Business and Market Vision

Deliverable D4.1.3

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1 Executive Summary

This document is the third main and last deliverable in Task 4.1 of Work Package 4; market vision and observations about the methodology. The vision and the observations are based on the lessons learned from both D4.1.1 and D4.1.2. It will outline services, business models and delivery modes for FascinatE and reflect on the progress and lessons learned during the project.

The first task is to develop a market vision, based on the information and work that has been done in this Work Package. The technologies and service concepts developed in FascinatE, particularly the "iDirector" concept, have good potential to become successful in the live entertainment market. But there are some hurdles that need to be taken before it can make fully use of its potential. These barriers are translated in three key take-aways.

1. **Focus on supporting the business goals in the industry: generate attention**

   It is important to support or strengthen the business case of the target customer with the proposed technology or service concept. In the home-entertainment market the business case is strongly related to the amount of attention (eyeballs) you can generate with the products and services. For iDirector this can be realised for several customer segments, such as commercial broadcasters, Pay-TV channel or public broadcasters. The interest of that customer segment can be slightly different; the Pay-TV channel e.g. needs to offer something that is distinctive from the competition. For the other technologies and product-market combinations developed in FascinatE the same applies, i.e. in order to find and attract customers.

2. **Take a local approach**

   In our research we found that, although the technologies and product-market combinations have global potential, it is necessary to take a local approach. The parties that play a role (or sometimes multiple roles) in the value chain of live-TV and the technology they use to offer live-TV broadcasts can be very different in each country. Therefore the exploitation of the FascinatE technology requires a local approach.

3. **Second screen devices; a good first start**

   Demonstrating products is necessary to show what the technology has to offer and what kind of products and services can be offered with it. The "second screen device" seems a good candidate to illustrate the benefits of the FascinatE technology. It is an upcoming trend and many parties are interested to experiment with this technology to see how they can benefit from it. The willingness to experiment has also another advantage because it makes it also easier to accept the business case, even when it is still largely based on qualitative assumptions.

The second task was concerned with reviewing the methodology that is developed in WP4 Task 4.1: identifying viable business models and associated services in the Front End of Innovation. With that method we aimed to support the partners of the FascinatE consortium to make choices in their technology development based on business information. The key take-aways from that approach are:

1. **Translating technologies in "service values" is useful to build the first high level Product Market Combinations (PMC)**

   The Business Model Canvas (BMC) is used to come up with new product-market combinations for the FascinatE technology. Normally the BMC is used to design new products and services from the customer/market perspective. It is less often used to start with the innovative technology as starting point. It is important to translate the innovative technology into so called service values. These service values are easy to understand and help to build product-market combinations with the innovative technology. For example the FascinatE rendering technology adds value by offering the service values: immersion and interaction. Interaction is used to create the iDirector PMC.

2. **One market scan provides enough insights**

   The technology is innovative. This means that the competition and market developments are limited. Therefore it is not necessary to perform a market scan two times in two years. One market scan provides enough basic insights to decide if the market for a PMC is interesting.

3. **Show what you got**

   Create as soon as possible an interactive demonstrator or mock-up to discuss the technology with parties that can adopt the technology. This will really spark people's interest, will make the results of the research tangible and allows people to assess the opportunities for their business.

4. **Early discussions**

   Create product-market combinations, first on paper and back those product-market combinations up with the demonstrators or mock-ups, and use them to discuss in an early stage with potential users, to understand how they fit in their business model. Understanding how a PMC or technology adds value to their business model is key. This was an insight that the interviews with the commercial parties made clear. The first question they asked themselves was to what extent this improved their existing business model, by offering a better or faster service, enhance the product or service or create a new customer segment. This was not always the main focus of when the FascinatE project started.

2 Introduction

2.1 Purpose of this Document

The main objective of this deliverable is to provide a market vision for the consortium partners. In this document the future market of the service concepts and the FascinatE technology will be discussed. It is based on the findings of the earlier deliverables in Task 4.1.

The second objective of this document is to share the key take-aways of the approach that we have used to make business informed technology choices and suggest some improvements for future use.

2.2 Scope of this Document

In this document we will translate the findings of the previous deliverables into a market vision. The scope of this document is to review all documents and deduct the most important insights for the FascinatE partners. Questions that are central in this document are:

- What (product/service) can be offered with the FascinatE technology?
- On which markets can this be offered?
- What is the product-market combination that has the greatest potential?
- What are important insights that have impact on the success of the PMC?

Answering these questions will result in an overview of the most important insights for the market vision. Note that for this document, we do not aim to provide a complete summary of all the documents that were used.

In the second part of this document we briefly review the approach that we have used in the deliverables thus far. The review is done with the people involved in the creation of the documents. Questions that are central are:

- What are the key take-aways from the approach?
- What should we recommend when the approach is used again?

2.3 Status of this Document

This is the final version of D4.1.3.

2.4 Related Documents

Before reading this document we recommend the reader to become familiar with the following documents:

- FascinatE project proposal, Annex I - “Description of Work” [1]
- D1.1.1: End User, Production and Hardware and Networking Requirements [2];
- D4.1.1a: Service Concepts, Business Models, Delivery Modes [3].
- D4.1.1b: Service Concepts, Business Models, Delivery Modes [5].
- D4.1.1c: Service Concepts, Business Models, Delivery Modes [7].
- D4.1.2a: Market Overview [4].
- D4.1.2b: Market Overview [6].

The relation and coherence between the various documents under Task 4.1.3. is shown in Figure 2-1. In general, the various iterations of deliverable D4.1.1 aim at supporting the consortium partners in selecting and refining the direction of their respective technological innovations. Deliverable D4.1.2 aims to identify the market opportunities by giving a market overview. The last deliverable, D4.1.3 will combine the insights into a market vision.

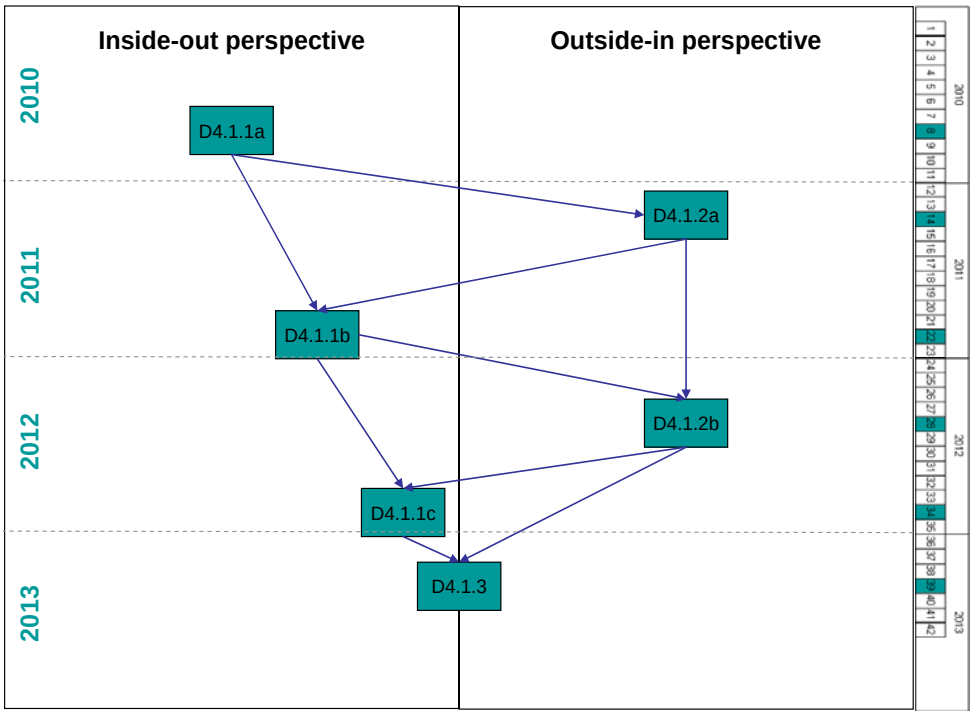


Figure 2-1: The coherence between the deliverables in Task 4.1.

