t-learning Study

A study into TV-based interactive learning to the home

Final Report

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5 May 2003

0   Executive Summary

0.1   Introduction

This final report of the t-learning Study provides a "state of art" survey and analysis of the issues concerning the development of digital TV-based interactive learning in the home. It tackles the issues from three perspectives: -

- Learning in the home
- Technology solutions as enablers
- Market developments

Large-scale technology enhanced learning in the home will be dependent on the market developing consumer devices that are affordable and are easy to use. Understanding is required, of the type of learning resources and the way people learn in the home, in order for appropriate services to be developed. Services are also dependent on the availability of the technology solutions that facilitate such developments. It is important that all three of these components are considered together if a wide range sustainable and replicable learning services are to be developed in the home.

This report aims to raise awareness and provide a point of reference for the range of existing developments and future possibilities for TV-based learning – "t-learning". It draws conclusions based on the research conducted during the study. It then makes recommendations for European policy and decision makers in education and training, broadcasters, service providers and other key players as to likely and possible ways forward for the development and utilisation of interactive digital TV solutions for increasing learning opportunities into the home.

0.2   Key Conclusions

1. Overall, the study has identified that there is a big potential for utilising the various interactive digital TV solutions for increasing learning opportunities in the home, particularly as an alternative solution to utilising an Internet-enabled computer.

2. Once policy and decision-makers have become aware of the potential that such solutions might offer, consideration is starting to be given to their utilisation particularly when addressing issues like widening participation to learning and overcoming the digital divide.

1. The biggest potential for utilising interactive digital TV solutions in the medium to long term is likely to be through personalised TV developments as sustainable and replicable models emerge from early pioneering developments.

2. Unfortunately, despite there being more than 25 years of experience using educational broadcasting there is still limited pedagogical research for early pioneering developments to draw upon to help understand how best learners may learn through this medium. There is also limited research addressing interactivity and learning to draw upon from other e-learning developments.

3. Creating a demand for interactive digital TV learning service has to be based around the development of a sustainable model particularly when the service utilises consumer-based devices.

4. The study has established a framework for a number of potential sustainable models, that when developed must also be assessed as to whether they are also pedagogically sound.

5. The development of any learning service must consider jointly - technology solutions, the development of sustainable models and pedagogical issues.

6. This study has identified many existing and emerging consumer-based interactive digital TV technology solutions. It has also identified potential sustainable models for the development of learning services, but there is still a need for further market research.

7. However, the study has found limited existing pedagogical research to draw upon. This does need to be addressed as services develop, but cannot be done in isolation, as there is little point in identifying pedagogical sound services that are just unsustainable within the consumer-orientated market place.

0.3   Key Recommendations

0.3.1 Strategic Recommendations

1. When developing a broadband strategy, governments should include interactive digital TV within that strategy.

2. When developing an e-learning strategy governments and other agencies should consider the role of interactive digital TV solutions within that strategy.

3. Traditional educational broadcasters and those in mainstream education and training need to work more closely in order to decide the most appropriate way forward for the utilisation of the range of interactive digital TV technology solutions that are starting to emerge.

4. Generally the focus should be on solutions that offer more personalised TV rather than broadcast/scheduled TV. There appear to be more opportunities for more personalised learning through these developments.

0.3.2 Developing the market

1. There is a need to establish a number of pilot projects utilising personal video recorders and content-on-demand type services through Broadband TV to order to test out how these means could increase access to learning opportunities in the home.

2. Broadcasters and interactive content developers should work with learning providers in order to find ways of utilising the "powerful medium" available through broadcast TV and associated interactive services to provide "hooks" to draw viewers into active learning environments.

3. Encouragement should be given to content developers to produce digital content that will work with the full range of digital delivery technologies.

0.4 Overview of developments

There is increasing recognition that e-learning through an Internet-enabled computer will not solve all the problems of increasing learning opportunities in the home. Although it varies across Europe, the penetration of Internet-enabled computers into the home is beginning to level off at around 40 to 60%. However, the penetration of televisions in European homes is already around 98%.

There are a number of very good reasons why it is important to consider the role that interactive digital TV has within a broader e-learning strategy: -

- Most people have access to a television in their home.
- Not every household will have an Internet-enabled computer.
- The TV is an easy to use device.
- People tend to trust the content that is on the TV.
- The TV has the potential for reaching more people and offering learning opportunities than traditional learning institutions can do.

