTIONAL NEEDS DESCRIPTION

This section aims to define the extent of each functional need identified in Section 3.

3D content distribution	Technologies allowing 3D content to be stored and distributed			
Access Control	Access control covers controlling and monitoring playback access to file. Once in possession of the media file the user will require ongoing permission to decode the content. Encryption can be used for the effective implementation of access control. The file and channel must be encrypted so that access to it may be controlled. The key management required to unlock files could be more secure than traditional digital broadcast techniques, since a 2- way link will be possible between decoder and server			
Asset (Content) Management	Asset management focuses on "where" the digital media file is and who has access to it rather than the issues associated with transporting the file from one location to another			
Audio techniques	This encompasses both the formats used to transport multi-channel, multi-lingual audio tracks and technology which ensure that systems can be easily configured and optimised in day-to-day use.			
Compression technologies	This embodies the techniques used to allow digital content to be made available in a format which has the correct balance between quality and file size. Compression also includes quality issues such as colour depth, colour space. As of June 2004, DCI selected JPG-2000 as the preferred compression scheme.			
Cost-effective multi-versioning for localisation	Technologies allowing subtitles, alternate audio tracks and other data to be packaged along side the content.			
Distribution piracy prevention	Systems to identify and prevent the theft of digital media			
Head Displays	Systems allowing individual or personalised 3D content to be relayed to audience members			
Improved lamp technology	While pixel resolution is important in digital projection, lamp technology is a key consideration. Current issues being addressed include cost, reliability, lifetime and brightness.			
Improved projection technology	This category includes projector technologies allowing the levels of fidelity required by the SMPTE and DCI. Fidelity is defined by a number of parameters including pixel resolution, contrast and illumination. 2K (2048 x 1080) is seen as the minimum acceptable resolution with 4K (4096 x 2160) preferred.			
In-cinema audience communication networks	Networks to allow 2-way communication between			
Market Intelligence Report Digital Cinema Page 53				

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	audience and interactive system. Wired systems could use standard LAN infrastructure. Wireless systems likely to be useful include 802.11x and Bluetooth. In the future high bandwidth UWB technologies such as W-USB, W-1394, Bluetooth 2.0 and WiMax will allow more personalised, high bandwidth content to be delivered.
In-cinema piracy prevention	Countermeasures to prevent copying of content once it is screened within a theatre. Includes both detection and preventative measures.
Integrated server/projector equipment	This is a combined decoder, projector and storage device. Example applications are in a small scale cinema, with only a single screen or a hybrid cinema with both digital and analogue projection screens
Interactive control system	Systems allowing interactive situations to be relayed to the audience and the responses processed. From games content through to voting systems.
Interactive user devices	Technologies to allow an audience member to interact with the content. This encompasses allowing interactive responses to be collected and the provision of personalised content to the user. As the technology progresses, text communication can be augmented by multimedia content
Intra-location communication	Systems allowing interaction between distinct locations such as cinemas, studios, concerts
Logistics and screen management systems	Technology allowing the scheduling of content to be easily managed and tracked. For instance, in allocating additional screens to popular films based on customer demand
Presence	Technologies allowing presentation beyond visual and aural senses such as smell, vibration, motion.
Secure content distribution within theatres	Video network within cinema - may have to handle both uncompressed raw data (for decoder to projector) and compressed distribution from server to decoder. The rights to access the content and the means to decode the encrypted content are discussed in the "Security" section.
Secure distribution of content to theatres	Assumed to be between distributor and cinema, this concerns the delivery of the digital movie data. Since the files will be large, they will require significant network bandwidth. Media distribution by physical means such as DVD may be viable for some types of content.
Secure Storage	File server, required to provide large amounts of storage space coupled with reliability and integration with asset management and control systems.