3 Market Vision

In this chapter the outcomes of the findings will be revisited and the implications of the findings will be translated in a market vision for FascinatE. Based on the insights that we have gathered during the research in Task 4.1 it seems that the FascinatE technology has great market potential and each independent technology can be used in several product-market combinations (PMCs) [20]. The potential is acknowledged by many (commercial) parties during live FascinatE demonstrations, interviews with field experts and feedback during demonstrations on events such as the International Broadcast Convention. In this market vision we focus on the market perspectives for the FascinatE technology.

This chapter consists of four sections. In the first section the concepts that can be offered with FascinatE technology will be discussed. The second section describes the insights that we gathered from the markets for both the concepts that were developed in the first section and the technologies that are developed in the FascinatE project. The third section focuses on the choice for the most promising product-market combination, based on the earlier findings. In the final section of this chapter we share our vision about the exploitation of the product-market combination and share the key take-aways from the process.

3.1 The Offering

The FascinatE project description [20] states that in the FascinatE project a system is developed to allow end-users to interactively view and navigate around an ultra-high resolution video panorama showing a live event, with the accompanying audio automatically changing to match the selected view. Five key technological innovations are identified in the FascinatE system [1]:

1. **Layered Scene Capture**; format-agnostic audiovisual production and capture framework, enlarging the spaces of production parameters. By ‘format-agnostic’ we mean that the resolution, field-of-view, aspect ratio, frame rate and colour depth of the captured image and the representation of the audio signal are chosen based on the requirements of the particular production, rather than being tailored to a particular delivery format. The video signals from the various cameras capturing the scene, including the audio signal capturing the audio scene as well as interesting audio objects, together with metadata describing their relative geometrical and photometric alignment, constitute a ‘layered’ scene representation, as each kind of camera as well as microphone and microphone arrays can be thought of as contributing a layer of information to at least a part of the whole scene. From this layered representation, any particular part of the scene can be rendered at any desired resolution and loudspeaker/headphone setup;
2. **Scripting**; a metadata-based scripting system, using semantic technologies and integrating the different types of metadata and knowledge, allowing the programme production team to (semi-) automatically select regions of the image that are of interest. These will be used to derive a set of ‘default’ shot framings appropriate for particular devices, by taking account of different screen sizes and device capabilities, thus allowing the automated production of multiple simultaneous versions of the programme with little or no additional production effort compared to producing a single-format programme today. Scene analysis tools to identify and track regions-of-interest (such as sportsmen) in the scene will be developed, together with an automated system for region selection to control how shots covering these areas should be framed for different screen sizes. These tools will allow a member of the production team to easily specify “default” views of the scene without having to track multiple areas manually. The viewer has the option of selecting one (or more) of the defaults appropriate for their device, or to navigate away from these in a controlled manner if they want more direct engagement. The system will also enable optimal adaptation to the respective terminal capabilities;
3. **Rendering**; the desired view is rendered from the generic scene representation, using either the transmitted script metadata or new automatically generated scripts taking into account user preferences or special viewing conditions. For flexible video rendering, video processing techniques will be developed that adapt the views given by the raw, high-quality scene data to the capabilities of the respective display. Rendering solutions will have to deal with a completely different partitioning of the data that represents a complete scene capture. In addition, video rendering will be designed to exploit the new scripting-based metadata and adapt to a large variety of terminals and services. For audio rendering the new features require transmission of “what is to be heard” (i.e., the sound field at the listeners’ position and orientation) instead of “how

to present it" (i.e., loudspeaker channels). At the viewer's side, the transmitted signal is then used for audio rendering to the local reproduction setup by a self-configuring decoder that also needs to be developed but is out of scope in the FascinatE project.

4. **Distributed Network Infrastructure**; a distributed network infrastructure for intelligent proxying and script processing. Intelligent network components will perform auto-scripting, self-configuration, format conversion, and distributed rendering. They will select the right format and conversion procedure depending on the network type and terminal capability. Distributed processing/rendering at different locations in the network and in the terminal will be considered, so that, for example, low-power mobile devices will receive images rendered by a proxy device, reducing the need for local processing, whereas a large-screen video theatre could receive all the video layers and script metadata directly and render its own view as required. Within the FascinatE system, the distribution mainly concerns scripting and rendering.
5. **Gesture-based Interactivity**; Novel user interfaces and interaction techniques, including a system for detecting and interpreting gestures, so that users can interactively and intuitively navigate through the audiovisual scene. New paradigms of user interaction will be investigated in order to adapt to a large variety of terminals and usage scenarios. In this context FascinatE will define and assess the viability of a set of user actions (including gesture recognition) that will allow the definition of the script to be followed in the rendering step in the various scenarios.

In two expert sessions with the partners we developed service concepts that make use of at least one, but often more of the innovative technologies developed in FascinatE as listed above. A service concept is the description of the combination of a *value proposition* (concrete product or service), the *distribution channels* (the way it is offered to the consumer), a describtion of the *customer relationship* (the relationship the company that offers the value proposition has with the customer) and the *customer segment* (the group of people that buy the actual product). During these expert sessions the following five service concepts were developed that were found interesting [20]:

1. **iDirector**; This service concept provides the home viewer with director-like functionality during live events. The user can orchestrate the different views that are available from the layered scene capture. Interfacing with this service concept is implemented by using gestures or a secondary interface like a tablet. Objects- and areas of interest can be defined by the user and presented in Picture in Picture (PiP) mode on the TV. Examples of the iDirector functionality are selecting a favourite football player as showing him as a Picture in Picture on the TV set, or following a favourite musician on a stage. Additional functionality, which could enrich this service concept, could be information of the tracked object as overlay or banner information. Main values offered to the user are personalisation and interaction.
2. **Immersive Experience**; This service concept provides an immersive experience of live events to viewers, by showing the audiovisual information on a panoramic screen and 3D-audio setup, such that the viewer experiences the feeling of being present at the even, even a feeling of co-presence with people physically present at the event. Examples include the provisioning of an overview of an athletics event, or the cockpit cam of a formula-1 race. Main value offered to the user is: immersion and interaction.
3. **Mobile Magnifier**; This service concept provides users the option to select a specific view, while watching a live event,. The view can be played out on a mobile device or shared with other participants on the event or at home. The user has an application on the phone, which gives him the opportunity to take a snapshot of a specific area of the event. This picture will be compared to the video stream of the OMNICAM. With an algorithm a stream will be generated that broadcasts exactly that area (to the mobile user, or in case it is shared to a home entertainment location). Examples include the use of a smartphone at live music events to see the artists even at great distances. Main values offered to the user is: personalisation and immersion.
4. **Cost efficient reporting**; This service concept enables a time and cost efficient manner to direct the registration of an event by using a simple interface and selecting areas of interest. These regions and objects of interest are generated based on a set up of an OMNICAM - and possibly semi-automated cams - at specific locations. When the director selects a specific area of interest, the scripting module calculates which cams have to take shots and from what angle. That image will be broadcasted to the consumers. The user experience of the cost efficient event reporting is similar to the iDirector. Examples include the automated production of low-profile sports events or highly standardized and/or slowly varying reality shows. Main value offered to the user is: cost efficiency.