However, some of the key issues that need to be addressed include: -

- How can a passive viewer be turned into an active learner?
- How can learning opportunities be made more accessible in the home as and when required?
- How can the gap be bridged between "edutainment" and "engaged learning"?
- How can learning support systems (human and electronic) that help to enable engaged learning be integrated within a TV-based learning environment?
- What types of interactivity are needed to enhance the learning experience through interactive digital TV?

Interactive television (iTV) is a two-way interactive service provided through television, enabling audiences greater choice, control, and customisation over their viewing experience. New digital technologies in the field of interactive television services such as video-on-demand, enhanced television, interactive program guides, and email are just some examples of the next generation of digital programming over cable, satellite and terrestrial broadcast television.

There are a number of complexities surrounding the evolution of interactive digital TV from both a technical perspective as well as from a market development perspective. Unfortunately, the education and training world has little control over how technological solutions will emerge and how the market for interactive TV and related solutions will develop within the broader consumer market.

These complexities are making it difficult for existing educational broadcasters to decide how best to utilise interactive digital TV services when they are available. Only a few well resourced and generally public service broadcasters have started to make some offerings available. Existing players who are already established in the "learning business" are very reluctant to enter this market due to the potential high costs of developing for multiple platforms and the uncertainly of getting any return on investments. Only very recently have there been signs that a few new players have started to enter the leisure learning end of the market – initially with video-on-demand offerings.

0.5   Specific Conclusions

0.5.1   Strategic learning issues

1. In the emerging era of lifelong learning - learning will take place in wide variety of context and locations in which informal and non-formal learning will increasingly become as important as the more traditional forms of formalised learning.

2. Some limited evidence seems to suggest that around a third of adults in certain regions have not participated in what they consider to be any form of learning since compulsory school leaving age.

3. Policies are already being directed towards the use of information and communication technologies for increasing learning opportunities – although this has tended to focus more on the use of a computer connected to the Internet.

4. There is evidence to suggest that this will increase participation of those *already* engaged in learning. However, there is also growing evidence to suggest that this is *not* encouraging wider participation of those not already active in learning.

5. The penetration of internet-enabled computers in European households also appears to be levelling out at around 40-60%.

6. Even specific initiatives that encourage a community to get "wired-up" and offer low cost computers and training – appear not to be increasing uptake beyond around 70% of households.

7. Therefore consideration needs to be given to a variety of alternative solutions to overcome the emerging so-called "digital divide" and find alternative ways of encouraging more people to become more active in learning.

8. This means looking towards solutions and devices that people are familiar with, and feel comfortable in using, whether, in their own homes or on the move.

9. Increasing the opportunities for informal learning can also be a means to encourage and draw people into active and engaged learning that might lead onto more formalised learning.

10. Television, plus other future personal devices developing from mobile telephones; and games consoles are all familiar tools that have the potential to also offer new learning opportunities in this way.

11. The home is already considered to be an important place of learning, with some evidence to suggest that there is an increasing preference for people wanting to learn in the home.

12. The television is a familiar and reliable consumer device with around 95-99% penetration in European households. It is also perceived to be a source of learning although in its more traditional role it has tended to be used in a passive viewing mode and perhaps not encouraged active and engaged learning.

13. Traditionally television has tended to be used as an informal mode of learning. Therefore enhancing learning opportunities through the use of interactive digital TV solutions could help in achieving this aim.

14. However, new interactive digital TV services are starting to emerge and change the way the viewer interacts with the TV from a passive to a more active mode. This is creating new opportunities for increasing its role in learning.

15. Therefore, ICT policies that are aimed at encouraging increased and widening participation in learning should consider the role that interactive digital TV solutions have in creating new learning opportunities in the home.

0.5.2 Role of interactive TV in learning

1. When available, current interactive TV offerings through broadcast/scheduled TV do offer a few appropriate learning

experiences for some groups of learners but these tend to be very limited or very expensive to produce.

2. They tend to have been produced by broadcasters often with the aim of adding some value to existing broadcasts. The focus tends to be on "edutainment" rather than encouraging active and engaged learning.

