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Abstract
This report builds upon the work reported in Deliverable 1 and Deliverable 2. The report starts by briefly summarising key issues and the selected NexTV applications. Also, a review of the background business models that have influenced the proposed framework is presented. Then, a basic business framework for consensus building to define and clarify the roles of key actors participating in the interactive application delivery is proposed. This framework is then used to define the mechanisms and rules of the interaction between key (business) actors. Finally, the relation between the applications development progress and the role of the business model is addressed.

Keyword list
Interactive digital TV, Business Models, Interactive Applications, Roles, Requirements.

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1. Introduction

The underlying objective of Workpackage 1 is to develop an appropriate business framework for NexTV applications. In the first deliverable [1] we reviewed emerging telecommunication and information services business models. We also reviewed the digital broadcasting industry as a starting point to develop an interactive television business framework. A set of criteria to select the application domains and specific applications to be implemented by the NexTV consortium as well as a preliminary set of applications was defined in the first deliverable. In the second deliverable [2], we identified the requirements and methodology to develop a suitable user interface for the application. A methodology based on user-centered principles was chosen. This methodology has proven to cope well when supporting the development of interactive applications prone to continuous changes and uncertainties. As a complement to the user-centered approach a framework was proposed and used for collecting and structuring requirements. By using the identified framework, not only the requirements of the selected applications were identified, but also a first version of the requirements of the service infrastructure was presented.

In this deliverable we build on the two previous deliverables and present the first description of NexTV business entities roles, requirements and interactions. Furthermore, since we are dealing with new interactive applications scenarios and emerging business spaces, it is foreseen that the role, requirements and interactions of key actors in the value chain will evolve as a consequence of the mutations/changes of the applications requirements. Therefore, the underlying aim of this deliverable is to first propose a framework to identify and clarify the roles of key actors participating in the interactive applications delivery business, and then use the proposed framework to define the mechanisms and rules of the interactions between key (business) actors.

The structure of this deliverable is as follows. The next chapter briefly summarises key issues and selected applications. In Chapter 3, we review the background business models that have influenced the proposed framework here presented. In Chapter 4, we propose a basic framework for consensus building to define and clarify the roles of key actors participating in the interactive application delivery. Then, in Chapter 5 we use the framework to define the mechanisms and rules of the interaction between key (business) actors. Finally, in Chapter 6, the relation between the application development progress and the role of the business model is addressed.

2. Application choice and key issues

The NexTV consortium is investigating new interactive digital TV business applications, which builds on recent development and agreements of standards committees such as MPEG4, Java, DVB and others. A well define and simple structure of the business will allow the key actors to identify and analyse new business opportunities as well as the opportunities and threats of new applications or substitutes. The underlying threat of substituting NexTV application services with other interactive services will come from, e.g., Internet or other interactive TV businesses. The level of such threat would depend on the quality of service and the level of interactivity provided by NexTV in respect to the substitute business.

2.1. Key issues relating to application services

Key issues in developing application services can be narrowed down to understanding the correct level of interactivity required by the end-user (which translates into the user's perceived value) and the level of interest (commitment) of key actors to pursue the development and maintenance of certain application services.

2.1.1. Level of Interactivity

A suitable interactivity level is the main leverage for NexTV to provide new and successful applications for today's business environment. The interactive or personalised user interface has been the aim of the media sector, the computing sector, and the telecommunication sector for a long time. An example can be found as early as during the period of 1953 to 1957, from a cartoon programme for children. The CBS television network in the USA broadcast the regular children's series, "Winky Dink And You," which might have been the very first effort to provide an interactive TV programme. During the broadcast, the announcer encouraged children viewers to participate into the programme by drawing scenes associated to the progress of the animation onto a transparent surface fixed to the TV screen. The content and narration were successful enough to pull the children to the screen, promoting positive moral values such as performing the fascinating role of rescue agent with crayons as a magic tool. Unfortunately, deep involvement into the programme caused the children to forget to apply the special transparent membrane to the screen. There were naturally many complaints from parents with damaged screen, caused by the negligence of end-users. As a result, this early interactive programme was stopped not by lack of demand, but due to the technical limitations of the era (namely the absence of suitable user-interface equipment, such as a Set Top Box). Contrary to this and other ideas, today's teletext service is perceived as the most successful broad range interactive service. The teletext service, started in 1970s, has illustrated many successful features, which evolved as new application services in the modern digital era. SkyText from BSkyB satellite system is an enhanced teletext service variation for Sky News, Sky's sports and movie channels. EPG from OpenTV even delivers a service superior to those new ones. However, the current teletext service is so popular that, in fact, analogue teletext-on-demand will not easily or merely be replaced by the new form of digital information-on-demand over interactive digital TV.

2.1.2. Stakeholders and level of commitment

The stakeholders should become active drivers of NexTV application services, as they are likely to come from different industries. Though the roles, requirements and expectations of stakeholders might be different for each application, there should be a common business framework for deriving the business motivation of every stakeholder. The key actors in the delivery of interactive applications were presented in Deliverable 1 [1] (see also Figure 5.1). The target end-user group is at the centre of the any new application development. It is well known that is less risky to develop new application services for known customers. In other words, it is better to deliver an unknown product/service for known customers than an unknown product/service for unknown customers. This is an underlying idea behind the two applications that NexTV intend to pursue i.e. TOONS and EPG-shopping.

2.2. NexTV Applications

2.2.1. TOONS: Interactive story-telling

TOONS is an interactive story-telling animation for NexTV application services, targeting the children group. A similar style of application has been tested in studio environment, prior to the design of a specific scenario for TOONS. Technical implementation considerations are still not in the final stage, but it is assumed that Philips' Set Top Box will be used. The priority for TOONS will be children's 'look and feel' for interactive matters, that is, how the animation can be modified according to the children's desires.

The present application scenario does not allow real-time change in broadcasting content by end-users' inputs. In other words, there is no interactive channel or backward channel for real-time operation. Practical considerations might lead to the conclusion that it is impossible to react to whole different yet simultaneous inputs with a consolidated content which satisfies all desires at once. However, it would be possible in a limited environment, such as with a small number of end-users or in a studio-like location. Hence critical issues are: the capability for local interaction, transportation of content, content creation and editing, and aggregation of end-users' feedback.

Real time but local experience

MPEG4 will provide the flexible editing function for the video stream. Each object can be registered for independent operation; that is, it can be eliminated, added, or changed in appearance. Adequate control procedures at the local terminal allow changes to some object featured in the screen, such as the static or motion attributes of a character in the animation. In other words, the end-user can specify his/her own character in the story-telling animation. Local reactions – such as character tripped up by stone – can be produced at the Set Top Box level. The local storage of the Set Top Box may provide better functional performance, including more interactive options or higher quality scenarios. The new animation or rule sets can be downloaded at any scheduled time, or as they become available. It would be similar to new game CDs in PC games, which can be downloaded to the end-user's terminal without reminding the end-user or requiring any specifications for the PC.

Overall, the application resembles a real-time strategy PC game, which allows selection of the character, personal gear, and basic strategy rules or scenario sets. The real time operations are based on MPEG4 and Java as a common standard.

Non-real time interaction

From the service scenario of TOONS, there is no on-line interactive channel. Instead, end-users are expected to join the forum on the Internet after the broadcast of the interactive animation. This allows active communication among the peer group. The producer or creator of the story-telling animation can collect the feedback from the WWW site. For example, children may suggest new scenarios or demand additional characters or accessories.

Content preparation and delivery reflecting end-users' interaction

The Creator and/or Producer of the animation can join the forum and engage in direct or indirect interaction with children (the End-user). The outcome of the forum in WWW can be injected to the existing content to produce new story lines. Although no delivery channel is determined yet, DVB from the satellite may be the preferred option.

2.2.2. EPG-shopping

Tele-shopping can be seen from a variety of different angles. A combination of tele-shopping and electronic programme guide (EPG) was put forward in the NexTV project as a differentiated application service. The primary configuration may include a 'Buy-me' button, which may link to URL, HTML, or other MPEG audio/video stream. Contrary to TOONS, which has no backward or interactive channel, EPG-shopping has an interactive channel. There may even exist the possibility of employing bi-directional video communication, to connect to a live sales person. Though such special function is not of a standard type, the MPEG server currently available on the market can accommodate such EPG-shopping functionalities. For the end-user's terminal, a PC-based MPEG4 hardware decoder is considered with a 3D-player functionality. Many issues are still under consideration; they range from technical issues such as the technical transitional/shared residency of MPEG2D player and MPEG3D player, to business issues such as identifying business users or availability and production of the appropriate content. Enhancements of the end-user profile are also considered in order to provide an improved, differentiated EPG-shopping environment.

Current types of e-commerce transactions performed in tele-shopping environments provide a benchmark for NexTV commercial transactions. The NexTV platform would provide the framework for e-commerce transactions, instead of the more conventional framework provided by the Internet. Even within a basic specification of the application, EPG-shopping will offer an innovative way of conducting electronic business through the NexTV platform. The EPG-shopping application service can be understood as follows:

- T-shopping may utilise MPEG4 on MPEG2TS as standard; the use of Java is not clear

- Essential functional requirements are 2D/3D player and hardware MPEG2 decoder
- End-user profile can be utilised at central control for customised information “push”
- EPG-based application service is the underlying core concept.

2.3. Final Comments

NexTV applications emerged as a result of combined rapid technological innovation and more pervasive consumption behaviour. Throughout their lifetime, NexTV applications will remain vulnerable to the exploitation of the same factors by rival services. The implementation of an evolving process is therefore imperative to establishing and maintaining NexTV’s advantage in the market space. Such a process must ensure uninterrupted communication among all key stakeholders to promptly adapt and anticipate technological and/or economic changes. In practice, this will translate both in improvements of levels of interactivity and in the consolidation of stakeholders’ commitment to NexTV.

3. Business Model Background

Attempts have been made outside the NexTV project to define reference models that allow the identification of key characteristics of an interactive application delivery chain. In this chapter, we review a subset of previously proposed solutions that will form the basis of the framework to be proposed in the following chapter.

The models to be reviewed in the remainder of this chapter are: the Imprimatur Common Reference Set (ICRS) [3], the Digital Video Broadcasting (DVB) [4], the OpenTV model [5], the TV Anytime model [6], the Power TV model [7], and the RespondTV model [8]. Each exhibits more than one common aspects with NexTV application services, e.g. content as main issue, digital video as main carrier, interaction as new leverage to value creation. There are also some differences, and therefore, the NexTV framework would be built from the relevant aspects of all these models.

3.1. Imprimatur Common Reference Set (ICRS)

Type of Business Framework: The ICRS is a simple entity-relationship model using a reference set model. The ICRS covers mainly the domain of Intellectual Property Rights (IPR), which has emerged as critical issues for the transaction of media products. IPR products are non-physical goods and likely demand complex information/payment flow dynamics.

Characteristics: The ICRS was developed for those key issues by identifying four basic entities and three types of flows (transactions amongst entities). The identification of actors and their roles appreciates the importance of creative work, which may be also valid to NexTV applications. Though there is nothing particular about the ICRS as a model, it demonstrates how to manage complex relationships using actors-flows pairs and their associated properties.

NexTV Application: NexTV application service such as TOONS may require the framework for creating, producing and delivering media content. Here, the role of creator is even more important as the storywriter should reflect the interaction in the story line continuously.

Another advantage of the ICRS is its use of a flow representation to model the complex interactions among actors as seen in [Figure 3.1](#). The dynamics within multiple layers of flow is a powerful tool to understand the complex dynamics of the business framework. In case of the ICRS, three flows have been identified: right, payments and information. The NexTV application services may have more flow layers than the ICRS, as interactive applications can generate other flows not included in the ICRS model.

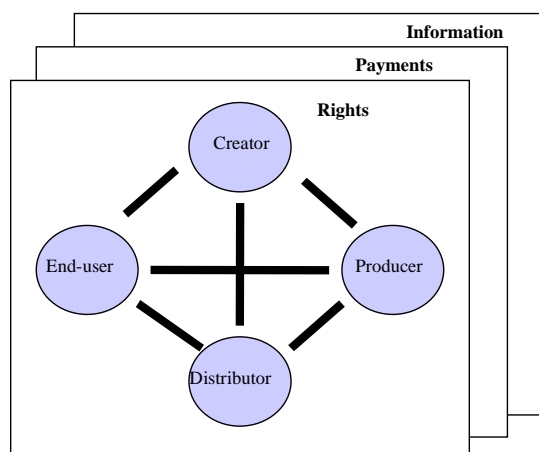


Figure 3.1: The Imprimatur Common Reference Set

Strengths and Weaknesses: There are some limitations in applying the ICRS directly to NexTV applications. Though the interactivity is the critical function in NexTV application services, there are also intrinsic issues from the nature of new digital TV broadcasting.

The limitations of the ICRS can be summarised as:

- An interactive manager entity is not considered in the business framework;
- The role of broadcaster is not proper to fit into existing entities;
- Other perspectives are not included like e.g., the hardware and software provision perspective is not considered.

However, the ICRS has the remarkable strength as a reference set in the following:

- Reference set with actors and flows for representing business framework;
- Introduction of creator as a basic entity or actor.

3.2. Digital Video broadcasting (DVB) general reference model

Type of Business Framework: The DVB reference model scope is wide, including broadcasting and telecommunication industry solutions. It is concerned with the underlying infrastructure and its technology (e.g. from satellite to Set Top Box). It more or less includes an implicit business model inserted in the technology as its general background. New trends in media service are well accommodated since the models are centred in technology innovation.

Characteristics: The DVB reference model in Figure 3.2 suggests interactive functions facilitated by the terminal, the broadcast channel and interactive channels. This function should be explicitly considered and modelled as a way to relate the end-user with the rest of the actors of the value loop as well as the level of interactivity of the service. The network architecture is based on the high-speed interactive channel from 64Kbps to 2Mbps bandwidth. However, little attention is paid to the importance of creation work, though there is an entity of Interactive Service Provider.

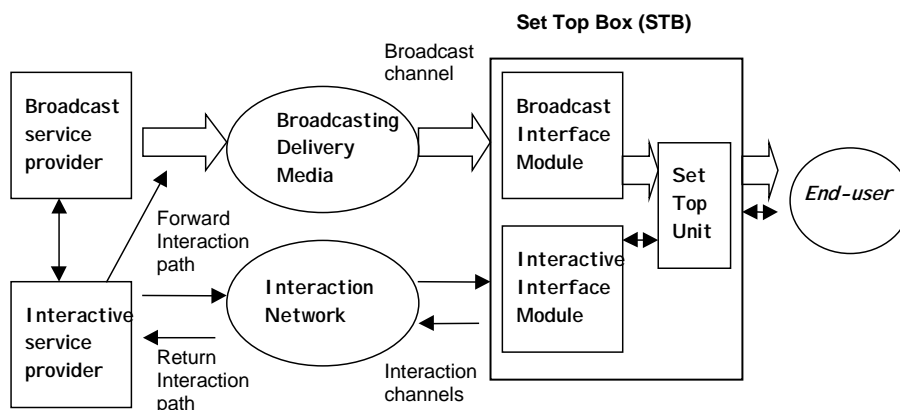


Figure 3.2: The Digital Video Broadcasting General Reference Model

NexTV Application: The reference model of Figure 3.2 is suitable to explain the following points for NexTV framework:

- Delivering customised product/programme at end-user's site via Set Top Box (STB) and interactive channels;
- Service provider and Interactive service provider as core business entities;
- Supply chain with Digital Video Broadcasting.

Strengths and Weaknesses: There are both advantages and limitations in applying DVB general reference model to represent the NexTV reference set. Limitations are as in the following:

- Lack of creator's role;
- Limitation on complex flow management;
- No other alternative channel than main stream broadcasting (e.g. satellite broadcasting).

The DVB general reference model may suggest ideas to NexTV

- The entity of interactive channel manager;
- The role of STB and equipment;
- Major supply channel with DVB.

3.3. OpenTV model

Type of Business Framework: Open TV illustrates a possible business implementation including applications elements as well as equipment. This framework is a simple reference for the equipment supplier and service provider (Producer and Broadcasters). The service provider is the focal point in this model. From a business model perspective, the supply chain is explicitly highlight so as to be able to determine overall requirements.