5. **Omni Security Cam**; This service concept is available e.g. for emergency services and security companies. One or more OMNICAMs are placed at specific positions in such a way that the whole area that needs to be secured is visible. All these views will be streamed to the control room. Additionally, Regions of Interest (ROI) or Object of Interest (OOI) will be defined to automatically generate the content that requires immediate action, thereby minimizing the human monitoring task. Examples include the monitoring of live demonstrations or crowd-control. Main value is: cost efficiency, namely in the monitoring of geographical locations.

After these service values were defined, we used them to identify the markets in which they can be offered. In the next section the outcomes and insights of that market research will be discussed.

3.2 The Market

There are two ways to look at “the market of FascinatE”. The first is to define the market based on the service concepts that can be offered by using the technology. The second perspective is to look at each individual technology developed in FascinatE and its market. In this chapter we will cover both perspectives. First the resultst of the most attractive market for the service concepts is discussed. Second the market environment and competition of each individual FascinatE technology is disccused [20].

3.2.1 Service Concept Market Analysis

The goal of the market analysis was to understand the attractiveness of the potential markets for the service concepts described in section one. For each of the service concepts we first identified on which markets they could be beneficial to customers (customers can be both business-to-business and business-to-consumer). For each potential market we performed an analysis of the structure (value chain analysis), the financial state (market size), the products offered (product overview) and trends regarding the technologies used to offer products (technology radar). We applied the market analysis on three geographical markets: Germany, United Kingdom and the Netherlands.

During our research we have identified five potential markets:

- **Home entertainment**; Live viewing events for consumers at home.
- **Live events**; Live viewing of events by the event visitors.
- **Cinema**; Live viewing of events in digital cinema.
- **Video Production**; Live registration and semi-automated directing for media professionals.
- **Security**; Live detection and notification for surveillance.

Of these five potential markets we found that the *home entertainment* market is the most attractive. This is a global market with a significant size. The market of live viewing of events is part of the market of watching TV by consumers, which has a penetration in Europe of almost a hundred percent. It is also a very stable market that is not rapidly affected by the economic ups and downs, last year its size was 233 billion Euro. Despite continued global economic uncertainty, iDate predicts growth for the global TV services market to rise to €355bn in 2020. This represents an average annual growth rate of 4.7%. Besides its growth and stability it also provides opportunities for most of the FascinatE technologies and service concepts that were defined in the first section.

The other markets also provide opportunities, but have some reasons why they are less attractive. The market for live events is significantly smaller than the home entertainment market. In the Netherlands, the best watched soccer match on television attracts almost as much viewers as all visitors of live music events together. Also the business model that is now used by organizers of events is not service based but based on the transaction of selling tickets and drinks and visitors do not seem to be willing to pay an extra fee for such services. It is possible that the organizer of the event is willing to pay for the service as a way to differentiate from the competition. The market for using FascinatE at the digital cinema shows potential in the future, as the market for alternative content is growing. Especially watching events at the cinema is taking of in the US and Asia. The bottleneck for FascinatE is that is hard to find services that are valuable in this context. Now the focus lies on personalization, but it is hard to compete with the immersive experience that people pay for in that setting.

Target Groups In The Home Entertainment Market

In the domain of live entertainment we have identified three target groups that can act as provider for the iDirector. In this section the target groups are discussed and the most important insights will be shared.

Broadcasters

To get a clear view of the broadcaster perspective we had an interviews with people in the field. The essence of commercial (non Pay TV) broadcasters is the delivery of advertisements. Main function of the broadcaster is to match the supply and demand of attention of audiences and advertisers. The core business of a (commercial) broadcaster is to attract and keep an audience. The success of that is measured in rating points: this is the percentage of all the TV households in a defined area that tuned in to a show. Traditionally the TV was the main channel, but with the appearance of new media it becomes more challenging to attract and keep the attention of the audience. Broadcasters sell time to advertisers using the concepts of gross rating points (GRP), reach and frequency. Reach is the percentage of households (or the target audience) exposed to a message at least once over a predetermined span. Frequency is simply the number of times an advertisement is used during a period of time. Thus, GRP is reach multiplied by frequency. Given that advertisers will always prefer to aim their messages first at audiences that are most likely to be receptive to or interested in their products or services, they aim to find broadcasters that are able to reach that audience, this is measured by the targeted rating points (TRP).

Broadcasters have multiple tools to influence the TRP. The first and most obvious tool is the content that is broadcasted: the TV shows, sport matches and so on. The broadcasters can acquire the rights of sports and other events or TV formats, but in some cases the production of this content is (partly) done by the broadcaster himself as well. The second toolset consist of the other services and products that are offered in addition to the traditional broadcast. Examples are the website of the broadcaster, additional apps and features such as mobile text-services to promote interaction.

In a nutshell the value proposition in the business model of the commercial broadcasters is: attention or ‘eyeballs’. Business model improvement is possible if cost savings or new services and strategies make it possible to gain more (controlled) attention. In the department of the interviewee all people regularly scout for new technology, but there is no structured analysis approach or method. New technologies should support the commercial model, independent of the platform used (TV, Websites, mobile apps or other new media). This is also the case for the proposed FascinatE technology.

The content offering of the broadcaster is important. If the content portfolio of the broadcaster do notdoesn’t contain any sports or large live event then it is not likely that the broadcaster is interested in the iDirector solution. Sports content like soccer could be interesting: there is a large audience. The difficulty there is to what extent the audience will benefit from the technology. Some broadcasters will interprete the FascinatE technology at the consumer end as a gimmick instead of a real distinctive feature.

Advertisement agencies

Advertisement agencies can also benefit from the iDirector technology in their campaigns for their clients. Main function of the advertisement agency is to match the supply and demand of attention of audiences and advertisers. In this game to attract demand, the agencies are always looking for new ways to attract the attention in their campaigns. The usage of video in campaigns is common, brands like Red Bull for example broadcast live events of extreme sports via the Internet. Their latest event, the skydive of Baumgartner attracedt more than 8 million viewers worldwide [9].

The additional content is most of the time only available on other channels than traditional TV. People had to watch the skydive for example via a live stream on Youtube. Because alternative channels are used to offer the content, people have to change their normal behaviour. Instead of watching the content on TV, what they are used to, they have to look it up on the Internet. Although the content itself can be very compelling as it is challenging to get people in action modus and let them change their behaviour. iDirector can be offered as a solution to advertisement agencies to tempt users to change their viewing behaviour by offering a new and compelling experience. As add-on feature it can seduce people to watch the content and play around with it to have a unique experience. Campaigns can benefit from the FascinatE technology.

Content owners

Content owners, such as Fifa and UEFA, have the rights of the sports games and are interested in ways to optimize the revenues they can make with these rights. The traditional way of making money of it, is by selling the rights to broadcasters. The broadcaster have a clear role, they match the supply and demand of attention of audiences and advertisers. The content owners themselves do not have the expensive infrastructure to do it themselves, so this is a win-win situation for all parties involved.

With the developments of the web, especially the web video technology, it seems that the expensive infrastructure to deliver content to end users becomes cheaper. For content owners with a large and high involved audience it can be interesting to broadcast the content themselves to the audience for a premium price. Sports leagues such as NFL and NBA do so and offer season passes to consumers that give them access to view the matches in that season via web streaming.

3.2.2 Competition for FascinatE Technologies

Second to the market analysis for the service concepts, we performed a competition scan of the independent technologies that were developed in the FascinatE project. This competition scan focuses on both existing products and competing R&D projects.