3. Broadcasters and service providers are still experimenting with the interactive services.

4. Enhanced TV productions like "Walking with Beasts" with various options to select during the programme are mainly aimed as entertainment and because of their costs have to be marketed globally

5. However, value can be added to the learning experience when these programmes are available in a video-on-demand mode rather than in a broadcast mode – assuming that all the enhanced features are available.

6. The Interactive "learning" services that are available independent of the broadcast channel tend to make use of limited graphics and text – rarely utilising video or audio – which are the best features of TV. Their interactive functions are limited and can be slow at times.

7. Unless there are some significant advances in the technology, broadcast or scheduled TV interactive learning opportunities are likely to be always limited.

8. However, developments with interactivity are raising awareness that the TV can start to be used in an active mode rather than just a passive mode. "Hooks" might also be provided to draw an active viewer but reluctant learner into becoming an active learner.

9. Despite, slow developments towards personalised TV, the time is right to start focusing attention on this area as a means of creating new, more personalised learning opportunities in the home. It is predicted that personalised TV within developed countries will be widespread (more than 60% of households) within ten years (see Fig 0.1)

10. This is likely to be a more fruitful way of widening access and participation in learning in the medium term (within the next five years) than focusing on just the interactive TV offerings available through "Broadcast TV".
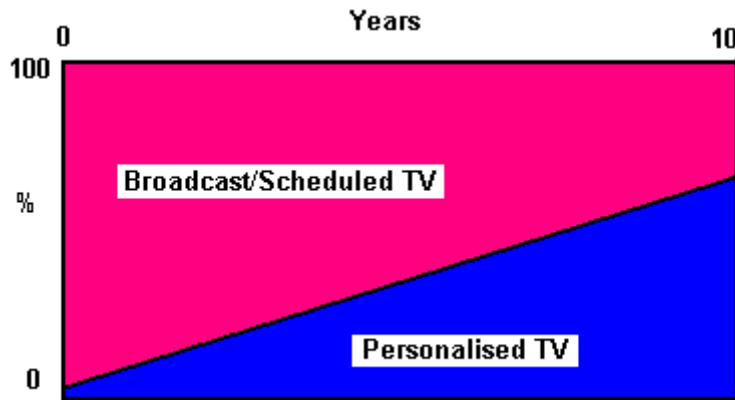
Fig 0.1 Likely Digital TV Trends over the next 10 years

0.5.3 Technical Issues

General

1. Overall, technical issues appear to be less of a problem than market-orientated issues. Many technical solutions are available but are not being rolled out as the market conditions are not favourable or appropriate sustainable business models have yet to be developed.

2. A common European-wide standard is beginning to emerge for future set-top boxes with the Multimedia Home Platform (MHP). However, regions that have been early adopters of digital TV services will have many legacy set-top boxes and service providers may take many years or may never adopt MHP. Market forces are more likely to determine the speed and direction of such developments. There is likely to be resistance to intervention in this area.

3. Standards determining the distribution and delivery of multimedia to the TV are likely to be reached sometime during 2003 through the efforts of the TV Anytime Forum.

4. Decisions concerning the provision of an appropriate broadband network to the home are primarily being driven by the market - rather than being held back by technical difficulties particularly in urban areas.

5. Although there are some technical difficulties concerning provision of appropriate bandwidth in rural areas, solutions to these problems are beginning to emerge. There may be a need for some government intervention to ensure universal access.

6. The broadcast industry is starting to add metadata to its content to enable specific items to be more easily retrievable. There are also parallel developments concerning the standardisation of learning objects. Both of these developments need to work more closely together in order to ensure that appropriate learning content will be easily retrievable through interactive TV solutions.

Broadcast or scheduled TV

7. In the short term, interactive services will be mainly available through or associated with broadcast or scheduled TV and will be dependent on how rapidly broadcasters and service providers will want to deploy such services.

8. In the medium term, such forms of interactive services will become integrated into hybrid developments with more personalised TV, possibly being used as "hooks" to capture interest and pull people towards more engaged learning opportunities.

9. In the longer term, they will become unrecognisable as more personalised services will start to dominate and form an integrated part of their lives.

Personalised TV

10. In the short term, a few pioneer developments will start to emerge and assist in the process of the identification and development of sustainable models using the various methods of personalised TV.