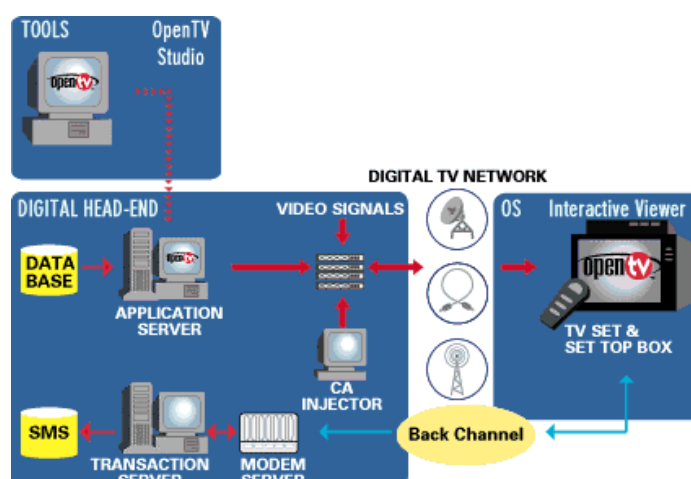


Figure 3.3: The OpenTV model

Characteristics: The business model proves the presence of back channel, transaction server, and broadcast server for a generic video related interactive application. It resembles NexTV configuration suggested in Deliverable 2. The characteristic of Open TV system highlights the importance of content delivery and implementations related issues.

NexTV Application: OpenTV frame of Figure 3.3 may suggest another reference set for NexTV applications, as it incorporates a back channel. It suggests the way of utilising Internet Protocol as an infrastructure, and means of providing MPEG4 contents over IP or MPEG2TS as ways of product packaging and the delivery. The transaction server can manipulate every transaction and the back channel can carry the feedback information to Web Server. The OpenTV frame explains the possible business operations or transaction. The following business aspects are shown: the complete set of supply channels; the presence of interactive channel and its management; and the creation work.

Strengths and Weaknesses: Though OpenTV frame has such advantages, it may not be efficient to deal with issues of every stakeholder. Those limitations can be identified as in the following:

- Limited view on the creators' role;
- Limited view on different flows or relationships among active entities;
- Less flexible for accommodating interactive options, e.g. user's input to creator;
- Not enough consideration on the influence from equipment or supporting infrastructure.

However, OpenTV frame can enhance the NexTV business model development in following aspects:

- Interactive channel management as a core entity;
- Appreciation of creator's role;
- Complete set of supply channels.

3.4. TV Anytime

Type of Business Framework: TV-Anytime aims to integrate traditional broadcast and new on-line interactive services in order for the viewer to select both programme and diffusion time. The TV Anytime model illustrates further the crucial role of creators and intellectual property rights. By introducing the concept of Metadata for content reference control, the TV Anytime model proposes effective and interactive supply chain control.

Characteristics: TV Anytime highlights the importance of content and rights management. The TV Anytime Forum was initially established to address issues of large volume local storage. As a result, the architecture of TV Anytime accommodates as many different types of business transactions as possible. The framework is independent from the delivery channel and concentrates on the content creator and consumer. Metadata is used to aid the consumer with searches and navigation. The key characteristics of TV Anytime include the definition of content referencing (identification, location and acquisition of content) and the management and protection of the rights of content owners and consumers. However, little attention has been paid to the issue of revenue stream generation for each stakeholder.

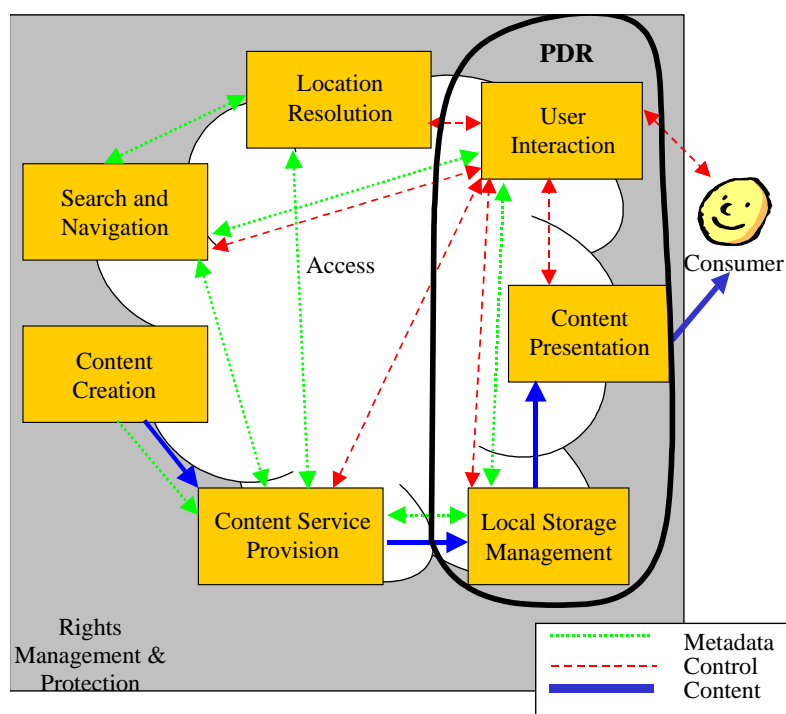


Figure 3.4: The TV Anytime Full Interaction Model

NexTV Application: The TV Anytime reference model presented in Figure 3.4 is suitable to explain the following points for the NexTV framework:

- Delivering customised product/programme at end-user's site via PDR (Personal Digital Recorder) function and the presence of Metadata;
- Content creator and content service provider as core business entities;
- Interactive supply chain control with Metadata.

Strengths and Weaknesses: There are both advantages and limitations in applying TV Anytime to represent the NexTV reference set.

The limitations of the TV Anytime model are as follows:

- Limited focus on revenue stream generation;
- Lack of distribution model;
- Diminished weight on the broadcaster's role;
- Limited commercial transactions other than media/content transactions.

The TV Anytime model may refine the NexTV framework in the following areas:

- Feature of right management;
- Role of local storage in consumer's STB and equipment;
- Interactivity with agent technology using metadata or similar.

3.5. Power TV

Type of Business Framework: Power TV relies on an innovative operating system (OS) for digital Set Top Boxes that will enable a wide range of interactive TV services. Flexible implementation of each interactive functionality enables content creators and developers to offer a differentiated consumer-driven interactive TV service. The business framework provides a reference model for customised interactive services enabled by proper content authoring. Hence Power TV exemplifies the role of the authoring tool in the value chain, in particular at the level of the creator and content developer.

Characteristics: In the Power TV model presented in [Figure 3.5](#), authoring tool developers provide (a) environments for creating interactive TV products. Creators/developers use these and other tools to create interactive TV content (b). Broadcasters and interactive content providers market these products and other media across the network (c). Cable and telecom companies provide the communications links to deliver information, interactive video products, and entertainment programming to consumers (d). Digital STB manufacturers provide the hardware, and operating system developers provide the software that allows consumers to take advantage of these products and services from their home (e).

NexTV Application: The PowerTV model can clarify the following points within the NexTV framework:

- Role of authoring tool and the various manufacturers in the interactive TV application;
- Influence of creator/developer on the supply of products and services;
- Supply chain with multiple delivery options, e.g., broadcaster or telecom.

Strengths and Weaknesses:

Limitations are as follows:

- Reduced interactive channel management;
- Limitation on complex flow management;
- Limited commercial transactions other than media/content transactions.

The Power TV model may contribute the following ideas to NexTV:

- Feature and role of flexible Set Top Box;
- Role of authoring tool supplier and STB manufacturer;
- Considerations on improving the content creation process for interactive TV applications.

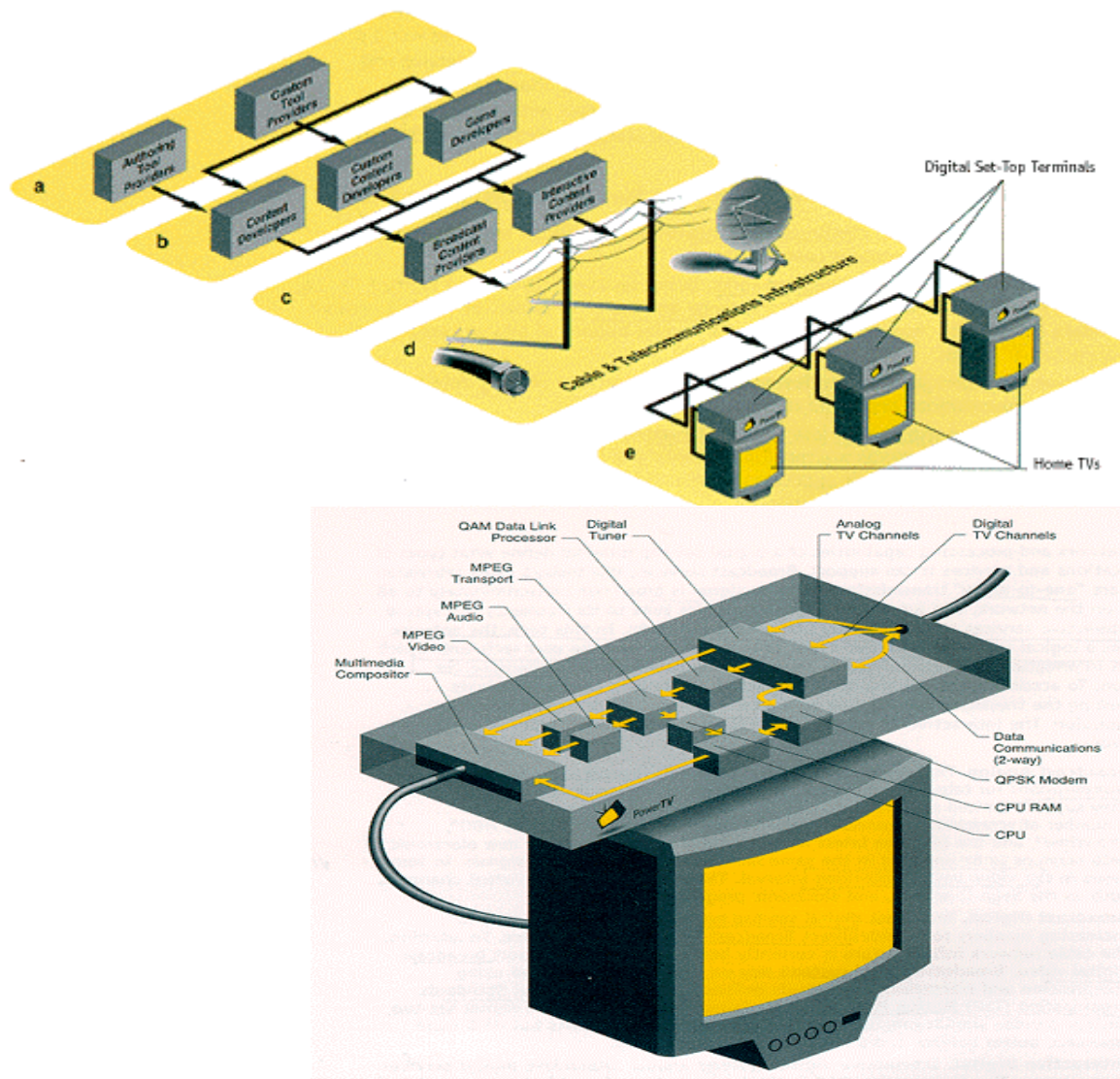


Figure 3.5: Power TV model and Set Top Box

3.6. RespondTV

Type of Business Framework: The value-added of RespondTV relies on the ability to tailor advertisements to viewer preferences. The model attempts to reconcile the need for broadcaster control over advertising content shown (e.g. suitable format and payment mode) and the advertiser's need for flexibility to alter advertising content.

Characteristics: The application relies on a number of features. First, a response management system organises capture of user information, storage into user

profiles for easy retrieval and commercial exploitation, stimulation of triggers, real-time feedback to advertiser or broadcaster. Second, a programme manager tool allows the broadcaster to monitor, filter and control triggers. The log of triggers sent can be viewed by the consumer at any time. Third, content control is performed in real-time via a web-based interface (known as the 'Campaign Manager').

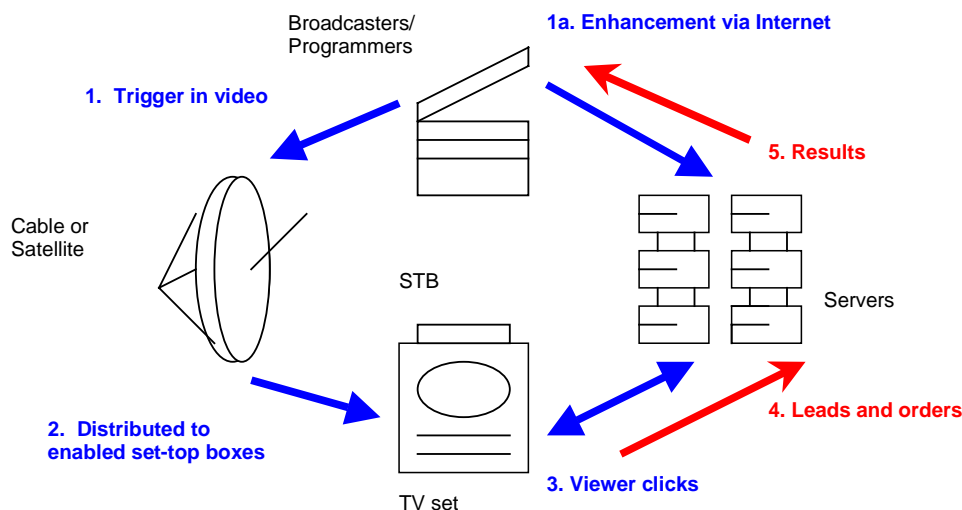


Figure 3.6: RespondTV Model

NexTV Application: So long as the TOONs application is limited to local interaction, the RespondTV model presents limited interest for TOONs since it overlooks content creation and emphasizes real-time interaction.

However, it raises a number of interesting issues with regards to the Tele-shopping side of the EPG-shopping application. In particular, it highlights the necessity for a response management system, a real-time campaign management interface and suitable tools for trigger monitoring, filtering and control.

Strengths and Weaknesses: RespondTV does not address a number of vital issues, and its overall presentation is not coherent with finer explanations (e.g. the advertiser is part of the BM, yet is not shown in Figure 3.6). However, some interesting aspects emerge in relation to the EPG-shopping application.

The main shortcomings of the RespondTV model with regards to NexTV applications include:

- Lack of interest in programming shown other than advertising;
- Content creation seen merely as part of the advertiser or producer role;
- Lack of explicit protection of viewers' privacy (Cf. Data Protection Act);

Nevertheless, RespondTV shows particular strengths in the following areas:

- Inclusion of advertiser as key role in the business model;
- Focus on the various facets of the interactivity management role;
- Real-time response through the use of personal profiles;
- Use of automated triggers to manage and monitor advertising content broadcast.

4. Interactive-TV Common References for User-centric Loop (ICR-UL) Framework

4.1. Introduction

The purpose of the Interactive-TV common reference for user-centric loop (ICR-UL) framework is to provide the business reference framework for all key actors in the NexTV solution that have been identified in Deliverable 1 [1] (Figure 6 and Figure 7 of Deliverable 1: see also Figure 4.1 and 4.2). Some of the possible interactions and transactions of the proposed model are partially covered by existing models like Imprimatur Common Reference Set (ICRS), Digital video broadcasting (DVB) model, OpenTV model, TV Anytime, Power TV and RespondTV. The aim of this chapter is to propose an underlying framework that encompasses all the common functions of the aforementioned models and the NexTV business framework.

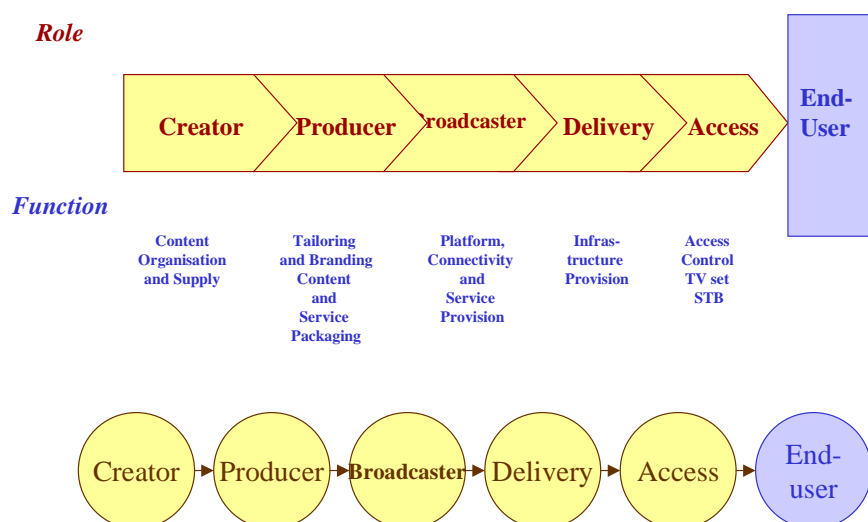
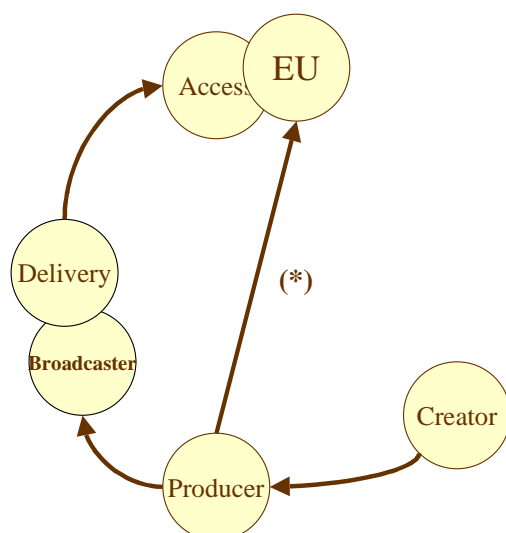


Figure 4.1: The traditional Supply Value Chain (adapted from Deliverable 1 WP1_D1, Figure 6)

In the more basic instance of the ICR-UL business framework for NexTV, seven actors and three conceptual layers of flow relationships are proposed. The actors are: Creator, Producer, Broadcaster, Delivery, Access, End-user and Interactivity Manager. The flow layers are: Supply (of physical product and/or application services), Payments and Rights. However, rapid changes in transport technology, and dynamic and proactive service provision and delivery which is now a common feature in the market place, may dictate additional layers in the future. To complete the analysis of the ICR-UL business framework it is suggested to include (apart from the pure business perspective) the following perspectives:

- the hardware and software provisioning perspective,
- the mode of communication between actors perspective,
- the influence of standard committees perspective, and

- the policies, legal and regulation perspective.