Conclusion of the scan is that the competition can be both similar technologies that are developed by other parties but also substitute technologies that offer similar functionality. The competition that we have identified is presented in detail in section 9.1 and 9.2. An overview of the technology competition is presented in Figure 3-1, it demonstrates that the distributed network processing has the least competition compared to the other technologies. It also shows that the other areas (e.g. layered scene capturing and analysis and scripting) experience competition from market ready products. Figure 3-1

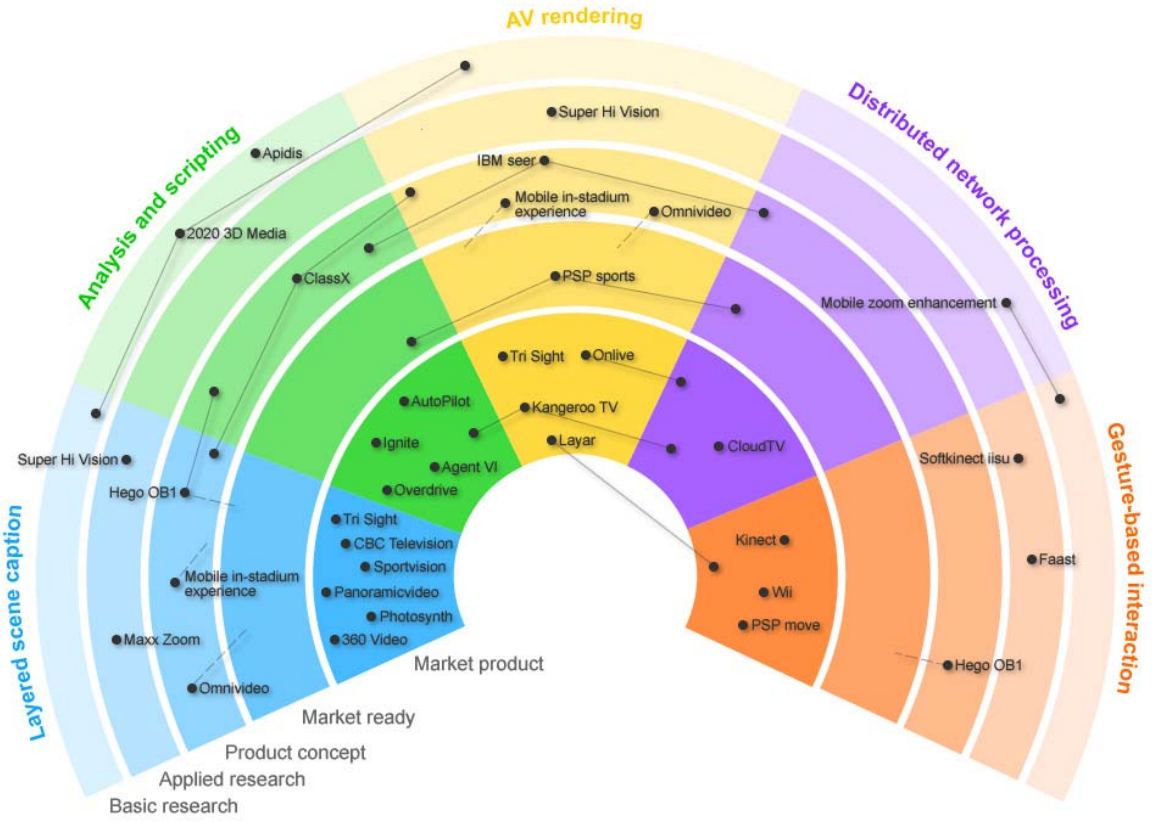


Figure 3-1: Technology Competition Radar[1]

Based on the insights in deliverables 4.1.2a `[20] and 4.1.2b [6] we have found that the distributed network processing technology has the least competition. This makes it an interesting component for the exploitation in a PMC. In the deliverables of task 4.1.2 we discuss this in more detail. We used these insights to understand the competition, demand and to select the right PMCs in the D4.1.1 deliverables.

3.3 The Selection

After performing the market analysis we selected the most promising product-market combinations for FascinatE. We found that the home-entertainment market was the most interesting market. For the home-entertainment market only two product-market combinations (PMC) were available in this study: the iDirector and the Immersive experience.

iDirector for the home-entertainment market

This PMC is a service that provides the home viewer with director-like functionality during live events. The user can orchestrate the different views that are available from the layered scene capture. Interfacing with this service concept is implemented by using gestures or a secondary interface like a tablet. Objects- and areas of interest can be defined by the user and presented in Picture in Picture (PiP) mode on the TV. Examples of the iDirector functionality are selecting a favourite football player as showing him as a Picture in Picture on the TV set, or following a favourite musician on a stage. Additional functionality, which could enrich this service concept, could be information of the tracked object as overlay or banner information. Main values offered to the user are: personalisation and interaction.

[1] Kangeroo TV is now FanVision

Immersive experience for the home-entertainment market

This service concept provides an immersive experience of live events to viewers, by showing the audio-visual information on a panoramic screen and 3D-audio setup, such that the viewer experiences the feeling of being present at the event, even a feeling of co-presence with people physically present at the event. Examples include the provisioning of an overview of an athletics event, or the cockpit cam of a formula-1 race. Main values offered to the user are: immersion and interaction.

After the identification of the two PMCs for the specific home entertainment market, we performed an expert business- and technical assessment to identify which is the most viable PMC. The outcome was that the iDirector for the live entertainment market was the most viable PMC. The outcomes of the SWOT analysis can be found in deliverable 4.1.1b [5].

Outcome of SWOT for iDirector – Live viewing at home

The iDirector concept is perceived as high viable product for viewing live content at home. Although the product is fancy and speaks for itself, it also has some weaknesses. The first weakness is the competition of normal live TV. The quality of live TV productions is pretty high. The directors of live television are professionals, there are already many cameras available covering different angles and end-users are used to these viewpoints when watching live content. Further, watching TV is a social event; iDirector transfers the directing function from the director to the consumer. In a setting where multiple consumers watch the same program in the living room this may introduce annoyance for the other viewers if the directing consumer is unskilled. The experts concluded that the iDirector functionality is probably best used by people as a second screen service. On the large screen the normal broadcast or one specific selection is shown. The second device is used by the users to watch specific viewpoints, track players or zoom, pan or tilt. When a very interesting viewpoint is selected, this selection may be shared to the main screen.

In the discussions with experts many threats were identified. A major threat is the availability of substitute products. Because it is a new way of watching television it has to compete and exceed the old fashioned way of television. Red-button applications, although available, are not widely adopted. The main solution to overcome this is by using the second device. Besides that issue, it is hard for new entrants to introduce this product. In order to offer iDirector, the service provider needs to acquire a content license from the rights holder.

The opportunities that were identified during the session were the following. While iDirector primarily offers personalisation to an end-user, it can have the additional benefit that you can share your personal view to social networks. Sharing screen captures, favourite camera viewpoint and so on can be integrated with the use of social media. By letting other people know what you are watching and let them experience it the same as you do, makes it a special event.

Closely related but slightly different is the fan experience that can be extended by using this product. When a consumer is a fan of a specific sports player or musician, it should be possible to give the user the option to have the experience of being together with that person. It is possible for example to let the user select a player of his favourite team. That player is followed from the entrance into the stadium, the warm-up training on the field to the interview after the game in which the player gives a short evaluation of the game.