11. In the medium term, hybrid solutions two-way satellite, VDSL and local wireless solutions will also meet the needs of rural communities outside the range of ADSL and cable.

12. In the medium to long term, various fast and very fast broadband solutions will be available in both urban and rural areas with users accessing the content that is most appropriate for their needs whether it be with a TV, computer or a mobile device.

13. Learning services will be only part of a wide range of integrated services available to the home. They will be sustainable because they have been developed in an integrated way.

0.5.4 Market issues related to development of learning services

1. The media industry is currently slowly moving out of a global recession and to a large extent so is the telecom industry. In fact, for the last 4-5 years, it has been very difficult to predict the development of interactive digital TV market, which is starting to show a regular pattern of slowing down then showing signs of speeding up before slowing down again.

2. The education and training business generally has little control of these developments and is dependent upon a relatively small number of players in the interactive digital TV industry.

3. The barriers to entry into the interactive digital TV market are high for the learning business compared to utilising the web. A number of different levels of development are required before any market for

interactive digital TV for learning in the home will emerge. All are potential barriers to such developments.

4. Market opportunities for the development of interactive learning services linked to broadcast TV are likely to be very limited. It is likely that broadcasters will still control this area and offer "edutainment" and some value added services linked to their main broadcast programme.

5. The biggest opportunity for the development of learning services is likely to be through personalised TV – as content on-demand or through "personal" delivery services.

6. However, existing on-demand services in Europe are still trying to identify the appropriate sustainable business models. This will slow down development.

7. However, it is predicted that within ten years the majority (around 60%) of users in the developed world will be using their TV primarily in a personalised TV mode rather than the traditional scheduled TV mode.

8. There is potentially a big market for leisure learning services that will develop through market forces without the need for intervention. There are signs that this market is now beginning to develop in North America and may start to develop in some parts of Europe by the end of 2003.

9. This may stimulate the development towards a sustainable market for the provision of other learning services utilising interactive TV solutions.

10. It is likely that content on-demand and "personal" delivery services will develop focused on specialist target audiences aimed at up-skilling or re-skilling professionals. These might involve public-private partnerships.

11. Within the e-government agenda there is a drive to make local and national government services accessible over multiple platforms including interactive TV. This could create new opportunities for offering informal and formal learning. It might involve the public service and perhaps the commercial broadcasters. However, large-scale trials are needed in order to identify how best to implement and develop a sustainable model.

12. A number of potential sustainable models are beginning to emerge, but some may require the aggregation of services to become sustainable.

13. Some infrastructure developments particularly those that enable broadband TV and personalised TV services may need to operate as public-private more community-based initiatives in order for them to become fully sustainable and replicable.

0.5.5 Potential learning services through interactive digital TV

Although based on limited feedback from a small-scale survey using potential scenarios, the research identified the likelihood of each scenario being "realistic and sustainable" using the categories of very likely; likely; quite likely and not likely at all.

Personalised TV mode

1. A scenario based around having access to a remote tutor via a TV in the home was considered to be *very likely* to be a realistic and sustainable.

2. Other scenarios that were considered to be *likely* to be realistic and sustainable, included the "Continuous Professional development of teachers"; the "Revising for National School Exams"; the "Virtual Professional Channel" and the "How do I? Do it yourself (DIY)" scenarios.

3. Scenarios utilising a personalised TV mode based on "Home-School links" and "From holidays to language learning" were considered to be *quite likely* to be a realistic and sustainable.

Broadcast/Scheduled TV mode

4. The "New employment opportunities and learning needs analysis" scenario that is based around interactive services in a more broadcast/scheduled TV mode was also considered *likely* to be a realistic and sustainable scenario.

5. A scenario focusing on "Developing basic numeracy from TV soap operas" using the interactive services associated with broadcast/scheduled TV and SMS messaging using mobile telephones was considered *quite likely* to be a realistic and sustainable.

Hybrid mode – combining both scheduled TV and Personalised TV

6. A scenario based on "A life specific episode stimulates skills updating" using a mixture of modes was considered to be *quite likely* to be realistic and sustainable.

0.5.6 Costs of accessing learning through interactive digital TV

1. Given, the very immature state of market developments it is still very difficult to predict likely costs of accessing learning through the various forms of interactive digital TV for individuals and households.