(*) : accounts for e/t-commerce

Figure 4.2: The e/t-commerce attempt to change the traditional Supply Value Chain.

4.2. Background

From the ICRS, the methodology of entity-relationship is adopted. The Broadcaster/Delivery replaces the role of Media Distributor and the End-user/Access represents the User or Purchaser in the ICRS model. All entities in the proposed model interact in the Client/Server (consumer/provider) mode. By positioning every actor as a possible consumer (or user)/provider, user-centric principles can be used as a methodology to iteratively optimise interactions and transactions among actors. The three layers as defined in the ICRS are here adopted but the specific flow will be application dependent.

The NexTV framework uses the notion of Interactivity Manager (IM) which is a generalisation of the interactive channel manager (ICM) of the DVB model. The IM not only plays a fundamental role once a mode of interactivity is decided but also may assist, in certain circumstances, to act as a clearing house for intellectual property rights (IPR) flows (note that IPR issues are not dealt with explicitly in this project).

From the OpenTV model, it is clear that the software and hardware provision perspective should care for, for example, interactive service software developer, the authoring tool and common authoring application programme interface (APIs) issues. Aspects to consider here are in terms of, for example, the efficiency and the demand for reusability of the product.

The requirement for digital video broadcast and the set-top-box (STB) lead to the addition of four additional perspectives:

- The hardware and software provisioning perspective (e.g. STB manufacturer) as shown in Power TV model;

- The mode of communication perspective (e.g. infrastructure solutions). For instance: agent technology and Metadata as in TV Anytime model, or embedded triggers in video streams and personal profiles as in RespondTV model;
- The standard committees perspective (i.e. agreed road map for development and commercialisation of technical solutions);
- The policies, legal and regulation perspective. This last perspective is not dealt with explicitly in this project.

Interactivity in NexTV application services generates a variety of interactive information flows among the different business entities (see [Figure 5.3](#)). To be able to account for these flows, the ICR-UL model introduces the Interactivity Manager (IM) business entity who is at the core of the proposed interactivity loop.

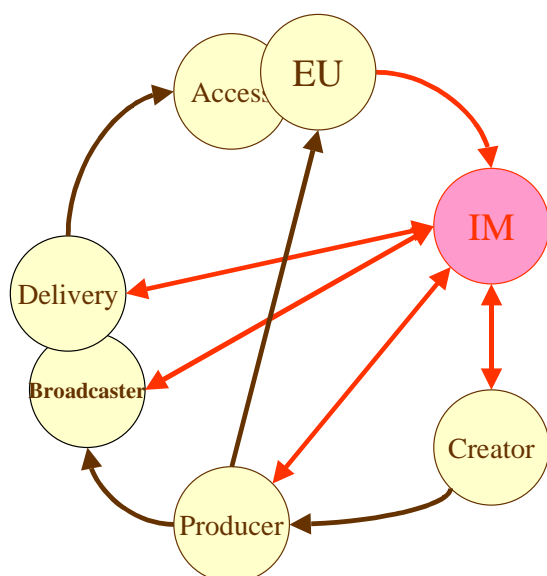


Figure 5.3: The NexTV Interactive Supply Value Loop and the Interactivity Manager (IM).

4.3. Roles

The forward supply chain and the backward interactive chain are equally important in roles and flows, the proactive level of each actor or the mode of interactivity would vary depending on application service, interactive level, technology adoption, standardisation level or target End-user group. For each actor (represented by a circle in [Figure 4.3](#)) an underlying set of generic roles can be stated in [Table 4.1](#).

ICR-UL BM	Description	Examples
Creator	<ul style="list-style-type: none"> - content creation or initiative generation for content creation or content production - input driver for tv-commerce production - advertiser 	<ul style="list-style-type: none"> - writer, player(e.g. orchestra, singer), professor - multimedia author; content creator, - programmer(e.g. game company), - advertiser, content production motivator(e.g. consumer product supplier)
Producer	<ul style="list-style-type: none"> - Packaging creator's work for the broadcaster - Accommodation or production of tv-commerce for any e-business 	<ul style="list-style-type: none"> - TV program production - Multimedia production - Media and game producer - TV box office retailer (e-commerce)
Broadcaster	<ul style="list-style-type: none"> - Preparing and delivering the interactive digital video streams from various sources 	<ul style="list-style-type: none"> - TV broadcaster, - Telecom company, - Cable company
Delivery	<ul style="list-style-type: none"> - Transport Infrastructure 	<ul style="list-style-type: none"> - Telecom company, - Cable company, - TV broadcaster
Access	<ul style="list-style-type: none"> - IDTV STB supplying and updating 	<ul style="list-style-type: none"> - Set Top Box relevant manufacturers, e.g. HW, SW, - Semiconductor vendors
End-User	<ul style="list-style-type: none"> - Consumer, purchaser 	<ul style="list-style-type: none"> - Individuals, Groups, Companies, etc
Interactivity Manager (IM)	<ul style="list-style-type: none"> - Interaction facilitation or the hub of interaction for all users - co-ordinating and monitoring the defined rules and interactions with end-users and related users 	<ul style="list-style-type: none"> - WWW - Portal service - Set Top Box

Table 4.1: Generic roles for the ICR-UL actors.

The overall consensus framework in terms of actors and layer structure is shown in Figure 4.4 and each layer is further illustrated in Figure 4.5- Figure 4.7.

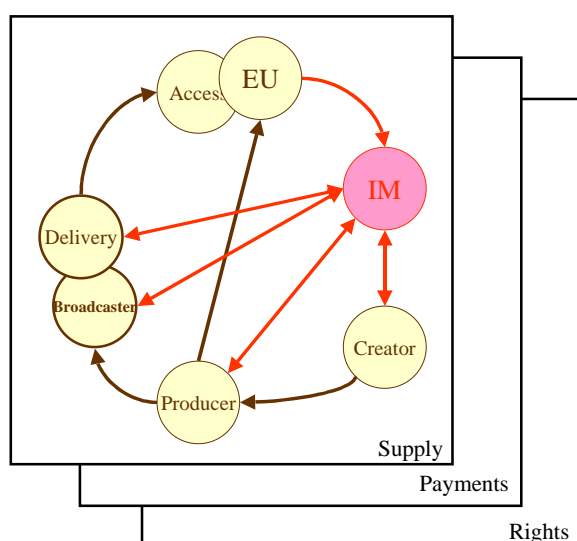


Figure 4.4: The ICR-UL Model

4.4. Supply layer

The Supply layer (Figure 4.5) illustrates two channels in the relationship between End-user and other: the direct channel(s) accounts for products/services supply (e-t-commerce is also included) and an additional back channel which takes into account aspects of level and mode of interactivity of the business model. The product/service supply represents the commercial transaction of goods, which may require the transfer of physical goods (for example by means of e-t-commerce).

Note that conceptually, the IM may act as the core entity or hub, as it connects every actor in the loop. It certainly facilitates the End-user's feedback to Creator, Producer, or Broadcaster. Those inputs can be associated to an agreement (or contract) for, a certain level of quality of service, the modality for buying a product, payment schemes and so on. At the same time, other actors can push their advert, authorisation or customised information via the IM. Such interactions are expected from the conventional e-t-commerce and Internet.

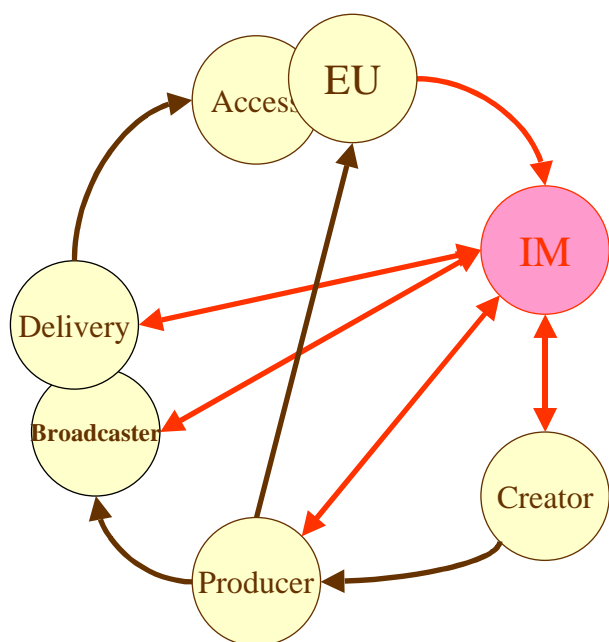


Figure 4.5: The Supply Loop Layer and the Interactivity Manager (IM).

The impact (in terms of effectiveness and efficiency) of NexTV application services delivery in the marketplace may be determined by, for example, the degree of non-overlapping activities, the identification of performance related synergies, and coordination amongst all individual actors involved in the loop. Note however that the role of IM would become more decisive depending on external factors, like for example, technology innovation. The characteristics, mode of implementation and flexibility of the IM actor form the key business differentiator between different service providers.

Note that, in a particular business model of interactive TV, there may be no direct interaction between the Broadcaster and the End-user; only via a separate IM entity.

In practice however, the same business entity may be in charge of both the Broadcaster and the IM. For example, a broadcasting company with DVB-RCS or a telecom company with broadband data network. That is, the actors in the ICR-UL may be represented by single business entity, multiple business entities, or duplicated multiple business entities. The idea of ICR-UL is to provide the reference for dynamic transactions and to accommodate the possible changes in the business environment as well as innovations.

4.5. The payment layer

The layer of payment flow in [Figure 4.6](#) suggests the transaction style of revenue and cost for every actor with NexTV application services. The IM could actively facilitate the payment flow, as all the transactions in the supply loop layer can be interpreted in the presence of IM.

The role of the IM in this layer should encompass current business models and revenue streams like the ones highlighted in page 28 of Deliverable 1 [1]: license fee model, advertiser-funded model, subscription-fee model, combination of advertiser-funded and subscription-fee model and pay-per-view model. Furthermore, the role of the IM should also permit new dynamics into the rate and nature of transactions as well as new modalities of revenue generation.

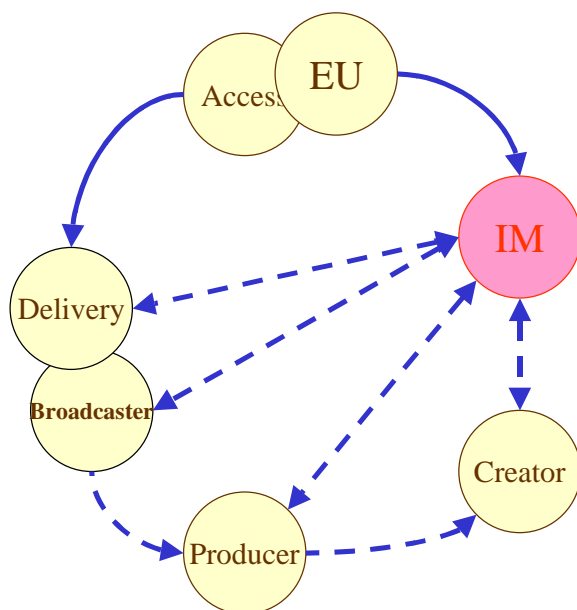


Figure 4.6: The payment flow layer.

4.6. The rights layer

The last layer that is mentioned in this report for completeness is the Rights Layer ([Figure 4.7](#)). Note however that, there are other initiatives and EC funded projects that are investigating Intellectual property rights (IPR) issues in depth. For example, the IST OCCAMM project, and related initiatives like Open platform initiative for multimedia access (OPIMA) and TV Anytime. It is just worth mentioning at this point that the IM is strategically positioned in the interactive supply loop and hence it could

also include the activity of monitoring (security) and manage Intellectual Property Rights (IPR) issues. From the experience of the ICRS and OCCAMM projects it is clear that the IPR Manager (IPRM) can be quite complex even in the simplest of scenarios.

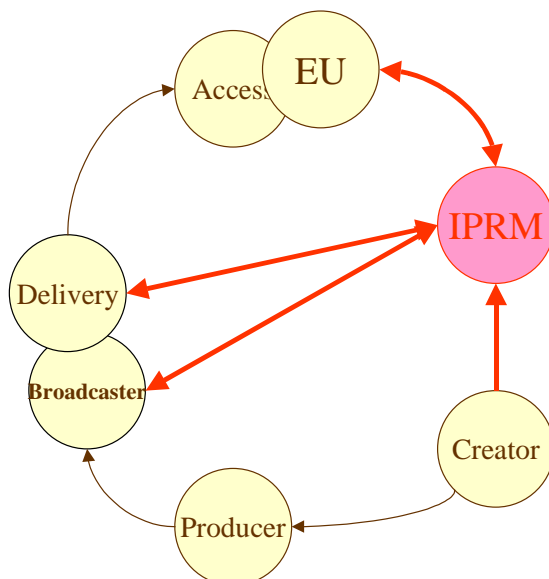


Figure 4.7: The Rights layer and the Intellectual Property Rights Manager.

4.7. Hardware and Software provision perspective

As mentioned earlier, in a dynamically changing business environment the technological infrastructure as well as available software and/or hardware solutions will play a critical role when implementing future Interactive (NexTV) applications. For example, the innovative function of interactivity and MPEG4 is only realised by a suitable Set Top Box (STB). Taking into consideration these aspects of the business, we introduce three analytical perspectives to explicitly include these variables that are of paramount importance as they impact the business in an orthogonal way. In [Figure 4.8](#) the role of the Software and Hardware provision is included to better depict their influence.

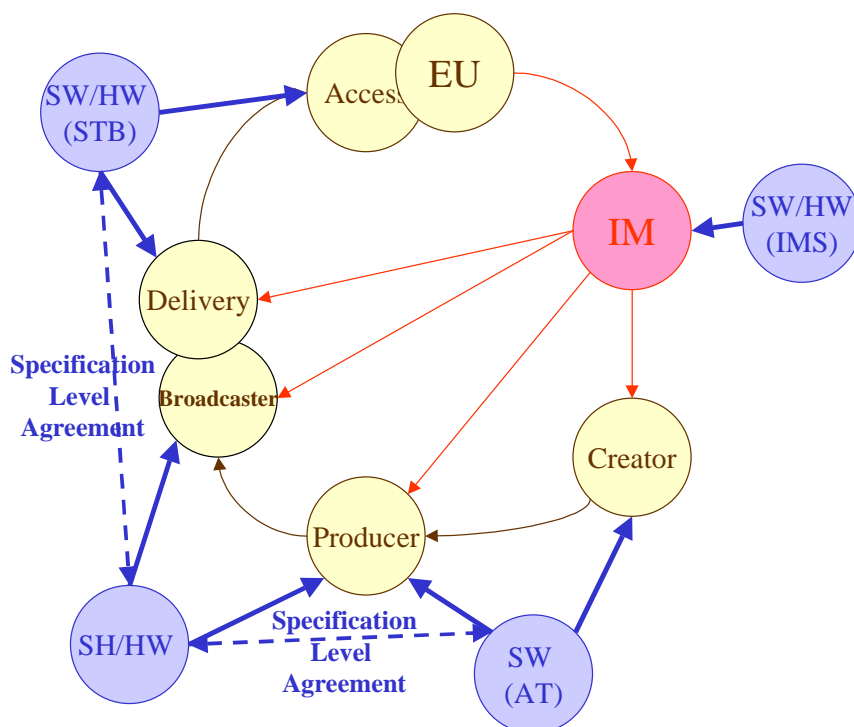


Figure 4.8: The role of hardware and software provision.