When the most viable PMC was identified we interviewed parties in the live entertainment value chain to identify the impact of the iDirector PMC on their revenues and business model. We focused on the media value chain for television, because the FascinatE partners have that as focus. The different roles in this value chain are well established: **producers** create or at least own content like movies and TV series. The content **aggregator** is typically the broadcaster, like the BBC, Channel 4 or Sky in the UK. They aggregate content and advertisements into TV channels. These are broadcast to consumers by the **distributors** and via its core and access networks. The **technical supplier** is the only party that is supportive to the parties in the value chain; it delivers the technology to the aggregator and the service provider that is necessary to provide the services to the consumer.

When the interviews were finished, we understand that the technical supplier is the most likely partner to adopt the iDirector technology and the aggregator is the less likely parties to adopt the FascinatE network technology. The technical supplier already provide the others in the value chain with technology. Adding iDirector as a new feature can help to keep ahead of the competition. Offer the iDirector as a separate feature or technology is possible but less likely.

3.4 The Vision

The FascinatE technology has great potential, but it is a challenge to get successful on the market. Based on our research we identified the following take-aways on our experience with the iDirector exercise, that also could work for the other technologies and product-market combinations in the FascinatE project.

3.4.1 How much attention can you generate with the FascinatE technology?

One of the most important decision factors is the existence of a valid (and positive) business- and use case. Basically everything that is done within broadcast of video content offering must deliver value by getting attention from viewers and users right from the start. To make sure that the value is delivered, it is important to demonstrate that new technology in the form of a service is perceived as so by the end users. This is not something that is only qualitative but should also be backed with figures about concrete market / consumer experience information. Specific user interaction and usage studies are very relevant in this stage. The use cases that are described in earlier FascinatE deliverables are not sufficient, as it lacks this specific business insights. This should be completed with user information about usage. The market potential is very important. How much attention can we get from the viewers (and maintain their attention during advertising)? This is the main question to be answered. If the technology can be connected somehow to the advertiser model, then it is probably worth to look deeper into it.

For PayTV operators it is also important to create products that are compelling to their users. When the service is more compelling it is easier for the PayTV operator to market subscription as a premium service. The FascinatE technology can help the operators creating such products.

3.4.2 Take a local approach

Although FascinatE has a worldwide potential, a local approach to market introduction is needed. The difference of the infrastructure that is available in each country plays a significant role [4].

The difference between the infrastructure availability in the United Kingdom and Germany is good illustration of the need to take local approach. The form in which FascinatE can be offered in the home entertainment market is highly diverse. In Germany most people have access to TV via cable and satellite. In the UK digital terrestrial and satellite are the most used technologies for TV. This infrastructure determines in what form FascinatE can and will be offered. Another important local issue are the (ownership of the) content rights. Every country has its own rules and regulations regarding the rights issues. In some cases the rights for live events and live sports content is owned by the same party that does the distribution and sells the service to the consumer. In other cases there is a separate distributor that is the service provider to the consumer. The right issues are important as iDirector makes use of the second screen device. The content owner can define this screen as a new window to sell his content to the broadcaster. How this topic is handled is highly dependent on the local market, as in some cases the broadcaster and the content owner are the same.

3.4.3 Second screen devices; a good first start

The explosive growth of the adoption of smartphones and tablets opens the door for the iDirector. Many people are using, or at least experimenting with second screen applications. Second screen applications allow a television audience to interact with the content they are consuming, such as TV shows, movies or live sports.

The first examples of second screen devices that offer interaction with the content are available on the French market. EVS delivers the network technology to both the aggregators and the service providers. This company does play a vital role in the segment of live sports registration as they develop hard- and software necessary to deliver replays seconds after the events took place. Their role varies. In some cases they only create and deliver products to their (B2B) customers, in other cases they organize and support a complete service. In 2012 they have introduced a new service for Canal+; the football app. The app is providing multicam video clips of match action in near real-time, up-to-the-minute statistics and bonus material such as pre-game coverage and interviews. It also features filmed reactions from the Canal+ live football programme, Canal Football Club, as well as the ability to interact via social networks.

Almost every technology in the FascinatE project can influence the delivery of product and services on the second screen. The second screen is a trend that appeals to a lot of people and is therefore, in combination with a good business case, a good first start to bring the FascinatE technology to the market and show potential buyers the potential of FascinatE.

4 Reviewing the Approach

In this chapter, the approach that was used in FascinatE to make business informed technology design choices will be reviewed in order to understand in what way it can be enhanced, so that future use of the approach can help others with making business-informed decisions at early stages of the R&D cycle.

4.1 The Approach in General

A common challenge of R&D projects is to develop new technologies that fit the demand of the market. This is a difficult challenge, especially when the technology is not developed yet and therefore market demand is unknown. Traditionally, a SWOT analysis is performed in part this phase, during idea generation. However, such an analysis does not take into account the inherent trade-off in product/service innovation, which is shown in Figure 4-1; as the flexibility in specification and development of technology is reduced during the R&D process, the articulation of user and business demands increases due to better understanding of the potential of the technology.

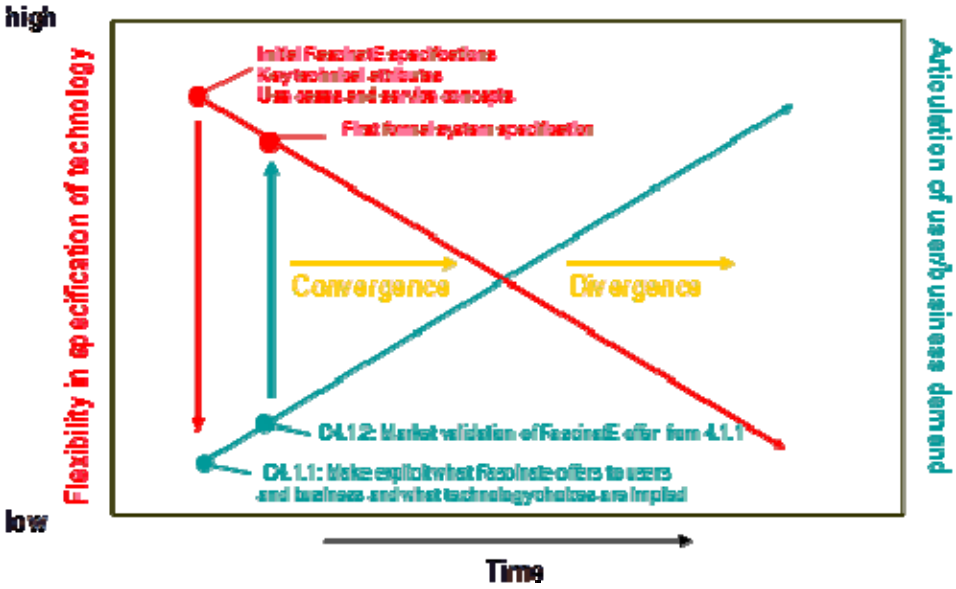
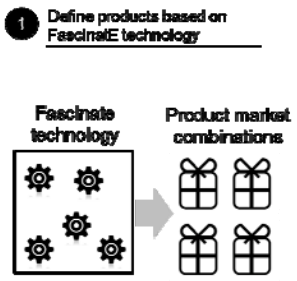
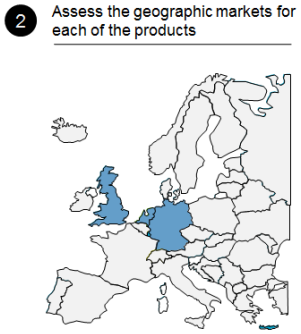


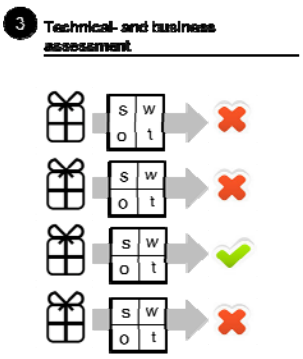
Figure 4-1: Flexibility in development vs. articulation of demands

To overcome this challenge we developed the FascinatE approach. The approach was developed to be used in an early stage of the project, to get faster and more efficient adoption of new products and service at the end of the project. To do so we used the business model canvas as a reference model. This requires constant feedback and convergence between technology development and business considerations in the early stage of the R&D process, and divergence in a later phase.