2. As the provision of education and training is funded by both the public and private sector, normal market forces and therefore consumer costs, often don't apply to certain sectors of the learning market.

3. Some learning resources are likely to be offered free particularly by public service broadcasters.

4. Some on-demand services – particularly in the leisure learning market will be competitively priced depending on the demand for such services.

5. Where there is a national or regional strategy to improve skills like numeracy and literacy - interactive services are likely to be free to the end user, but the digital TV industry may be subsidised by national or regional education and training government departments and agencies to provide such services.

6. In some instances they may be aimed at widening participation to learning but using the home-accessed component via interactive TV as a "hook" to bring a learner into a "campus" or "learning centre" based environment. Such services may be free to the end user, as they will form part of public sector funded learning provision.

7. Other learning services like those for continuous professional development may utilise the video-rich component of interactive TV particularly the on-demand capabilities as part of a blended distance learning solution that also utilities computer-based and text-based learning. The cost to the user of interactive TV component would be bundled up with the rest of the product/service.

0.5.7 Differentiated European and Other Markets

1. Within the different regions of Europe and across other parts of the world interactive digital TV is developing in a number of different ways. This will have an impact in how such developments may be utilised for learning purposes.

2. When looking at the prospects for the adoption of personalised TV services South Korea is likely to develop most rapidly in the short term up till end of 2004 with some usage. (See Fig 0.2)

3. By the end of the medium term (end 2007), Singapore, South Korea and Canada are likely to have widespread usage with some smaller countries like Cyprus, Monaco, Portugal and Sweden also having widespread usage. Many other European and other developed countries in the world are likely to have some usage. Greece, Poland and the smaller Central European countries are likely to have limited usage. Brazil would also probably have very limited usage. (See Fig 0.3)

4. During the longer term period up to end of 2012 most developed countries in the world are likely to be making use widespread use of personalised TV services. Greece and Brazil may still be behind in

such developments although some usage is likely to be made in both of these countries. (See Fig 0.4)

5. These predications have generally been made on the basis normal market developments of consumer services, however, some governments may decide intervene to stimulate developments in order meet policy needs of social inclusion, other coming the digital divide and widening participation to learning.

Fig 0.2 Short Term (2003-04) Prospects for Adoption of Personalised TV Services					
Country	Widespread usage	Some usage	Limited usage	Very limited Usage	None
Austria				X	
Belgium				X	
Cyprus			X		
Denmark				X	
Finland			X		
France				X	
Germany					
Greece				X	
Ireland				X	
Italy			X		
Luxembourg					X
Monaco			X		
Netherlands				X	
Portugal				X	
Poland					X
Spain				X	
Sweden			X		
United Kingdom				X	
Australia				X	
China			X		
Japan				X	
Malaysia				X	
Singapore			X		
South Korea		X			
Taiwan			X		
USA				X	
Canada			X		
Brazil					X

Fig. 0.3 Medium Term (2005-07) Prospects for Adoption of Personalised TV Services					
Country	Widespread usage	Some usage	Limited usage	Very limited Usage	None
Austria		▨			
Belgium		▨			
Cyprus	▨				
Denmark		▨			
Finland		▨			
France		▨			
Germany		▨			
Greece			▨		
Ireland		▨			
Italy		▨			
Luxembourg		▨			
Monaco	▨				
Netherlands		▨			
Portugal	▨				
Poland			▨		
Spain		▨			
Sweden	▨				
United Kingdom		▨			
Australia		▨			
China		▨			
Japan		▨			
Malaysia		▨			
Singapore	▨				
South Korea	▨				
Taiwan					
USA		▨			
Canada	▨				
Brazil				▨	

Fig 6.6 Longer Term (2008-12) Prospects for Adoption of Personalised TV Services					
Country	Widespread usage	Some usage	Limited usage	Very limited Usage	None
Austria	▓				
Belgium	▓				
Cyprus	▓				
Denmark	▓				
Finland	▓				
France	▓				
Germany	▓				
Greece		▓			
Ireland	▓				
Italy	▓				
Luxembourg	▓				
Monaco	▓				
Netherlands	▓				
Portugal	▓				
Poland	▓				
Spain	▓				
Sweden	▓				
United Kingdom	▓				
Australia	▓				
China	▓				
Japan	▓				
Malaysia	▓				
Singapore	▓				
South Korea	▓				
Taiwan	▓				
USA	▓				
Canada	▓				
Brazil		▓			

0.5.8 Learning and pedagogical Issues

1. Although it is probably accepted that the television in its traditional format is a very powerful medium, the body of research into its role for learning is rather more limited. Research has tended to focus on the impact that TV makes on individuals.