In Figure 4.8 the role of the authoring tool (SW (AT)); role of the Set-Top box manufacturers (HW/SW (STB)), other supporting software and/or hardware (SW/HW) to be used by the producer/creator; as well as the software and hardware developers of the IM System (IMS) are explicitly depicted. For example, as seen in Figure 4.8, the STB manufacturer has an intimate influence on most actors.

Other aspects of the business that can also be included in this perspective are, for example, the influence of cost of STB and authoring tool in the popularity and acceptance by actors in the supply loop (specially amongst Producer and End-user).

4.8. The influence of standard committees perspective

It is also important to recognize that most of the technological advances in an established industry (like for example, the broadcasting industry) is driven mostly by the agreement on common standards. Therefore, a more complete version of Figure 4.8 is shown in Figure 4.9 where the role and scope of standards initiatives is included. Note that the IM actor should not be regulated since it is the key actor that will permit to realise a competitive market environment on the basis of personalised interactive services for differentiation.

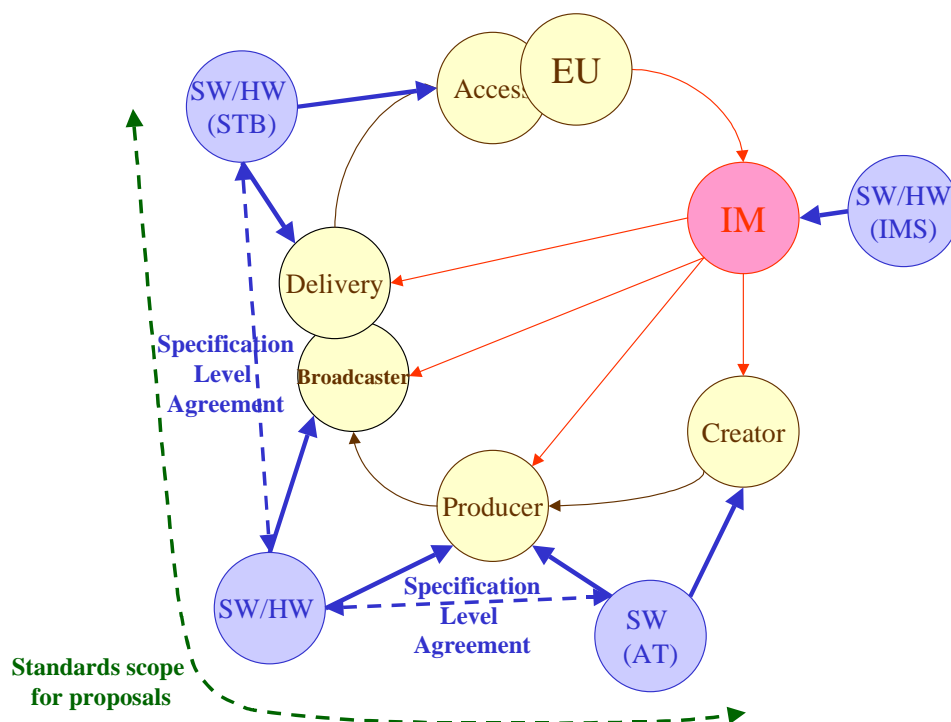


Figure 4.9: The role of standard initiatives and hardware and software provision.

4.9. The mode of communication between actors perspective

The underlying communication perspective should represent a variety of underlying resources available to implement the NexTV solution. Note that this perspective can also be influenced by the standards committee perspective.

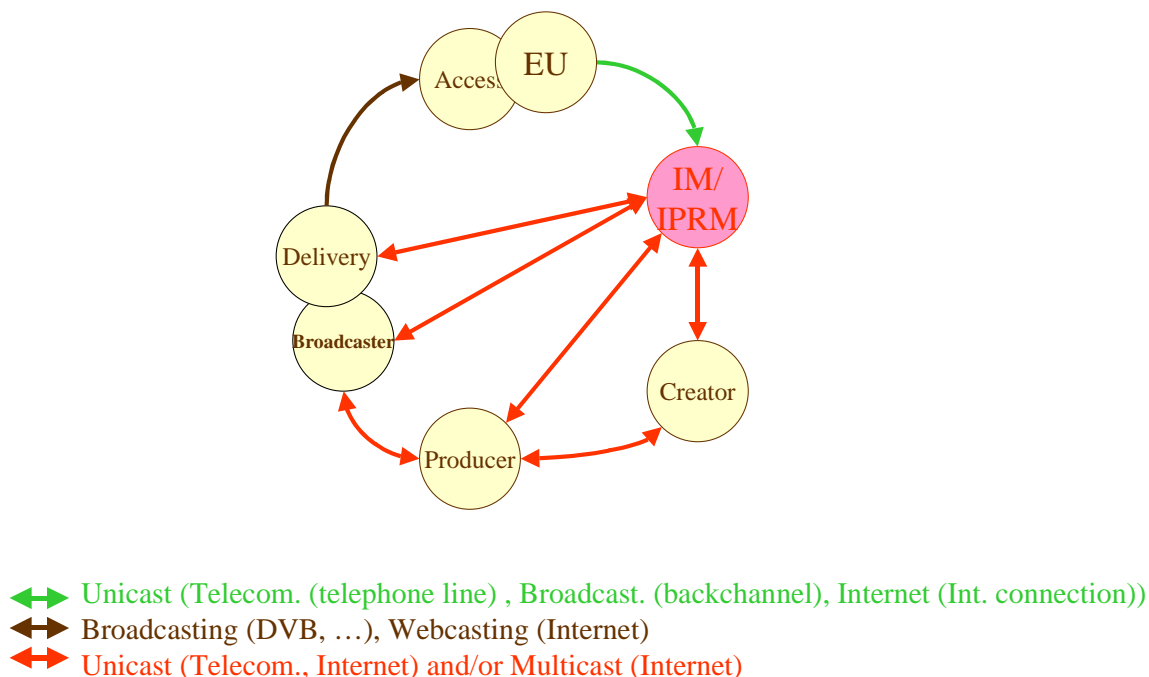


Figure 4.10: Infrastructure (mode of communication) perspective.

4.10. The policies, regulation and legal perspective

In most European countries, the broadcasting sector is already subject to regulation and legal aspects. Therefore, at this point in time first movers or not into the interactive TV business will have to comply. The question remains which way to go: do we need more regulations or do we need de-regulation for the interactive business potential to reach its full potential. This perspective is not dealt with explicitly in this project but key aspects will be considered as exogenous variables.

4.11. Final comments

When facing the reality of application developing evolving scenarios, the ICR-UL framework proposes a simple and flexible model structure suitable for consensus building. This framework should be able to aid the different actors in the value loop in their quest for and discovery of, new business models. ICR-UL is well-suited to encompass an overall business framework analysis as well as to the analysis of specific aspects of the business.

5. ICR-UL roles, requirements and interactions

5.1. Introduction

With a circular supply value loop, the level of interactivity between actors should provide the basis for offering differentiated products/services to (all) actors in the loop (See Figure 4.1). In this framework, a layered structure is also proposed to allow for different nature of interactions in each layer depending on the particular application. Furthermore, aggregation, composition and/or federation of functions performed by different actors could, in principle, be permitted. The relationship between actors is certainly a dynamic process that can change as industry progresses.

At the centre of the ICR-UL framework is the Interactivity manager (IM) actor. The role of the IM is to facilitate an agreed level of interactivity between actors. For example, a particular interaction can be triggered by the End-user's behaviour, or on request by any other actor. These requests in the more basic instance of the ICR-UL framework is processed by the IM which is in charge of the service level agreement negotiations and monitoring between the relevant actor(s) of the value loop. The mode and level of interactivity (which can represent e.g. the features of the back channel) in the loop should also be selected depending on the application service type. For example, the flow from End-user to IM should be a matter of real-time concern in the EPG-shopping application but it is not so time sensitive in the present NexTV interactive story telling animation application (TOONs). In general, the role of actors is a function of the underlying business objectives and nature of the application services. For example, the location of the End-user profile will determine End-user management functions and the associated responsible actors.

5.1.1. Roles

The forward supply chain and the backward interactive chain are equally important in the ICR-UL framework. The level of interactivity of each actor would vary depending on application service, technology adoption, standardisation level or target End-user group. For each actor (represented by a circle in Figure 4.3) a set of generic roles have been proposed in Table 4.1.

5.1.2. Requirements

This section should be regarded as a complementary piece of information to that stated in Deliverable 2 [2]. A fine tuned set of requirements will certainly come from further agreement on the level of interactivity, technology adoption, model for creating better perceived user value (PUV), channel (Interactive and direct) management, content preparation, look and feel, secure operation, usability, cost-effectiveness and standards. In this sense, the agreements and decisions taken in workpackage WP2: Platform development and integration, would allow the fine

tuning of requirements and the determination of the following key technological choices:

- Appropriate technological framework (See [Appendix B: Technology Mapping](#)).
- Authoring tool Hardware and Software.
- Set-Top-Box hardware and Software.
- The Interactivity Manager System (IMS) Hardware and Software.

- Definition and location of core interactivity functions (features).
- Definition and location of the End-user profile.
- Definition and location of storage memory.
- Scope (duplications) of functionality of each user in the value loop
- Transport technology (delivery and mode of communication amongst actors).

- Infrastructure utilisation,
- Cost effectiveness of Infrastructure

Requirements: Framework for analysis

A starting point for all of the above issues was set down in Deliverable 2 [2]. The underlying requirements addressed in Deliverable 2 [2] are:

- Purpose of the application: the motivation and advantages in perspectives
- Scope of application: the context of the application
- Functional and data requirements: tasks the application must do and their related functionality
- Look and feel requirements: features of application in appearance
- Usability requirements: the qualitative measure for the intended user, such as usefulness, attractiveness or easiness
- Performance requirements: the application platform's minimum functional specification
- Operational requirements: the environmental requirements for the platform's operation
- Maintainability and portability requirements: issues related to the easiness for changing and adapting the system to new requirements or environments
- Security requirements: security related issues for the application
- Cultural and political requirements: social factors for the acceptability
- Legal and standard requirements: applicable laws and standards

Since the IM is at the core of the ICR-UL framework, it seems appropriate to add the requirements of the IM. Also, due to the well known End-user sensitivity to billing and payment, it seems appropriate to include a level of personalisation to the billing information.

- Interactivity Manager requirements: For example, managing large response through WWW on time (i.e. scalability issues).
- Personalised Billing requirements: flexible billing features to comply with users' expectations.

Another requirement that should be included in the analysis of the business is the return on investment requirements. This type of requirements is out of the scope of

the project. However, as mentioned by Timmers (see also [1]) this could be include in a so called Marketing model which should aid users with the necessary information to decide a level of investment, based on various level of expected returns and market conditions.

5.1.3. Interactions (Transactions)

The ICR-UL provides the reference framework for deriving the corresponding description of roles, interactions and transactions requirements for each application at an abstract level. The generic model of ICR-UL shown in Figure 4.4 can be also represented by transactions matrices at each layer. In our case we are primarily interested in the top two layers of the ICR-UL framework. These layers are closely dependent to each application services affecting not only the attributes different elements in the matrix, but also their importance.

By describing the attributes of the elements of the transaction matrices for the supply and payment layers, all of the viable business scenarios should be identified. Also, the transaction matrices for each application may identify further technology requirements.

In the generic transaction matrices, the actors (and roles) are not detailed. Different business objectives and a variety of generic interactions, such as the TOONS application and EPG-Shopping application are particular instances of these matrices. Hence, these tables will require further elaboration for specific application services. Elements on the diagonal represent recursive relationships. For example, a production can be composed of various media productions. Another example is that the Creator can “cut and paste” content, which is itself a composition of constituents’ contents.

To From		End-user/ Access	Broadcaster/ Delivery		Producer		Creator			Interactivity Manager
			TV	Telco	Media- production	e/t- commerce	C	M	A	
End-User/Access										S
Broadcast/ Delivery	TV	<S>		S	S	S				S
	Telco	<S>	S		S	S				S
Producer	Media- production		<S>	<S>	S					S
	e/t- commerce	<S>				S		S	S	
Creator	C				S		S			
	M					S				
	A				S	S				
Interactivity Manager		S	S	S	S	S	S	S	S	S

C: (IPR) Creator

M: Manufacturer/supplier of consumer products

A: Advertiser

<S>: core supply of products/services

S: supply of product/services

Table 5.1: Transactions (Supply flows)

To From	End-user/ Access	Broadcaster/ Delivery		Producer		Creator			Interactivity Manager
		TV	Telco	Media- production	e/t- commerce	C	M	A	
End-User/Access		P	P	P	P				P
Broadcast /Delivery	TV		P	P					P
	Telco	P		P					P
Producer	Media- production	P	P	P		p			P
	E/t- commerce	P	P				P	P	P
Creator	C					p			P
	M				P		P		P
	A	P	P	P					P
Interactivity Manager		P	P						P

Note: one-off payments like e.g. TV set or STB are not included in this table

C: (IPR) Creator

M: Manufacturer/supplier of consumer products

A: Advertiser

P: Payment

Table 5.2: Transactions (Payment flows)

To From	End-user/ Access	Broadcaster/ Delivery		Producer		Creator			Interactivity Manager
		TV	Telco	Media- production	e/t- commerce	C	M	A	
End-User/Access		P	P						P
Broadcast /Delivery	TV			P					P
	Telco			P					P
Producer	Media- production					P			P
	e/t- commerce								P
Creator	C								P
	M								P
	A								P
Interactivity Manager		P	P	P	P	P	P	P	

Table 5.3: Instance of payments transactions of Figure 5.6.

5.2. TOONS

The scope of the TOONS application is to provide story telling animations with local interactive interface for children. It does not have on-line interactive channel, instead the Internet manages the interaction between End-user and Creator/Producer after the program has finished. The Creator or Producer may reflect the interaction or feedback from End-user group by joining the forum on the WWW.

There is a local interactive interface that would be based on Java virtual machine downloaded via digital video broadcasting. The content should be in MPEG4 format for supporting local interactive features from downloaded rule sets.

5.2.1. TOONs Actors (Roles)

In this application the level of interaction is high amongst Creator (editor) and Producer to react to the requirements of the End-user. There is no special real-time requirement in terms of the interaction between End-user and Creator or Producer, but the End-user's terminal may require substantial local storage and processing power.

The Authoring tool should facilitate the efficient flow among Creator and Producer. It should also be design and dimensioned to cope with different requests and variety in contents. This is in addition to the content preparation requirements. The Creator and/or Producer are likely to adopt a central role in this application, as they constitute a key driving force in the successful render of the interactive story.

Target End-user group

The target End-user group is children from 8 to 12 years old. Since PUV is difficult to quantify in advanced and in absolute terms, a relative comparison could be made available with similar interactive games like Internet PC games. A more reliable End-user PUV measure can be derived from studying common experiences in large communities of End-user group.

5.2.2. Assumptions

- MPEG4 for content representation and MPEG2TS for video stream delivery are assumed as technical reference.
- The Java VM is expected to manage the local interactive interface.
- It is also assumed that the children as End-user would be satisfied with the peer group interaction after the interactive story-telling animation has finished.
- Broadcaster/distributor are assumed to use the standard DVB to broadcast.
- End-user's interaction is based on Internet.
- The interactive content shall be based on MPEG4 for the user's interaction with the live video.
- DVB MHP or PC should implement MPEG4 and JAVA VM with hardware. It should accommodate the flexible change in operational or functional changes
- Authoring tool should be available for users to facilitate the common protocol and reusability.
- Secure operation management with existing infrastructure, such as DVB with satellite.

5.2.3. Constraints

- The available resources (and computational requirements) for the Set Top Box are a key constraint.
- The lack of on-line interactive channel (during interactive story telling animation) may become a constraint with respect to the evolution of NexTV interactive story telling animation application.
- The limited common set in authoring tool or animation tool is an additional constraint.
- For the proper production process, a common authoring interface is expected

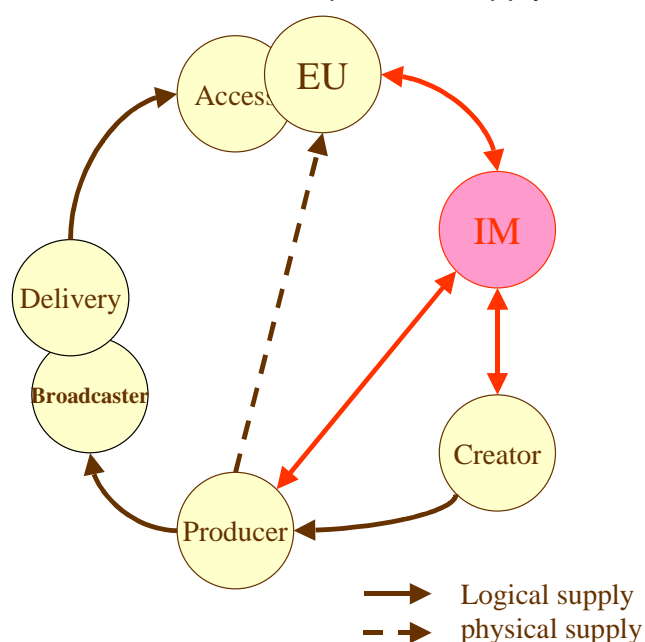
among producers and creators.