The approach consisted of the following four steps:

<table>
<tr>
<td> 

Deliverable 4.1.1a</td>
<td> 

Deliverable 4.1.2a & b</td>
</tr>
<tr>
<td>The first step of the approach started with the analysis of the key technological innovations of the FascinatE project. In multiple expert sessions with the FascinatE partners several product market combinations were developed. Each of the product market combination was elaborated by using the four sections of the business model canvas; the customer segments, the value proposition, the distribution channels and the customer relationship.
The first step can be described as part of the inside-out approach. This means that the ideas and concepts were developed based upon ideas within the consortium.</td>
<td>After the definition of the different product- market combinations we started to take the outside-in approach. In this approach we confront the concepts and product-market combinations with the reality in the ‘outside world’.
First we analysed the markets. The goal of the market analysis was to understand the attractiveness of the potential markets for the product-market combinations.
Second to that we analysed the competition in the market for the FascinatE technologies. This gave us important insights about alternatives for the technology that we developed and also opportunities to combine the FascinatE technology with.</td>
</tr>
<tr>
<td> 

Deliverable 4.1.1 b</td>
<td> 

Deliverable 4.1.1c</td>
</tr>
<tr>
<td>After performing the market analysis we selected the most promissing product-market combination for FascinatE. We used the inside-out approach in this step; with experts of the consortium we analysed the PMC’s. We performed an expert business- and technical assessment and a SWOT analysis to identify the most viable PMC.
The outcome was that the iDirector for the live entertainment market was the most viable PMC. The outcomes of the SWOT analysis can be found in deliverable 4.1.1b.</td>
<td>In this last step we used the outside-in approach. After finding the most viable PMC, this deliverable has as goal to identify, what the factors are, that explain if and under what conditions the FascinatE technology is adopted. Therefore we discussed the most viable product market combination with several industry parties. During this discussion we aimed to understand how the product market combinations could impact their business model, how the selection process works and what the financial considerations and impacts were.</td>
</tr>
</table>

4.2 Observations

In this section the approach will be discussed. After performing all the steps in the approach, we have found that there were four important generic observations regarding the method:

1. It is helpful to translate the innovative technology into so called service values. These service values are easy to understand and supportive in building product-market combinations. Furthermore it is important to pick the right level of abstraction for the service values. They need to be concrete enough to be used in the PMCs. For example in the first steps of our deliverable we used as service concept “interaction”, but we found out that this level of abstraction was too high. During interviews people did not understand what was meant by it and this resulted in difficult discussions. In a later stage we translated this abstract term to “live video zoom”. This was more helpful, as people tend to understand this service value better. It improves the communication and therefor will help to get valuable information.
2. The technology is innovative. This means that the competition and market development is limited. Therefore it is not necessary to perform a market scan two times in two years. One market scan provides enough basic insights to decide if the market for a PMC is interesting.
3. Create as soon as possible an interactive demonstrator or mock-up to discuss the technology with parties that can adopt the technology. The feedback of the interviews when we showed the working technology was much more useful than the feedback from the interviews where we discussed abstract service concepts.
4. Create product-market combinations and discuss them in an early stage with potential users, to understand how they fit in their business model. How a PMC or technology add value to their business model is key.

Besides the insights stated above we also identified some other challenges during the process that are worth looking into. These challenges are related to the specific FascinatE case.

Separate components, smart combination or total solution?

Finding the most viable PMC for FascinatE started with the question how to deal with all the technology that should be developed in the project. Because there were many different innovative technologies, it was not feasible to define products and services for each of the independent technologies. During the workshops in the early stages of the project we divided the technology into three types: production, network centric and device centric technologies. Many of the challenges that the PMCs provide solutions for could be solved with multiple or all the three types of technology. E.g. the iDirector can be offered with both network and device centric technologies. It was very helpful to classify the FascinatE technologies and take the distribution form as starting point (production, network- and device- centric). This created the freedom to design product-market combinations and to pick a specific angle (e.g. device-centric) to select the corresponding FascinatE technologies.

Market focus & Market insights

When the development of technology starts, it is important to understand the market in which the technology should land. To get a better view it is recommended to perform an overall market scan. In this scan, information about the country where companies are active (and the technical and business characteristics of that country), their business model and state of the art technology can be gathered on high level. These variables provide insights about the groups of companies that can benefit from the new developed technology and help also to focus the research to deliver something that has a clear fit with that group in the market. Alternative to gather the information yourself, another option is to acquire this information from consultant agencies such as Parks Associates, futurescape.tv and others.

There are many ways to gather market information. It is important to find the balance between doing the research self and buying information from consultant agencies that provide similar information. The benefit of doing some parts of the research yourself is the feedback, insights and the interaction with third parties. Generic market information can be bought, but specific technology or product related information can be better gathered by the consortium.

Decision factors: where does the money come from?

During the interviews with the parties that could adopt the FascinatE technology we discussed the product-market combinations. During these discussions the same central question arises: where does the money come from? In other words: how does the FascinatE technology improves or strengthens the business model? It is important in an early stage to understand the business models, cost structures and

the revenue models of the parties that are able to adopt the FascinatE technology. The impact of the business model on technology choice is huge; while the product or service for a commercial broadcaster won't work in a small country, it can work perfect for a commercial broadcaster in a large country. The discussions with the companies about their business model help to identify the important gaps and hurdles for adopting and implementing innovative technologies such as FascinatE.

What you see is what you understand

Business modeling in the front end of innovation is always fuzzy. The problem with innovative projects is that you are designing business models with abstract concepts. This makes it hard to have conversations with parties in the market about the potential of the technology and its applications. Early discussions with parties in the outside world were difficult as we were talking about abstract concepts. What we experienced was that as soon as we had a demonstrator of the technologies, it became clear for interviewees what the iDirector was and how to build products with it.

Dialogue

The dialogue with the potential end user and their customers is very important. The interaction provides insights that speed up the development of the technology and the business case. Understanding the motivations of when to adopt technology is necessary and it is important to test the assumptions over and over again and understand the business dynamics, the business needs and the information that is necessary to get in business with them. In line with the previous observation it is very helpful to support the dialogue with real live examples. This help to steer the discussion in the right direction. In this task we have not been doing this. But it is an important step in the near future.

5 General Conclusion

Within Task 4.1 of WP4, we aimed at derving a business and market vision for technology developed within FascinatE, in particular network-based technology. When considering the overall results of the work in Task 4.1, we find that the technologies and service concepts developed in FascinatE, particularly the “iDirector” concept, have good potential to become successful in the live entertainment market. But there are some hurdles that need to be taken before it can make fully use of its potential. These barriers are translated in three key take-aways.

1. **Focus on supporting the business goals in the industry: generate attention**

   It is important to support or strengthen the business case of the target customer with the proposed technology or service concept. In the home-entertainment market the business case is strongly related to the amount of attention (eyeballs) you can generate with the products and services. For iDirector this can be realised for several customer segments, such as commercial broadcasters, Pay-TV channel or public broadcasters. The interest of that customer segment can be slightly different; the Pay-TV channel e.g. needs to offer something that is distinctive from the competition. For the other technologies and product-market combinations developed in FascinatE the same applies, i.e. in order to find and attract customers.