2. There appears to be limited research into the importance of informal learning as a means of drawing people into be formalised learning.

3. Despite some evidence to suggest that more people wish to learn from home, there appears to be limited work into understanding the conditions and requirements that are needed in order to make the home a conducive learning environment.

4. Understanding the role of interactivity is a very complex process with most, but limited, research focused on interactivity in computer-based environments. Unsurprisingly, there has been little research into using interactive TV for learning purposes.

0.5.9 Awareness-raising issues

1. The research has shown that awareness of the potential of using interactive digital TV for learning purposes even amongst those involved in educational technology is generally very low.

2. However, once decision-makers and practitioners have been made aware of the range of possibilities that are now emerging – they become more positive towards the potential that digital TV could offer.

0.6 Recommendations for future research

0.6.1 Pedagogical Research

1. There is a need for the educational research community to look at and present evidence as to how people learn in their home environments and how they may relate to learning through TV compared to other means (i.e. when people have access and can take advantage of learning opportunities in their home).

2. Socio-pedagogic research should be conducted into better understanding the sociological dynamics that operate in the home, how these relate to the television and what impact this may make on creating learning opportunities in the home (i.e. social barriers to preventing access to learning opportunities in the home).

3. There is also a need to gain a better understanding as to what aspects of interactivity are needed for different learning contexts and how it can motivate learners.

0.6.2 Socio-economic Research

1. There is a need to better understand the social and economic issues concerning whether broadband to the home should be considered as a universal service just like water.

2. Consideration should be given as to what impact market forces act as a barrier or a constraint to such developments and whether there is a need for government intervention to ensure social inclusion.

0.6.3 Learning Technology Research

4. Pilot projects should be established in order to better understand how to best utilise the limited interactivity of broadcast TV to engage groups

of people that are difficult to reach by more traditional educational routes i.e. turning them from being a passive viewer into an active learner.

5. There is a need to develop appropriate personalisation systems and tools that will enable learning content to be easy retrievable through Personal TV systems.

6. There is a need for an ongoing observatory to monitor developments in broadband and interactive digital TV and games plus consumer devices too keep up to date with such developments for those involved in technology-enhanced learning.

7. Future research should not consider learning in the home in isolation to other types of learning.

8. Future learning technology research into learning in the home needs to consider the home environment as a whole and the range and impact of devices that are becoming available – PDA, 2.5 and 3G phones, games consoles, Tablet PC, desktop and laptop PCs – local digital storage devices, access to remote storage devices, wireless communications, home servers.

9. In addition, consideration needs to be given concerning the inter-relationship between the different geographical locations for learning in the home; the workplace; learning centre (school, college, training centre, university and more informal local community learning centres); on the move and at leisure centres (sports, theatre, museum, cinema, countryside)

0.7 Format of main report

Chapter one introduces the purpose of the t-learning study; provides background information on e-learning developments and describes t-learning. It discusses the role of interactive digital TV developments within an e-learning strategy.

Chapter Two describes, using examples, the current state of the art concerning the use of interactive TV for what can be loosely called learning in its broadest context.

Chapter Three looks at the wide range of technology and service solution trends and developments in interactive digital TV. It broadly divides the solutions into: -

- Broadcast/Scheduled TV
- Personalised TV

It draws some overall conclusions as to what technology solutions are most likely to be appropriate for increasing learning opportunities in the home.

Chapter Four provides some insights into learning in the home with some conclusions.

Chapter Five describes some possible future scenarios with analysis based on the consultation and consensuses forming process involving experts and those with a specific interest in these developments.

Chapter Six looks at market developments and describes possible sustainable models for learning through interactive TV

Chapter Seven describes the key conclusions and recommendations.

5 May 2003

The full Final t-learning Report is available here

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