5.2.4. TOONs Interactions (transactions) = Actor-Flow pairs

It must be noted that the current application scenario of TOONs will evolve in the life span of the project. Therefore, the discussion in this section on TOONs transactions should be regarded as the state of the art at the time this deliverable is going into press.

Applying these generic transaction matrices to the TOONs application, the stakeholder requirements, roles and interactions, and expected transactions could be further detailed in the different layers.

In the TOONs application there is enough flexibility in respect to mapping actors to different industry players. For example, the Broadcaster role can be fulfilled by either the TV industry or the Telecom industry. Another possible outcome is that the Interactivity Manager (IM) can be implemented in a centralised or distributed way. In the TOONs application the set-top-box (STB) is likely to possess some of the features of the IM's role. A possible supply scenario is shown in [Figure 5.1](#).



[Figure 5.1: Supply layer flows for TOONs.](#)

Other functions of the IM role can be supported by Internet based connections in the form of an interactive back-channel between the End-user and the Creator (story writer). It is not clear at this point in time what the evolution of the STB features capabilities will be; specially in respect to its capabilities to provide an alternative to the Internet interactive back-channel. In any case, any distributed solution will result in a slightly different picture to the one presented in [Figure 4.5](#). For all of the above reasons, the ICR-UL has at its core the Interactivity Manager (IM) and its functionality is left as a separate actor to allow freedom in the analysis and freedom in the design of interactive business solutions. This functionality should evolve in a completely independent manner to create a real competitive environment based on differentiation of services (by means of interactivity and personalisation).

The following matrices identify the most likely transactions for the TOONs applications. These matrices are effectively a sub-set of the generic transaction matrices and subject to changes as the application evolves.

To From	End-user/ Access	Broadcaster/ Delivery		Producer (Media- production)	Creator	Interactivity manager
		TV	Telco			
End-User/Access	S					S
Broadcaster/ Delivery	TV	<S>	S	S		
	Telco	<S>	S	S		
Producer (Media-production)		<S>	<S>			S
Creator				<S>	S	S
Interactivity manager	S			S	S	

C: (IPR) Creator
 A: Advertiser
 <s>: Core supply of products/services
 s: Supply of product/services

Table 5.4: TOONs Transactions (Supply) (see also Figure 5.1 and Appendix A).

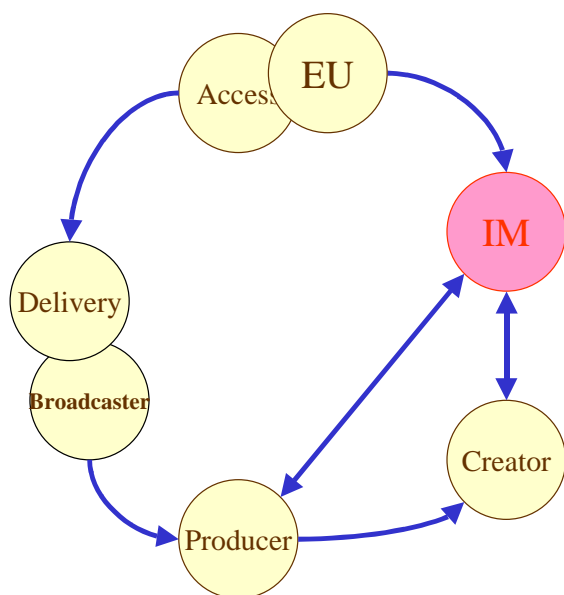


Figure 5.2: Payment layer flows for TOONs.

To From	End-user/ Access	Broadcaster/ Delivery		Producer (Media- production)	Creator	Interactivity Manager
		TV	Telco			
End-User/Access	P	P	P			P
Broadcaster/ Delivery	TV		P	P		
	Telco		P	P		
Producer (Media-production)					P	P
Creator					P	P
Interactivity manager				P	P	

C: IPR Creator
 P: payment

Table 5.5: TOONs Transactions (payment) (see also Figure 5.2 and Appendix A)

From analysis the payment transactions, there are several alternatives that should be decided by the key stakeholders' preference (actors within NexTV consortium and other key actors from the supply loop). The business opportunities detected by a sub-set of actors (community of common interest) in the value loop should decide the exact payment transaction mode, and supply transactions mode in accordance with the technology available.

TOONs detailed set of Interrelations (Appendix A)

The identification and definition of the attributes of the relevant elements of the interaction matrices (Tables 5.1-5.5 and Figures 5.1-5.2) need careful consideration. In Appendix A, the first attempt to identify all aspects of these interactions is presented. It should be noted that attributes evolve over time and hence recurrent visit to the current descriptions (See Appendix A) may be necessary.

The format followed by the information presented in Appendix A has its inspiration in the following observation: each actor is a business entity and hence they have demand and supply characteristics as well as requirements and features associated to them. In other words, there is a consumer/provider relationship amongst all of them. In the ICRS model (see also [1]), much of the explanatory text is contained in "Actor-Flow Pairs" that explain the relevance of each of the flows for each of the actors. The Pairings use as common format Goals and Sub-goals/Actions:

- Goal: is what needs to be done in terms of actors' requirement in order for a transactional system to exist.
- Sub-goals/Actions: are the basic features required to fulfil the main goal. This might include sub-dividing the main goal into more detailed goals or actions the actor can take to achieve the goals.

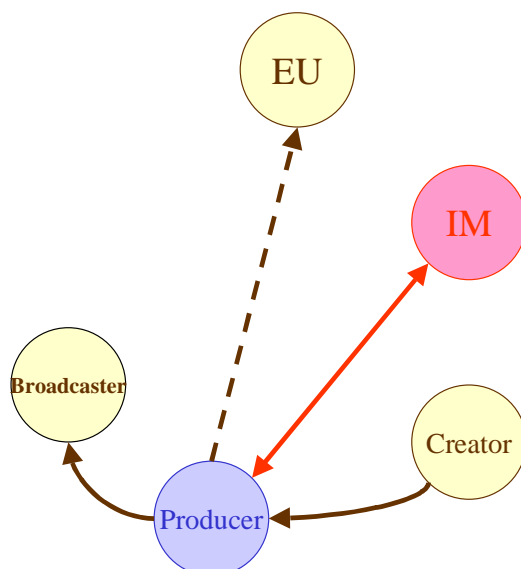


Figure 5.3: The producer interactions in the ICR-UL Framework.

In Appendix A, we adapt the "Actor-Flow Pairs" methodology suggested in the ICRS model by adding to the requirements and features of each actor, the demand and supply dimensions. A figurative representation is shown in Figure 5.3 where the producer is the target actor.

Once the actor has been identified, its dual role of Producer/Consumer (Supply/Demand) is further detailed (See Figures 5.3-5.4).

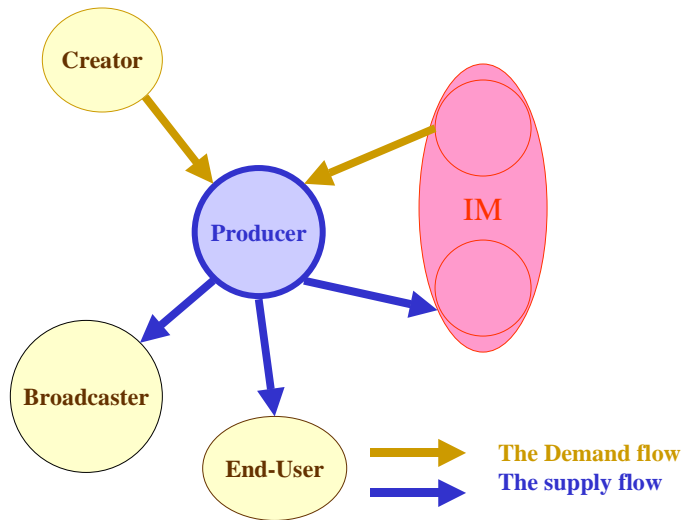


Figure 5.4: The Producer (Supply) and Consumer (Demand) relationships of the Producer in the Supply layer.

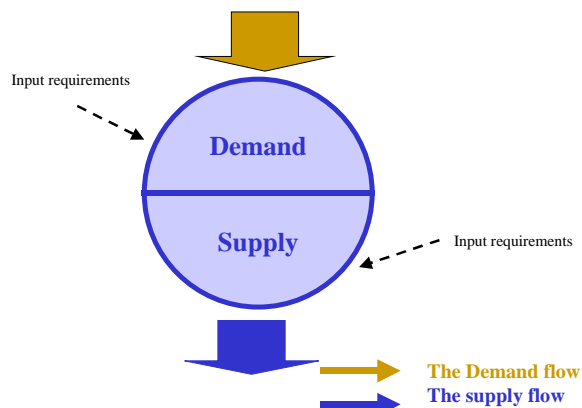


Figure 5.5: The Actor's Producer (supply) Consumer (demand) dual roles.

5.3. EPG-Shopping: Roles and Requirements

The scope of the EPG-shopping application is to provide final consumers with all information necessary to the successful completion of a range of commercial transactions [9, 10]. Bringing the Internet to a broadcasting environment, the application is aimed to capture emergent sources of advertising and commercial revenue in the media industry.

The application boasts three key innovations on existing traditional EPG and tele-shopping applications. First, multimedia streams can be aggregated into a single scene. Multiplexing enables to offer an attractive interface displaying simultaneously, say, programming, programming information, personal profile, search results, advertisements, Web, and others. Second, a personalisation engine allows to store both dynamic and static profiles. This feature allows to offer an improved service to the end-user, but also to attract more advertisers with access to rich profile information. Third, a recommendation engine aids end-users in their decision-making process regarding purchases. The recommendation engine is not limited to searching databanks to answer the end-user's question. It also exploits information contained in saved profiles on personal preferences and consumption patterns, in order to truly assist decision-making.

5.3.1. EPG-shopping Actors (Roles)

In this application, access to up-to-date information by all parties is essential. Real-time interaction with the end-user relies on two aspects: end-users are browsing up-to-the-minute information, and advertisements are pushed as a result of dynamic profiles updates. The role of the interactivity manager in the business loop has become significantly more sensitive. Indeed, as the owner of all end-users profiles, the interactivity manager is at the heart of all interactions between the other actors. The success of the application is therefore based on the level of trust placed by all other actors in the ability of the interactivity manager to handle private information.

Target End-User Group

The target end-user group is, as yet, undefined. To an extreme, the application could target ALL potential television viewers. To do so, the application would have to offer substantially modified content from one user to the next, and to separate the EPG and the tele-shopping functions easily in order to provide additional security protocols to protect more vulnerable viewers (e.g. children viewers only have access to the adverts and e-commerce when they are under parental guidance). Determination of the target end-user group will need to evaluate whether the costs attached to separating both functions outweigh the additional revenues from giving such segments of population supervised access to the application.

5.3.2. Assumptions

- Simple implementation through delivery of MPEG4 content over existing MPEG2 transport streams coupled with IP-based infrastructures.
- Set-top box integration: broadband / IR remote control / embedded MPEG4 in 2D

and/or 3D.

- Whether composed in pure, mixed or non-MPEG4 itself, the starting page always links to MPEG4 content.
- Web content accessed via advert is adjusted to the low resolution of the TV screen.
- Information on the user is known not only at the time of purchase, but also at the time of browsing. It is obtained via cookies.
- Individual security is ensured through on-terminal storage of profile information.

5.3.3. Constraints

- The limitations of a 2D MPEG player may set a major constraint on the implementation. These may be relaxed depending on the availability and reliability of a 3D MPEG player.
- The definition of the target end-users is critical.
- Perceived quality of service may depend on the ability to present identical information in different ways. Example 1 – linguistic characteristics: a) different languages in multi-lingual geographical areas, b) different levels of linguistic difficulty depending on educational development of viewer, c) different levels of linguistic content depending on age of viewer (no violent or obscene sentences when children viewers), etc. Example 2 – different approaches to presentation: a) background information to a historical programme may vary from one country to another to reflect different national histories b) different presentations to match specific cultural values or religious beliefs.
- Methods for conditional access and subscriber management.

5.3.4. EPG-Shopping Interactions (Transactions) = Actor-Flow pairs

The Interactivity Manager receives two types of information from the end-user: direct requests to provide information via the back-channel, and the profile information associated to end-users' use of the application. The interactivity manager then exploits both types of information: requests are passed on to other business loop actors (creator/producer), profiles are used to determine the best mix of advertising to send to the End-user.

The creator role is minimised in this application. The producer provides the broadcaster with all 'logical' supplies: produced Metadata for the main screen and produced advertising material. The producer also provides the end-user directly with any NexTV physical products (say, remote control to operate the application). Physical products from non-NexTV suppliers are delivered outside the business loop, unless specific arrangements have been made to enjoy the NexTV physical delivery network. The broadcaster delivers both programming (and all associated data enhancements) and advertisements to the end-user.

To From	End-user/ /Access	Broadcaster/ /Delivery		Producer	Creator	Interactivity manager
		TV	Telco			
End-User/Access	S					S
Broadcaster/ Delivery	TV	<S>		S		
	Telco	<S>	S			
Producer	<S>	<S>	<S>			<S>
Creator				S	S	
Interactivity manager		<S>	<S>	S	S	S

A: Advertiser

<S>: Core supply of products/services

s: Supply of product/services

Table 5.6: EPG-Shopping Transactions (Supply) (see also Appendix A).

On the payment side, the main difference with the TOONs application is that now the broadcaster explicitly pays the interactivity manager for indicating when to push which advertisement.

To From	End-user/ Access	Broadcaster/ Delivery		Producer (Media- production)	Creator	Interactivity Manager
		TV	Telco			
End-User/Access		P	P			P
Broadcaster/ Delivery	TV		P	P		P
	Telco	P		P		P
Producer					P	P
Creator					P	
Interactivity manager				P	P	

P: payment

Table 5.7: EPG-Shopping Transactions (payment) (see also Appendix A).

EPG-shopping detailed set of Interactions (Appendix A)

Read Appendix A as per instructions given for TOONs.

Note that the Advertiser has been previously typified as an instance of the creator role, implicitly assuming that the requirements from the advertiser are exogenous and static. In reality the Advertiser demands feedback from Creators and the rest of the value loop, that is, its role can also be seen closer to an End-User than a Creator. In Appendix A for the case of EPG-Shopping the Advertiser is typified as an instance of the end-user role. This interpretation is under consideration.

5.4. Other Issues on NexTV Interactions

There are still many interactions to be defined for the target NexTV application service. These issues can be described in forms of content creation, program production, delivery with broadcaster, interactive playback at end-user's site, and interaction in actors' communities. A framework to monitor these aspect is presented in Appendix C.

5.5. Technology

5.5.1. Technology background

The ICR-UL business framework should be harmonised with the technology available as well as being flexible enough to adapt to future technological advances. Identifying the most likely directions of changes in requirements may help to tailor the degree of flexibility and choice of technology.

The requirements of selected application services and the generic requirements of the service infrastructure were defined in Deliverable 2 [2]. From the reported findings in Deliverable 2, it was noted that the details of global, functional, and non-functional requirements might differ from application to application. The roles of business actors may also change depending on the relative scope of influence of the respective stakeholders and their interest in developing a particular application.

5.5.2. Assumptions

Creator-Producer-Broadcaster/delivery (Content): MPEG4 is used for content preparation as a standard protocol. MPEG2TS as DVB will be used for delivery. For each application services, stakeholders may agree on further common sets such as data format, compatibility, extension in standard, platform specification and so on.

Interactivity Manager (Delivery channel and Interactive channel): Whether it is real-time or not, the interactive channel is managed via IP using WWW.

End-user/Access (Terminal): Set Top Box for MHP or PC-based hardware is used for End-user's terminal. In the same application service, actors (users) as stakeholders should agree on technical specification, methodology, and compatibility. It may not be a necessary condition for the terminal to accommodate all different applications, though it is highly expected.

5.5.3. Technology mapping

Factors for change in Roles and Interactions

Roles and Interactions are affected by at least two forces: Application requirements [2] and technological constraints. Technological constraints are an underlying factor for the implementation and deployment of application services, therefore availability of technology and its corresponding mapping into NexTV business framework actors is of primary importance. Figure 5.6 represents the mapping of the service infrastructure in the value loop. The details of only the service infrastructure are shown in Figure 5.7. This is due to the fact that modifications in the NexTV applications can be driven by technology innovation, regulation, underlying e/t-business solution, in short or medium term. Moreover, aspects of scalability and dependability of the underlying technology and solutions should be carefully considered.