2. **Take a local approach**

   In our research we found that, although the technologies and product-market combinations have global potential, it is necessary to take a local approach. The parties that play a role (or sometimes multiple roles) in the value chain of live-TV and the technology they use to offer live-TV broadcasts can be very different in each country. Therefore the exploitation of the FascinatE technology requires a local approach.

3. **Second screen devices; a good first start**

   Demonstrating products is necessary to show what the technology has to offer and what kind of products and services can be offered with it. The “second screen device” seems a good candidate to illustrate the benefits of the FascinatE technology. It is an upcoming trend and many parties are interested to experiment with this technology to see how they can benefit from it. The willingness to experiment has also another advantage because it makes it also easier to accept the business case, even when it is still largely based on qualitative assumptions.

When we review the methodology of Business Modelling in the Fuzzy Front-End, that was developed as part of Task 4.1, the key take-aways from this new approach are:

1. **Translating technologies in “service values” is useful to build the first high level Product Market Combinations (PMC)**

   The Business Model Canvas (BMC) is used to come up with new product-market combinations for the FascinatE technology. Normally the BMC is used to design new products and services from the customer/market perspective. It is less often used to start with the innovative technology as starting point. It is important to translate the innovative technology into so called service values. These service values are easy to understand and help to build product-market combinations with the innovative technology. For example the FascinatE rendering technology adds value by offering the service values: immersion and interaction. Interaction is used to create the iDirector PMC.

2. **One market scan provides enough insights**

   The technology is innovative. This means that the competition and market developments are limited. Therefore it is not necessary to perform a market scan two times in two years. One market scan provides enough basic insights to decide if the market for a PMC is interesting.

3. **Show what you got**

   Create as soon as possible an interactive demonstrator or mock-up to discuss the technology with parties that can adopt the technology. This will really spark people’s interest, will make the results of the research tangible and allows people to assess the opportunities for their business.

4. Early discussions

Create product-market combinations, first on paper and back those product-market combinations up with the demonstrators or mock-ups, and use them to discuss in an early stage with potential users, to understand how they fit in their business model. Understanding how a PMC or technology adds value to their business model is key.

6 Remarks and Considerations

The main aim of this deliverable is to provide a market vision for the technology developed in FascinatE. Throughout Task 4.1, we focused on one specific product-market combination: the iDirector. We identified this PMC as the most viable, but it is not the only viable PMC that can be created with the FascinatE technologies. Also, the steps described in chapter four are not only relevant for the network technology used in the iDirector concept. It also provides an approach for finding suitable product-market combinations for the other innovative technologies that have been developed in the FascinatE project. To do so it is recommended to start with the ideational phase again. The information from step 2 in our approach (as described in D4.1.2a and D4.1.2b) can be used for inspiration during this first phase. Furthermore the recommendations as stated in section 3.4 can help to find viablePMCs.

The goal of task 4.1 was to make business informed choices during technology development. The approach we developed and used in this task helped us to find the most viable PMC, but it had very limited influence on the actual technology development choices. In our opinion this has to do with the timing. When for example it is clear in an early stage which buyers are going to use the end product, it is possible to do in-depth interviews and customer research, and it becomes possible to influence the technical development. Important information about the customers, such as what infrastructure is used, is available and can be taken into account. But, because the customers were not selected (because it is a worldwide market and each local market has its own characteristics) this was not possible. In future research it is interesting to improve the approach that we have followed to identify viable PMCs. Some of the observations and recommendations to improve the approach are stated in chapter four e.g. find ways to translate technology into suitable service values and organize interaction with potential users.

The actual exploitation of the innovative technology is something that was out of scope in this task, but is becoming more interesting as the end of the FascinatE project is reached. How the exploitation should be done is an interesting question that needs to be answered. There are many different strategies for exploitation, and for each partner different factors play a role. Some of these strategies will be described in D7.1.3c.

Although the original goal of this deliverable (support business informed technology choices) was barely met with our approach, the approach by itself was perceived as very valuable for other purposes. At the NEM summit in 2012 we presented our approach to a wider audience that was involved in business research within European projects. We received positive feedback about the steps we took and the approach was recognized as valuable in projects where technology plays a major role. It is recommended for future research to apply the approach in European projects and enhance the method to select viable PMCs with new and innovative technology.

7 References

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8 Glossary

Terms used within the FascinatE project, sorted alphabetically.

BMC	Business Model Canvas
PMC	Product Market Combination
iDirector	A product market combination that is defined in the first and second deliverable of D4.1.1
ROI	Region Of Interest
OOI	Object Of Interest
SWOT	Strengths, Weaknesses, Opportunities and Threats

Partner Acronyms

ALU	Alcatel-Lucent Bell NV, BE
ARI	Arnold & Richter Cine Technik GMBH & Co Betriebs KG, DE
BBC	British Broadcasting Corporation
DTO	Deutsche Thomson OHG (Technicolor), DE
HHI	Heinrich Hertz Institut, Fraunhofer Gesellschaft zur Förderung der Angewandten Forschung e.V., DE
JRS	JOANNEUM RESEARCH Forschungsgesellschaft mbH, AT
SES	Softeco Sismat S.P.A., IT
TII	The Interactive Institute, SE
TNO	Nederlandse Organisatie voor Toegapast Natuurwetenschappelijk Onderzoek – TNO, NL
UOS	The University of Salford, UK
UPC	Universitat Politecnica de Catalunya, ES

9 Appendix

9.1 Competition Scan Results

A first analysis of this information is shown in Figure 9-1 and Figure 9-2, in the form of service value and technology radars. From these figures, we can make the following observations

- Most developments up to the phase of product concept have a broad scope, covering multiple service values. In market products, we observe a dual image; Products in the area of panoramic video combine several service values, namely cost-effective production, immersion and interactivity, other products mostly aim at delivering a specific service value.
- Immersive service value is currently offered by very similar products, with a focus on single- layer panoramic scene representations, with comparable technology (e.g. stitching). Several research efforts are looking at much higher and more immersive media. The phases between market and research are not populated; this is an area where e.g. 3D receives a lot of attention.
- R&D developments in the areas of interactivity and personalization are relatively scarce, i.e. thereis no ongoing innovation flow.
- R&D developments in the area of distributed network processing and gesture-based interaction are relatively scarce. Main developments in the latter area come from the gaming market. In contrast, there is a steady innovation chain for layered scene capture and audiovisual rendering, although not exactly similar to the technology developed within FascinatE.

A further analysis is performed by mapping service values against technical attributes in matrix form, as shown in Figure 9-3. Here, we observe the following:

- The technical attributes Distributed Network Processing and Gesture-Based Interaction play no key role in providing the service values immersion and cost-effective production;
- Layered Scene Capture, and to a lesser extent Analysis & Scripting are important in providing all service values;
- Interactivity and Personalization can be provided by a variety of technologies, mostly related to mobile applications and distributed network-based rendering.