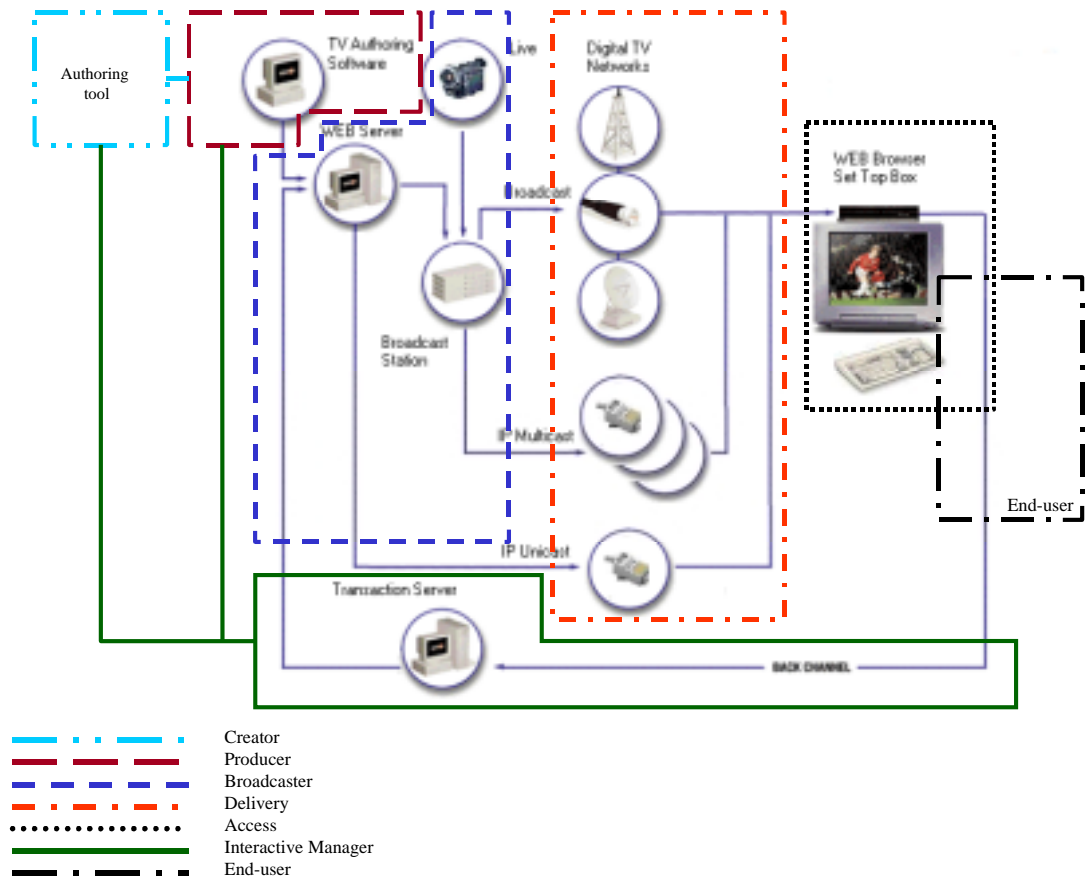


Figure 5.6: The service architecture and de value loop actors

In [Appendix B](#) the first attempt to map the technology available to the various actors identified is presented. This mapping should be seen as a continuous process for the lifespan of the project.

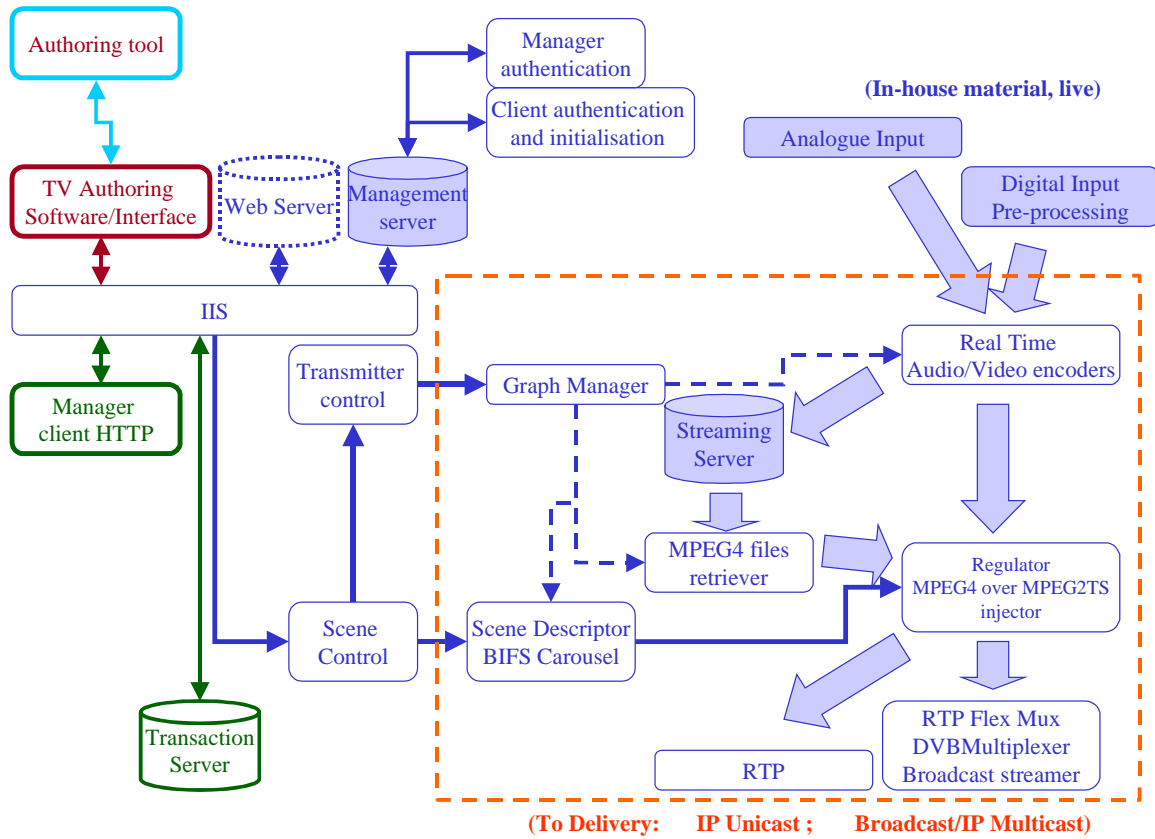


Figure 5.7: The service architecture

6. Application development and the ICR-UL Framework

In this section, the mechanism by which the ICR-UL framework could facilitate the fine-tuning of viable application ideas or service development is addressed. A proposed mechanism to define the relation between the application development progress and evolution of the role of the business model is also presented.

6.1. Emerging Business Models

6.1.1 Emergent requirements

It is well known that it is difficult to define user's requirements or needs for a new business. Fast and large-scale changes of economical, technological, social and political environment contribute to the complexity and uncertainty in the formulation of new business models. The influence of digital information as new leverage has recently grown substantially in various business applications. In the context of NexTV application development, not only can the user's business target be dynamically changed but it seems that there is no comprehensive business model publicly available for commercialising interactive digital video applications. In evolving market spaces, with unknown new products, the development of NexTV application services can be facilitated by the iterative feedback from users about their needs and requirements. Convergence on needs and requirements may come from understanding user's stake, commitment, business visions, or end-user's buying criteria.

In this volatile environment it has been suggested that emerging business models are attained through systematic value-chain destruction and re-construction. Opportunities to integrate the value-chain appear through the identification of requirements for the application being developed. In contrast to other types of requirements, those that emerge during the application development process best capture the potential to generate innovative business models. The methodological approach employed during the application development process is therefore critical. Concerns for the final commercial viability of the application provide the incentive to adopt an approach which promotes the identification of emergent requirements.

6.1.2 Consensus Building

In this type of evolving scenarios, the ICR-UL framework proposes a simple and flexible model structure suitable for consensus building. This framework should be able to aid the different actors in the value loop in their quest for and discovery of, new business models. ICR-UL is well-suited to encompass an overall business framework analysis, and equally suited to the analysis of specific aspects of the business. From this starting point, the ICR-UL consensus building framework should allow the different actors to pursue their own particular solutions into aspects such as:

- Identify actors' roles and requirements in the value (supply) loop.

- Identify interactions and transactions (e.g., supply flows and revenue flows).
- Permit to focus on key relationship with other (sub-set) actors to further enhance particular aspects of the business (e.g. decrease costs, increase productivity, avoidance of duplication of activities, etc).
- Swift reaction to new End-user requirements by identifying the key affected actors.

In the background of this process of analysis the following aspects should always be borne in mind:

- Expectation of value addition or creation by actors of the value loop and its contribution to the End-user perceived user value (PUV).
- Expectation on attainable service quality and enhanced PUV.
- Resource requirements (infrastructure, hardware, software requirements).
- Environmental impacts (other business entities, standard, regulation, technology, popularity, etc).

6.2. Application Development Approach

6.2.1 Classification of application development approaches

When addressing the process of application development, a possible classification of different suggested approaches revolves around the level of awareness and mode of treatment of the uncertainty of requirements. Uncertainty arises from the fact that user needs and requirements are both too pervasive to be captured exhaustively and evolve over time. Four different types of approaches have been identified as possible candidates to deal with underlying uncertainties on application requirements of the NexTV application development. At one extreme, waterfall approaches do not acknowledge uncertainty of requirements. Life-cycle and incremental approaches acknowledge the presence of uncertainty and attempt to reconcile a set of proposed solutions with a static statement of requirements. User-centric approaches furthermore consider whether the stated requirements produce the desired effect if they are met.

The underlying premise to such a classification is that the approach focuses mainly on human requirements [11,12]. The rationale for the prevalence of human requirements over other types of requirements, such as data or processing/functionality, is straightforward: Optimisation criteria are fundamentally more complex due to the volatile and independent nature of human requirements.

6.2.2 User-Centric Approach: Underlying Principles and User-Centric Loops

Three underlying principles of the user-centric approach render it the more appropriate to support the NexTV application developing process. First, users' involvement must be maximised. Second, standardised interfaces and re-usable components improve productivity and communication within the project. Third, firm and stable business concepts must address the uncertainty and volatility of human requirements.

The first two principles can be used to define the concept of 'user-centric loops'

within the ICR-UL framework. First, maximum involvement is achieved when the 'users' (actors) targeted by the user-centric approach are not limited to the end-users of the application, but include all parties interested in the application development process. Second, enhanced co-operation within the business/development team translates into the identification of subsets of actors associated to specific areas of development which can be worked on separately. A user-centric loop arises when communication is established between the various actors involved in the same independent aspects of the application development process.

Activities within user-centric loops are dynamic processes. During the initial stages of application development, loops may need to occur in a pre-defined sequential order. Some loops may be able to occur concurrently when the sufficient level of independence has been identified. However, it is advisable to realise that once started, all user-centric loops remain active throughout the application lifetime. This feature of the user-centric approach guarantees that new users, usage or technologies are incorporated within the application as they emerge in response to new business solutions or requirements.

6.3. Final remarks

The user-centric approach within the ICR-UL ensures that volatile requirements are captured in a stable manner by the business model and associated scenarios. Furthermore, key application development issues can be addressed by actors/partners co-operating via on-going user-centric loops.

Communication between the economic or business realm and the technological realm is vital since a worthwhile application must reconcile the two domains. In this respect, the user-centric approach seems to be a methodology worth considering seriously when faced with matching emergent user requirements and forward-looking technologies.

7. References

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8. Appendices

8.1. Appendix A

Legend

Comments specific to the TOONs application are shown in green.

Comments specific to the EPG-shopping application are shown in purple.

General comments are shown in black.

Instructions on navigation in the following tables are provided in Section 5.2.

Supply layer

TOONs	Flow	Supply Layer	
Actor	Sub layer Dual role	Physical	Logical
Creator Note: between brackets () actors with which interaction takes place	Demand Requirements	<u>Input requirements:</u> Enquire on feasibility constraints. <u>Output requirements:</u> Make on-line suggestions for new toys / physical interfaces.	<u>Input requirements:</u> Receive feedback from End-user group by joining the forum on the WWW / by examining requests for more information on specific programmes (E-U, IM). <u>Output requirements:</u> Participate to on-line forum and provide on- line feedback to end-users (IM). Browse through suggestions received spontaneously and address them. Solicit further suggestions as and when necessary. (IM, E-U)
	Demand Features	<u>Input features:</u> Receive information from manufacturers on feasibility of toy. Receive information from producer / broadcaster on technical ability to use toy in conjunction with programme. <u>Output features:</u> Receive feedback from children on preferences for toys (IM).	<u>Input features:</u> Strengthen contact by organising events on the website – to motivate children to log on (IM) Motivate end-users to provide feedback (IM) by organising competitions / lottery draws for participants. <u>Output features:</u> Stimulate children's imagination by proposing topics on-line and assessing their reactions (IM). Transform end-user requests into improvements to the interface (IM) or the information contained (P), or provide direct personal feedback to end-user if request cannot be implemented (E-U, IM). Post requests for end-user feedback on particular aspects the creator wishes to improve upon (IM, E-U).
	Supply Requirements	<u>Input requirements:</u> Ascertain interest of producer / broadcaster for suggested toy (IM). Liaise with manufacturers to produce prototypes. <u>Output requirements:</u> Evaluate prototype and propose for commercialisation.	<u>Input requirements:</u> Enquire expectations from producer and end- users (IM). <u>Output requirements:</u> Generate innovative ideas for content (P).
	Supply Features	<u>Input features:</u> Closely liaise with producer / broadcaster with regard to associated toys (IM). Outsource manufacturers. <u>Output features:</u> Send prototype to prize winners to evaluate toy.	<u>Input features:</u> Evaluate technical constraints faced by production team (IM). Receive information on format envisioned by producer / broadcaster (how many episodes, etc) (IM) <u>Output features:</u> Fully exploit End-user feedback (IM). Add value to raw suggestions from end-users (IM). Provide clear distinction between basic story- line and possible enhancements. For instance: What will the presence of a particular toy add to the story? Possibility to have gradation in language difficulty (more vocabulary, more complex grammatical structures) if children signal they are over a certain age or educational level? etc. (P) Generate ideas for format of EPG initial screen (eg, multi-faceted, rotating cube) and for background to tele-shopping section. Identify further enhancements to include to both the EPG or the tele-shopping section. (P)

TOONs	Flow	Supply Layer	
Actor	Sub layer Dual role	Physical	Logical
Producer Note: between brackets () actors with which the interaction takes place	Demand Requirements	<u>Input requirements:</u> Establish access to physical goods to be delivered. <u>Output requirements:</u> Establish long-term relationship with reliable logistics company to deliver ordered physical goods to end-users.	<u>Input requirements:</u> Obtain feedback from End-user by joining the forum on the WWW (IM). Obtain raw information on programming (B). <u>Output requirements:</u> Obtain regular yet innovative content ideas for programme production (IM).
	Demand Features	<u>Input features:</u> Establish whether goods will be delivered directly from supplier's warehouse to end-user (logistics company needs constant access to warehouse), or whether stock will be taken to warehouse owned by logistics company (negotiate dates when stock can transported to warehouse). Decide whether items will already be packaged ready for distribution, or whether logistics company needs to provide suitable packaging. <u>Output features:</u> Outsource logistics companies. Negotiate long-term contracts. Set quality standards (time deadlines, damage policy) to be respected by logistics company and implement means to check QoS provided. Set up mechanism to check items have been received by end-users in time and in good condition (Maybe the logistics company is asked to return a form signed by the end-user at the time of the delivery. Or maybe there only exists a procedure by default: the mechanism does not check every delivery, but provides end-users an opportunity to report problems. It could also be a combination of both). (E-U). Give logistics company access to stock in time to meet deadlines.	<u>Input features:</u> Promote End-user participation to forum (IM). Buy information on, say, next month's programmes and associated meta-data directly from the broadcaster (B) or from an external information agency. <u>Output features:</u> Establish contact with multiplicity of creators (C).
	Supply Requirements	<u>Input requirements:</u> Mechanism to obtain orders (E-U, IM). <u>Output requirements:</u> Produce goods and organise distribution.	<u>Input requirements:</u> Constraints imposed by broadcaster (B). <u>Output requirements:</u> Produce content for broadcaster from ideas (B).
	Supply Features	<u>Input features:</u> Need to implement a mechanism to be notified of orders placed. Mechanism must allow prompt verification of both end-user's and deliverer's details (E-U, D). <u>Output features:</u> Set goods characteristics (e.g. durability/planned obsolescence). Set production objectives: numbers to be produced, time horizon...	<u>Input features:</u> Negotiate deadlines for sending productions. Identify length of individual productions (duration of each programme: 10-minute, 20-minute, 30-minute?). Identify post-production format required by broadcaster (B). <u>Output features:</u> Arrange all necessary production 'tools' – e.g. studio facilities, production team, drawing experts, etc.

TOONs	Flow	Supply Layer	
Actor	Sub layer Dual role	Physical	Logical
Broadcaster Note: between brackets () actors with which the interaction takes place	Demand Requirements	<u>Input requirements:</u> Receive expression of interest from advertisers and sponsors (A). <u>Output requirements:</u> Promote NexTV TOONs physical interfaces and merchandising (P) through advertising mix. Promote advertiser's products through advertising mix (A).	<u>Input requirements:</u> Seek sources of content (P). <u>Output requirements:</u> Obtain regular and correct content for programme itself (E-U), associated advertisements (P, A), and meta-data (P).
	Demand Features	<u>Input features:</u> Outsource advertisers and sponsors (A). Specify format for advertising/sponsoring material. <u>Output features:</u> Decide mix of content advertising NexTV TOONs physical products. Assess threat of non-NexTV products advertised on NexTV physical products (P). Select suitable sponsors. Decide advertising mix (A).	<u>Input features:</u> Liaise with production companies for new content for episodes (P). Outsource advertisers (A). <u>Output features:</u> Establish long-term relationship with producer (P).
	Supply Requirements	<u>Input requirements:</u> Obtain information on possibilities for competitions (C, P). <u>Output requirements:</u> Promote NexTV TOONs physical interfaces and merchandising (P) through additional competitions. Promote advertisers' products through additional competitions (A).	<u>Input requirements:</u> Receive production in time for preparing for broadcast via delivery (D). <u>Output requirements:</u> Programme contents for broadcast into appropriate delivery (D).
	Supply Features	<u>Input features:</u> Liaise with creator to co-ordinate puzzles and games proposed on-line and those proposed during broadcast. Set joint strategy with creator (C). Obtain information on available physical products (P, A). <u>Output features:</u> Organise additional competitions (in addition to the various competitions/games/puzzles already included in episode as creator's suggestion) to promote the channel, where prestigious NexTV TOONs physical products / advertisers' products are awarded as prizes.	<u>Input features:</u> Negotiate deadlines for receiving content (P). <u>Output features:</u> Maximise viewing figures. Incorporate correct amount/nature of advertising material (P, A). Internal negotiations within broadcasting company to decide time-slot and duration of individual programmes (B).

TOONs	Flow	Supply Layer	
Actor	Sub layer Dual role	Physical	Logical
Delivery Note: between brackets () actors with which the interaction takes place	Demand Requirements	N/A	<u>Input requirements:</u> Identify broadcaster's delivery needs (B). Keep abreast of developments in delivery technology (D). <u>Output requirements:</u> Establish long-term relationship with broadcaster to deliver programmes to end-users (A).
	Demand Features	N/A	<u>Input features:</u> Arrange regular contact with broadcaster (B). Anticipate broadcaster's needs (B). Identify state-of-the-art infrastructure. <u>Output features:</u> Demonstrate reliability of delivery services. Negotiate long-term contracts (B, A).
	Supply Requirements	N/A	<u>Input requirements:</u> Establish optimal transport given existing customers' location. <u>Output requirements:</u> Transport interactive digital video applications to end-user (A).
	Supply Features	N/A	<u>Input features:</u> Identify percentage of national coverage aspired to by broadcaster (B). Identify most efficient available transport technologies. <u>Output features:</u> Provide widest possible geographical coverage for delivery given existing infrastructure. Make plans for developing infrastructure as necessary.

TOONs	Flow	Supply	
Actor	Sub layer Dual role	Physical	Logical
Access Note: between brackets () actors with which the interaction takes place	Demand Requirements	<u>Input requirements:</u> Outsource new physical interfaces / equipment. Outsource available equipment and technologies <u>Output requirements:</u> Acquire value-for-money physical interfaces / equipment.	<u>Input requirements:</u> Level of local storage from E-U profile (E-U). <u>Output requirements:</u> Acquire suitable equipment/technology to provide delivery channel, and local interactivity functions.
	Demand Features	<u>Input features:</u> Locate available physical interfaces / equipment and suppliers. Submit requirements for made-to-measure physical interfaces (e.g. must exhibit image of a TOONs character). <u>Output features:</u> Assess technological performance of various physical interfaces / equipment proposed.	<u>Input features:</u> Determine which equipment is best-suited to purposes, run user interface acceptability tests. Anticipate short-term technology developments (D). <u>Output features:</u> Promote competition across manufacturers to each type of equipment. Consider different types of technologies (D).
	Supply Requirements	<u>Input requirements:</u> Identify end-user's preferred characteristics for physical interfaces / equipment (E-U). <u>Output requirements:</u> Provide physical interface / equipment to end- user (E-U).	<u>Input requirements:</u> Liaise with STB manufacturers to obtain information on available STB. <u>Output requirements:</u> Provide platform and delivery channel of interactive applications (E-U)
	Supply Features	<u>Input features:</u> Run acceptability tests for physical interface / equipment. <u>Output features:</u> Select series of physical interfaces / equipment and strategy to promote/advertise them.	<u>Input features:</u> Establish network with manufacturers. Encourage innovation and competition among manufacturers . <u>Output features:</u> Provide delivery channel (STB). Enable local interactivity functions for End- User (E-U).

TOONs	Flow	Supply Layer	
Actor	Sub layer Dual role	Physical	Logical
End-User / Advertiser Note: between brackets () actors with which the interaction takes place	Demand Requirements	<u>Input requirements:</u> Identify products available. Identify retailers and purchase modes (on-line, via catalogue, at the store) (P?). Create network of children willing to exchange (E-U) <u>Output requirements:</u> Collect associated merchandise – physical interfaces and storage cards, toys, cards, etc (P). Viewers acquire desired products advertised in the Tele-shopping section. Advertisers buy advertising space in Tele-shopping section (B).	<u>Input requirements:</u> Interact locally (A) and through forum (IM) / Internet (on-line buying, end-user requests to creator). Parents control viewing of advertisements (A+IM). <u>Output requirements:</u> Derive maximum utility during (local interaction) (A) and after (Internet) broadcast (IM).
	Demand Features	<u>Input features:</u> Order or download catalogues if available (IM ?). Promote exchange activities with other children (E-U). Actively seek rare items. <u>Output features:</u> Complete collection. Decide which items will collect (all, only fluffy toys, only cards, only storage cards for physical interfaces, etc.) Advertisers obtain information on the channel, the application, the characteristics of different time-slots.	<u>Input features:</u> Acquire additional physical interfaces for better enjoyment during broadcast. Maximise limited (these are children) time spent on Internet. <u>Output features:</u> Identify which activities enjoy most (broadcast: passive watching, amount of local interaction, use of authoring tools specially downloaded; forum: exchange views, solve puzzles, participate to competitions, suggest topics for episodes, discuss collection...) (IM) Identify type of information wish to receive and possible actions (EPG: programme schedule, background information on programmes shown; Tele-shopping: browse products available for sale, purchase on-line)
	Supply Requirements	<u>Input requirements:</u> Identify network for exchange (IM, E-U). Advertisers check technical / morality constraints placed by broadcaster on advertising material (B). <u>Output requirements:</u> Exchange redundant or unwanted items directly with other children (In contrast to demand requirements, the primary objective here is to get rid of undesirable items, rather than to expand collection) (E-U). Advertisers provide raw material for producing advertisement (P).	<u>Input requirements:</u> Obtain information on how to submit successful suggestions (IM). <u>Output requirements:</u> Make suggestions with maximum likelihood to be implemented (IM).
	Supply Features	<u>Input features:</u> Promote exchange activities with other children (E-U). <u>Output features:</u> Establish priorities among items in collection.	<u>Input features:</u> Seek information on editorial process (IM). Seek information on other children / viewers suggestions (IM, E-U). <u>Output features:</u> Co-operate with own team to generate better ideas (E-U). Establish competition strategy (E-U).

TOONs	Flow	Supply Layer	
Actor	Sub layer Dual role	Physical	Logical
Interactivity Manager Note: between brackets () actors with which the interaction takes place	Demand Requirements	<u>Input requirements:</u> Implement protocols for end-users to send their orders. <u>Output requirements:</u> Receive orders from end-users (E-U).	<u>Input requirements:</u> End-user requirements (E-U) Creator constraints (C) Producer constraints (P) <u>Output requirements:</u> Service level agreements between actors (E-U, P, C)
	Demand Features	<u>Input features:</u> Implement 'Buy' button on relevant section of NexTV TOONs website / Tele-shopping screen. Offer alternative contact procedures – for instance, use services of a customer call centre, use services of a mail marketing company, print order forms in TOONs Club magazine. Outsource additional services providers Co-ordinate various procedures used for orders placed to be entered on same central computing system. <u>Output features:</u> Make ordering procedures known to end-users (E-U). Emphasize security aspects of on-line ordering.	<u>Input features:</u> Receive update on other actors' interactivity requirements (E-U, C, P). <u>Output features:</u> Provide web-hosting for demand negotiations (E-U, C, P)
	Supply Requirements	<u>Input requirements:</u> Receive updates on order processing status from other actors (E-U, P, C, A). <u>Output requirements:</u> Facilitate physical goods transactions.	<u>Input requirements:</u> Track and implement new technologies / state-of-the-art equipment. <u>Output requirements:</u> Provide interactivity to other actors (E-U, P, C).
	Supply Features	<u>Input features:</u> Receive updates from Producer actors on goods currently available or out-of-stock (P). Receive updates from bank for clearance of end-user's account details. <u>Output features:</u> Process end-user's orders (E-U). Authenticate bank account details. Dispatch order and end-user details to Producer actors (who then contact their logistics company). Feedback end-user on item's status. For example: a) Temporarily out-of-stock => do you want to cancel order or wait until date X when will be re-available?, b) Ceased production => a close substitute is available, do you want to order it instead? c) available: item will be delivered at date X, do you require a different delivery date? d) item available but bank account details not cleared: do you want to give different bank account details? (E-U)	<u>Input features:</u> Identify security levels required by other actors (E-U, P, C). <u>Output features:</u> Provide Web hosting for on-line forum, Tele-shopping web pages and end-user feedback to Creator (E-U, P, C). Enable transaction management with required level of security (for accurate billing by broadcaster).

Payment layer

TOONs	Flow	Payment Layer	
Actor	Sub layer Dual role	Physical	Logical
Creator Note: between brackets () actors with which the interaction takes place	Demand Requirements	<u>Cost requirements:</u> Opportunity cost of working on the project. <u>Revenue requirements:</u> Must ascertain feasibility and affordability of toy at all levels.	<u>Cost requirements:</u> Reward End-users for suggestions. Reward End-users for use of application. Assume cost of authoring tool. <u>Revenue requirements:</u> Realise potential of children's 'good' ideas (IM).
	Demand Features	<u>Cost features:</u> May have to pay for quotes from manufacturers. <u>Revenue features:</u> Investigate affordability and durability of envisaged toy.	<u>Cost features:</u> Award prizes to End-users whose contributions are used – for instance via weekly competition Award prizes for participating to the forum – for instance, for solving a puzzle, etc (IM). Award prizes for using the application instead of a traditional TV guide magazine – for solving games/puzzle, for making suggestions for improvements, for requesting more information on a particular programme (IM). <u>Revenue features:</u> Add value to children's suggestions by creative editing, so as to later claim income for overall idea (IM). Add value to viewer's suggestions through knowledge of technical constraints and available meta-data, so as to later claim income for overall idea (IM).
	Supply Requirements	<u>Cost requirements:</u> Assume cost of prototype. <u>Revenue requirements:</u> Receive monetary compensation for toys created if commercialised (IM).	<u>Cost requirements:</u> Opportunity cost of not working on a different project. <u>Revenue requirements:</u> Extract maximum revenue from creation (P).
	Supply Features	<u>Cost features:</u> Negotiate with manufacturer for discounts by offering proportion of intellectual property rights if toy is commercialised. Negotiate with producer prior to development of prototype to share cost (P). <u>Revenue features:</u> Follow-up decisions made on commercialisation of prototype, and claim compensation accordingly (IM).	<u>Cost features:</u> Compare earning potential of working on a different project. <u>Revenue features:</u> Establish contact with multitude of producers (P) Exploit intellectual property rights. Highlight added-value on children's suggestions (IM).

TOONs	Flow	Payment Layer	
Actor	Sub layer Dual role	Physical	Logical
Producer Note: between brackets () actors with which the interaction takes place	Demand Requirements	<u>Cost requirements:</u> Price charged by logistics company to deliver goods. Maximise profit by minimising internal costs incurred to have goods delivered by logistics company. <u>Revenue requirements:</u> Payment of compensations/penalties paid by logistics company if service is below agreed QoS (breakages, missed deadlines, failure to provide any agreed complementary service).	<u>Cost requirements:</u> Pay competitive price for innovative material (C). <u>Revenue requirements:</u> Evaluate earning potential of ideas put forward (IM, B).
	Demand Features	<u>Cost features:</u> Use competitive tendering process to select logistics company offering best price for chosen level of delivery QoS. Evaluate cost of disruption caused within warehouse (e.g. need extra personnel to show logistics company employees where correct stock is kept, need to reserve warehouse space for stock ready to be delivered). Upgrade facilities if necessary (e.g. more parking bays for delivery lorries). Cost of checking QoS provided by logistics company. Cost of running complaints centre or equivalent. <u>Revenue features:</u> Set penalties to levels that at least offsets cost of checks.	<u>Cost features:</u> Establish detailed medium-term contracts with highly innovative creators (C). Award token prize to End-users whose contributions are used – for instance via weekly competition (IM). <u>Revenue features:</u> Evaluate technical feasibility of ideas put forward. Evaluate match between creator's suggestions and end-users' wishes (IM).
	Supply Requirements	<u>Cost requirements:</u> Production costs. Administrative costs. (IM) <u>Revenue requirements:</u> Set pricing strategy to maximise profit (E-U).	<u>Cost requirements:</u> Recover sunk costs. <u>Revenue requirements:</u> Establish pricing strategy to recover sunk costs.
	Supply Features	<u>Cost features:</u> Cost of raw materials. Investment in capital (e.g. machinery). Administrative costs to receive notification of orders placed. (IM) <u>Revenue features:</u> Select strategy. For instance, if the market for NexTV TOONs products is not established, may want to price competitively to attract interest. Or may prefer to emphasize differentiated nature of products and price above marginal cost.	<u>Cost features:</u> Measure operating costs and infrastructure/equipment costs. Studio facilities may be hired from external company. <u>Revenue features:</u> Negotiate payment with broadcaster on the basis of past success of content already produced for the same programme (TOONs, EPG-shopping). Identify further revenue sources for broadcaster (B, C, IM), eg, programme contains more content for end-users who have bought a particular physical interface (say, presence of a given toy/physical interface in the same room activates presence of same character in story or clues to solve puzzle provided by that character) / eg, EPG interface offers range of activities comparable or superior to that of a paper TV guide magazine (programming, background information... but also exclusive interviews, games, psychological tests, recipes, house-keeping / family / gardening tips, horoscope, etc.). End-user can set activities as part of user profile – with option to set personal criteria (difficulty of cross-words, size of garden, age of children, horoscope sign, frequency of updates). By default, information from the IM on the user (personal details, viewing habits) can be used to tailor activities pushed to the end-user.

TOONs	Flow	Payment Layer	
Actor	Sub layer Dual role	Physical	Logical
Broadcaster Note: between brackets () actors with which the interaction takes place	Demand Requirements	<u>Cost requirements:</u> For a given advertisement, trade-off between: <ul style="list-style-type: none"> - cost of not showing advert, in terms of lost advertising revenue, - cost of showing advert, in terms of decrease in sales of NexTV products (P) - opportunity cost of not showing a different advert, more compatible with image of the channel / NexTV EPG-shopping application (A). <u>Revenue requirements:</u> Advertising and sponsoring revenue.	<u>Cost requirements:</u> Minimise price paid for good-quality content. <u>Revenue requirements:</u> Ensure long-term revenue stream by signing long-term contract with innovative producer (P).
	Demand Features	<u>Cost features:</u> Evaluate degree of substitutability between products offered by potential advertisers or sponsors and products marketed by NexTV partners (P). <u>Revenue features:</u> Set pricing strategy for adverts shown. Establish critical level for financial participation to be received from sponsors.	<u>Cost features:</u> Ensure content purchased is value-for-money (IM). <u>Revenue features:</u> Establish long-term contract with producer of good quality content (P).
	Supply Requirements	<u>Cost requirements:</u> Cost of organising competition. <u>Revenue requirements:</u> Additional revenue from enlarged viewer base. Potential payments from other NexTV actors for promoting NexTV.	<u>Cost requirements:</u> Recover operating costs and sunk costs (for infrastructure) via pricing strategy. <u>Revenue requirements:</u> Potentially receive payment from end-users (direct or indirect via IM) and maximise charge imposed on advertisers (IM, A)
	Supply Features	<u>Cost features:</u> Cost of prestigious, latest-release physical products offered for competition. Cost of delivery. Promotion expenses once prize awarded – photo shoots with winner, etc. <u>Revenue features:</u> Additional payments associated to additional viewers attracted by the competitions (receive more subscriptions, can charge more for adverts shown, etc.). (E-U) Payment from producer for promoting his products (This may take the form of a discount on price paid for products. Or the products may be offered for free). (P)	<u>Cost features:</u> Measure costs accurately. Sunk costs of maintaining and developing infrastructure and equipment. Operating costs – personnel, opportunity cost of showing programme rather than a potentially more successful programme. Hidden costs of monitoring success and viability of programme. <u>Revenue features:</u> Decide whether to charge end-users or derive revenue solely from advertising (IM, E-U, A). Decide price strategy for charging end-users, if applicable. Establish price strategy for programming adverts (A).

TOONs	Flow	Payment Layer	
Actor	Sub layer Dual role	Physical	Logical
Delivery Note: between brackets () actors with which the interaction takes place	Demand Requirements	N/A	<u>Cost requirements:</u> Invest in suitable infrastructure. <u>Revenue requirements:</u> Negotiate good rates for carriage of applications.
	Demand Features	N/A	<u>Cost features:</u> Identify optimal investment in infrastructure development (B, A). <u>Revenue features:</u> Determine rates quoted by competitors. Determine range of profitable rates, and desired profit margin.
	Supply Requirements	N/A	<u>Cost requirements:</u> Minimise transportation cost of interactive digital video applications to end-user. <u>Revenue requirements:</u> Set pricing strategy for delivery to end-users. This may be entirely covered by the price paid by the broadcaster – who will himself later recover the cost from the end-users (for example, via subscription) (E-U, IM).
	Supply Features	N/A	<u>Cost features:</u> Invest in suitable infrastructure. <u>Revenue features:</u> Identify end-users' willingness-to-pay for delivery (E-U, IM).

TOONs	Flow	Payment Layer	
Actor	Sub layer Dual role	Physical	Logical
Access Note: between brackets () actors with which the interaction takes place	Demand Requirements	<u>Cost requirements:</u> Negotiate contract with physical interface / equipment manufacturer – good prices and regular introduction of new interfaces <u>Revenue requirements:</u> Opportunity cost of alternative physical interfaces / equipment . Negotiate discounts.	<u>Cost requirements:</u> Negotiate good prices with STB manufacturer and other manufacturers. <u>Revenue requirements:</u> Opportunity cost of alternative technologies/equipment. Negotiate discount.
	Demand Features	<u>Cost features:</u> Give incentive to manufacturer to develop new interfaces / equipment . Take advantage of competition between different manufacturers. <u>Revenue features:</u> Negotiate discounts for large quantity and/or sole supplier.	<u>Cost features:</u> Take advantage of competition between manufacturers. <u>Revenue features:</u> Negotiate substantial discounts through large quantity contracts and/or sole-supplier contracts.
	Supply Requirements	<u>Cost requirements:</u> Purchase physical interfaces / equipment according to their potential to generate profits when re-sold. <u>Revenue requirements</u> Generate long-term revenue stream.	<u>Cost requirements:</u> Select STB that is value-for-money. <u>Revenue requirements:</u> Establish long-term financial link with end-user (E-U).
	Supply Features	<u>Cost features:</u> Assess affordability, durability and desirability of physical interfaces / equipment proposed. <u>Revenue features:</u> Establish long-term marketing strategy.	<u>Cost features:</u> Assess affordability, durability and functionality of STB. <u>Revenue features:</u> Negotiate long-term contracts with end-users (E-U). Determine STB supply policy (offered, bought or leased by end-users).

TOONs	Flow	Payment Layer	
Actor	Sub layer Dual role	Physical	Logical
End-User / Advertiser Note: between brackets () actors with which the interaction takes place	Demand Requirements	<u>Cost requirements:</u> Acquire (purchase and exchange) items missing from collection (P, E-U). Viewers acquire items that satisfy buying impulse. Advertisers bear advertising costs charged by broadcaster for showing adverts, and distribution costs for using NexTV delivery services (B, P). <u>Revenue requirements:</u> Benefit from unrealised market value of goods received in exchange and as prizes. Advertisers benefit from Increase in sales due to advertising. (E-U)	<u>Cost requirements:</u> Parents minimise payments made for viewing programme and communicating on Internet and control access to advertisements / buying on-line (A, IM). <u>Revenue requirements:</u> Parents benefit from opportunity cost of alternative activities not engaged in by children whilst using TOONs. Benefit from prizes such as "free subscription for a month".
	Demand Features	<u>Cost features:</u> Make best investment with pocket money for purchases Value items willing to give in exchange (E-U). <u>Revenue features:</u> Value items willing to receive in exchange (E-U). Value prizes competing for.	<u>Cost features:</u> Parents avoid long-term engagements with providers (IM). Parents veto response to advertising (A). <u>Revenue features:</u> Parents compare and contrast substitute activities (relative costs, educational value, entertainment value). Parents encourage children to compete for non-physical prizes.
	Supply Requirements	<u>Cost requirements:</u> Spend time finding someone willing to accept undesirable items. Advertisers bear production cost charged by producer to transform their raw material into suitable advertisements. (P) <u>Revenue requirements:</u> Attempt to exchange for item which higher personal (but not necessarily intrinsic) value (E-U).	<u>Cost requirements:</u> Opportunity cost of solving puzzles / preparing and submitting suggestions. <u>Revenue requirements:</u> Seek to win prize if suggestion has been used. Seek to win prize if is n^{th} viewer to check item m or if has solved puzzle, or if drawn out from those who submitted suggestions.
	Supply Features	<u>Cost features:</u> Establish sequential exchange strategy (may exchange undesirable item for another undesirable item which can then be exchanged with someone else for a desirable item). Keep track of <i>desirata</i> of potential traders, so as to trade sequentially (E-U, IM). <u>Revenue features:</u> Value items willing to give and to receive in exchange Establish exchange strategy (say, willing to exchange several items for one more valuable item) (E-U, IM).	<u>Cost features:</u> Prioritise activities and set time limits to participation to forum (homework, chores, extra-curricular activities such as sports or music, time spent with family/friends, etc.) (IM) <u>Revenue features:</u> Target more valuable prizes. Establish policy for sharing prize within team (E-U).

TOONs	Flow	Payment Layer	
Actor	Sub layer Dual role	Physical	Logical
Interactivity Manager Note: between brackets () actors with which the interaction takes place	Demand Requirements	<u>Cost requirements:</u> Select ordering procedures on the basis of trade-off between: <ul style="list-style-type: none"> - cost of implementing additional procedure, in terms of cost of buying additional services from other firms (mail marketing, call centre...) - loss of sales revenue if a particular protocol is not available (E-U). - Loss of revenue from provision of physical good delivery service to advertiser and end-user. (A, E-U) <u>Revenue requirements:</u> Initial processing fee due by advertiser if customer cancels order (E-U, A).	<u>Cost requirements:</u> Optimise service provision costs associated to higher levels of quality of service (QoS). <u>Revenue requirements:</u> Choose pricing function (E-U, C, P, B).
	Demand Features	<u>Cost features:</u> Identify target groups preferences for ordering procedures. Request competitive bids from potential additional services providers. <u>Revenue features:</u> Set strategy for cancelling fee – it may be that the best strategy is to set Cancelling Fee = 0 if cancel within X days, and use it as a sale argument (E-U).	<u>Cost features:</u> Identify shape of service provision costs: increasing function of QoS, but is it concave? For provision of higher levels of QoS, need decreasing marginal costs: past a certain level of quality, each additional 'unit' of quality will cost less and less to provide. <u>Revenue features:</u> Pricing function may mimic the shape of the cost function (more likely if competition among several interactivity managers) or adopt a different form to extract more surplus from end-user, creator, producer... (IM is a monopolist).
	Supply Requirements	<u>Cost requirements:</u> Brokerage and management costs. <u>Revenue requirements:</u> Receives payment for brokerage services (E-U, B, P, C).	<u>Cost requirements:</u> Invest in suitable equipment. <u>Revenue requirements:</u> Receive payment for interactivity services (E-U, B, P, C).
	Supply Features	<u>Cost features:</u> Costs incurred for processing order – transferring order, authenticating bank details, receiving and transferring payments, providing feedback to end-users on order progress. <u>Revenue features:</u> Receives payment for the physical goods from the end-users. Transfers payment to Producers (who then pay logistics companies). Compensation for brokerage services is taken out of payment received before transfer. This may be a percentage commission, a flat fee, or a combination of both.	<u>Cost features:</u> Invest in state-of-the-art equipment to provide highly differentiated service to other actors. <u>Revenue features:</u> Recover costs by charging broadcaster for services – broadcaster pays out of subscriptions received. The charge may divide into charges for transaction management and charges for number of visitors to website (B).

8.2. Appendix B

Technological mapping of NexTV service infrastructure

Note:

Yes : available now or within the lifespan of NexTV
 No : may not be available in the lifespan of NexTV
 --- : need further technical assessment
 Prototype : early stage development
 () : relevant standardisation

Creator (content creation)

Interactivity	System/equipment	Standard	Function	Status
Interaction at Web page		(IP, W3C)	Interaction with End-user's	Yes
	Video Authoring Tool	(VRML, XMT, MAYA)	Designing the interactive video	Yes
	BIFS encoder	(MPEG4)	Designing the interactive video	Yes (off line)
	MPEG4 encoder	(MPEG4)	Designing the interactive video	Yes(off line)
	MPEG2 encoder	(MPEG2)	Designing the digital video	Yes
		MPEG2	Digital video standard	Yes
		MPEG4	Interactive video format standard	Yes

Producer (Content and service packaging, e.g. branding or tailoring for application)

Interactivity	System/equipment	Standard	Function	Status
Management client			Participating the broadcast process	Yes
Web server***		(IP, W3C)	Interaction/transaction with end-user	Yes
	TV authoring tool	(Maya, VRML, XMT, MPEG4)	Producing interactive video and/or 3D Web in common form	Yes
	VRML translator	(MPEG4, SIGGRAPH)	Translating VRML content into MPEG4 content	---
	MPEG4 converter	(MPEG4)	Translating other digital video clip into MPEG4 content	Prototype
	MPEG4 encoder	(MPEG4)	Producing MPEG4 content from ordinary video source	Prototype
	MPEG2 encoder	(MPEG2)	Packaging the ordinary video source in MPEG2 content	Yes
	BIFS encoder	(MPEG4)	Producing BIFS format for interactive interface in MPEG4 content	Yes

(*** it can be also part of Broadcaster)

Broadcaster (Service provision with platform)

Interactivity	System/equipment	Standard	Function	Status
Real time Audio/Video encoder		(MPEG4)	Real time A/V encoding for MPEG4 format	In development stage
IP over MPEG2TS		(IP, DVB)	Web page delivery in DVB	---
management server		(IP)	Interaction for configuring the broadcast	Yes
	Broadcast station with streaming server	(DVB)	Video stream programming	Yes
	MPEG4 file server	(MPEG4)	MPEG4 file storage and retrieval	Yes
	BIFS carousel	(MPEG4)	Interactive content encoding for MPEG4	Yes
	MPEG4 over MPEG2TS injector	(DVB, MPEG4)	Packaging MPEG4 for broadcaster's delivery	off-line
		MPEG4	Standard for both the interactive interface and the scaleable compression	Yes
		DVB	Digital Video Broadcast standard	Yes

Delivery transmission (Infrastructure provision, e.g. digital TV networks)

Interactivity	System/equipment	Standard	Function	Status
Web server		(IP, W3C)	Uni-cast	Yes
	DVB broadcast station/ Multiplexer	(DVB)	Provide the physical transfer channel of digital video via DVB-terrestrial, DVB-satellite, Cable TV, B-ISDN, IP-multicast	Yes
		DVB	European digital TV broadcasting standard	Yes
		IP	Internet protocol standard	Yes

Access (Set-Top Box, TV, etc : terminal vending)

Interactivity	System/equipment	Standard	Function	Status
Web browser		(IP over STB)	Internet access for search, buy etc	Yes
HTML		(W3C)	Hyper text interaction in Internet Web page	Yes
VRML		(SIGGRAPH)	3D Web interaction	Yes
	MPEG2 HW decoder	(MPEG2)	MPEG2 video real-time decoding	Yes
	2D/3D HW player	(---)	2D, 3D rendering	Yes
	MPEG2/4 player	(MPEG2, MPEG4)	video display for mixed MPEG2 and MPEG4	No
	MPEG4 player	(MPEG4)	MPEG4 video display	Software only
	TriMedia Set Top Box	(DVB, MPEG4, MPEGJ)	DVB MHP with Java and MPEG4 extension	No
	MHP with MPEG4	(DVB, MPEG4)	MPEG2+MPEG4	No
	PC based MPEG player	(MPEG2, MPEG4)	MPEG2, MPEG4 Play	Software based
		MPEG2	Full screen digital video display	Yes
		MPEG4	Interactive display and scalable compression	Yes
		MPEGJ	local interactivity	-- not clear
		EAI	local interactivity	-- not clear
		DVB	Digital TV broadcasting	Yes*

(* DVB-J API for MHP)

End -user

Interactivity	System/equipment	Standard	Function	Status
Interactive Content		(MPEG2, MPEG4, VRML, Java)	Facilitates user interactivity	Yes
Internet		(IP)	Interaction to suppliers	Yes
	Digital TV	(DVB)	Display interactive video and accommodate the interactive play	---
	Set Top Box	(DVB MHP or NexTV)	Display interactive video and accommodate the interactive play	---
Remote controller**			Access tool of Set Top Box controller	---
Handheld device			Graphic character generation and applying	Prototype

(** may be part of Set Top Box or application)

IM (Back channel management)

Interactivity	System/equipment	Standard	Function	Status
Agent		(FIFA)	End-user profiling for the individual centred service	No
	Interactive channel/back channel		Connection between End-user and IM	Yes
	Web server	(IP, W3C)	Hosting web-pages of broadcaster and producers for End-User's interaction	Yes
	Transaction server		Handling End-User's transaction request such as procurement transmission	Yes
	Security management		Facilitating authentication process involved in commercial transaction	---
		IP	Internet protocol standard for implementing interaction in IM	Yes

8.3. Appendix C

Other issues on NexTV Interactions

Category	Issues for interaction	Description	Comments	
Creation (content)	Target user group	Effective group for appreciating new NexTV application		
	Story line	Attractiveness to target user group		
		Feasibility of implementation in NexTV		
	End-user's interest	Pilot trial test		
	Interaction with end-user	Polling user's feedback		
		Fee payment to IM's role		
	Interface with producer	Level of design		
Common standard for content transfer				
Revenue – transaction and price				
Production (Program)	Animation production	Authoring tool and common data interface		
		Program standard format	MPEG4	
			JAVA	
			MPEG2TS	
	Interface with creator	Level of design		
		Common standard for content transfer		
		Payment – transaction and price		
	Level of interactivity in program	STB functionality		
		End-user's ability		
		End-user's resource/cost		
	end-user group	level of attraction revenue generation		
	Interface with broadcaster	Program supply standard format		
		Revenue/payment transaction and price		
STB standard				
Broadcaster/Delivery	Broadcasting program	Broadcasting technology		
		Cost		
	STB	STB manufacturer/supply		
		STB standard	MPEG4	
			JAVA	
			MPEG2TS	
			2D, 3D rendering	
	Cost			
	End-user's adoption level			
	Interface with producer	Program supply standard format		
		Fee/payment transaction and price		
		STB standard		
	Interface with end-user	STB with IM		
Subscription/Buy transaction				
Customer profiling				
Popularity of program	2ndary revenue generation			
Interactivity Manager (Playback at end-user's site)	STB	Cost		
		Broadcaster with attractive programs		
		Functionality		
		Convenience		
	Auxiliary devices	Compatibility		

		Functionality	
		Cost	
	Payment	Flexible options	
		Security	
		Subscription and interactive channel	
	Level of interactivity	STB functionality	
		Program's interactivity	
	Education	Easy to learn	
Interactivity Manager (In user's community)	Internet	Convenience - latency	
		Feel and feedback	
	Proprietary device	Compatibility	
		Popularity	
		Functionality	
		Cost	
	Easiness	Easy to participate	
		Popularity in methodology	
	IM	STB	
		Web server	
Cost	Interactive channel fee		