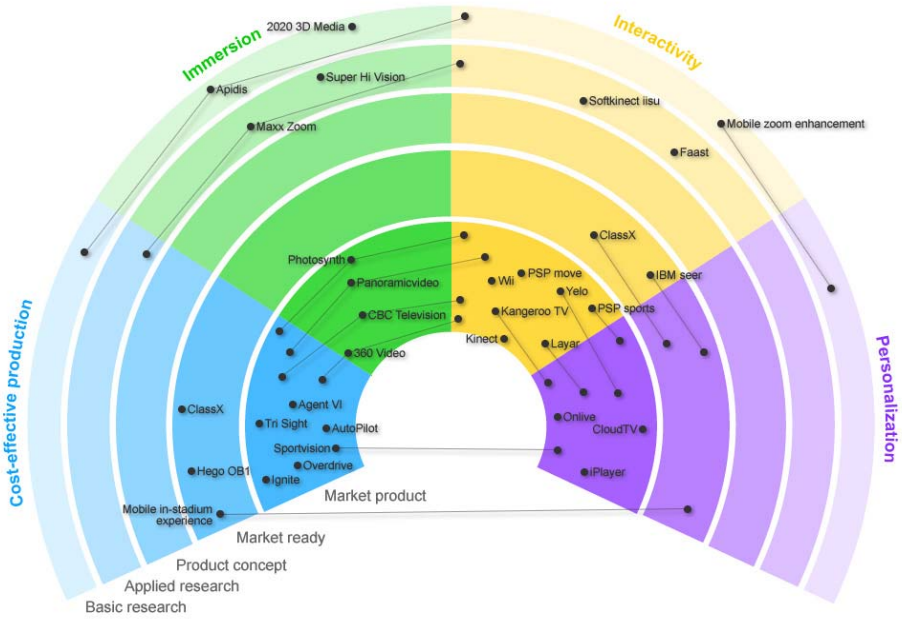


Figure 9-1: Value Radar

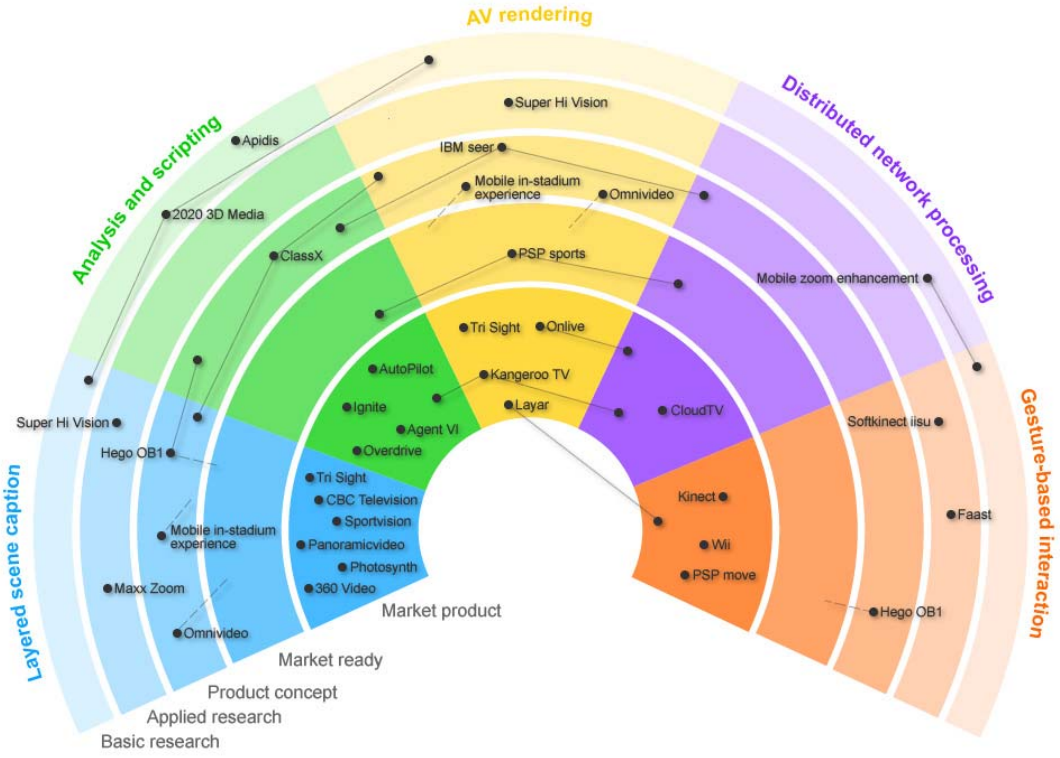


Figure 9-2: Technology Radar

	Layered scene capture	Analysis and scripting	AV Rendering	Distributed network processing	Gesture based interaction
Cost-effective production	Photosynth Panoramicvideo.com.au CBC Television 360 Video, Rich Media Tri Sight Hego OB1 Mobile in-stadium experience Maxx Zoom	Agent VI AutoPilot Ignite Overdrive ClassX Hego OB1 Apidis	ClassX Mobile in-stadium experience		Hego OB1
Immersion	Photosynth Panoramicvideo.com.au CBC Television 360 Video, Rich Media Maxx Zoom Super Hi Vision 2020 3D Media	2020 3D Media Apidis	Super Hi Vision 2020 3D Media		
Interactivity	Photosynth Panoramicvideo.com.au CBC Television 360 Video, Rich Media ClassX Maxx Zoom	Kangeroo TV PSP sports IBM seer ClassX Apidis	Kangeroo TV Layar PSP sports IBM seer ClassX	Kangeroo TV PSP sports IBM seer Mobile zoom enhancement	Wii PSP move Layar Softkinect iisu Faast
Personalization	ClassX Mobile in-stadium experience Sportvision	Kangeroo TV PSP sports IBM seer ClassX	Kangeroo TV Onlive Layar PSP sports IBM seer ClassX Mobile in-stadium experience	Kangeroo TV Onlive Cloud TV PSP sports IBM seer Mobile zoom enhancement	Layar

Figure 9-3: Analysis of the service value – technical attribute heat map

9.2 Benchmark with Competing R&D Efforts

In this section, we compare the service and technology trends in D4.1.1b and D4.1.2a, with the technical components developed in FascinatE. We use the table provided in D1.4.2.

Content Production block			
System component	**Partner, Task**	**Main advances**	**Main competition**
Scene processing unit	BBC T2.2 T2.5	Dynamic calibration (calibration of moving region-of-interest cameras); colour matching	- Dynamic calibration: Companies selling sports graphics systems that offer 'tied-to-pitch' annotation using image-based camera tracking (e.g. Orad, VizRT, RedBee Media, RT Software). None of these appear to offer registration using a panoramic camera as a reference; instead they rely on specific scene features (e.g. lines on a football pitch) or manual identification of features at known locations. Note that BBC already licenses camera tracking software to RedBee Media and RT Software, so rather than being competitors, these companies provide a potential route-to-market for new developments. - Colour matching: Offline post-production tools from companies like Avid, FilmLight, Adobe; manually-adjusted real-time colour correction processors like the CC-2M from Eyeheight. None provide automated matching between cameras. - ConditionOne production workflow for omnidirectional video, seems to be aimed at new form of event video coverages (news, documentaries). No details on the technical solution are publicly known.
OMNICAM	HHI T2.2 T2.4	Panoramic video capture and generation; system calibration; algorithms for stitching, warping and blending	- Camargus (http://www.camargus.com/): This system consists of 16 cameras (8 in two rows) mounted looking inwards with significant overlap between the views. Due to this arrangement, the system has a significant parallax between the different cameras. It is not possible to stitch seamless in a large depth range. The output of the system is an HD video that can be panned and zoomed in the video panorama. The frame rate is stated as 50/60 fps in the latest release being available in Q2/2012. - Sony: Panoramic video system with three HD cameras mounted in star-like landscape format with a resolution of 6k x 1k. The viewing angle is something about 90 degrees with significant distance to the scene. The inward mounting of the cameras also causes significant parallax between the three views.

ALEXA M	ARI T2.2	Integration of ALEXA video and meta data streams into OMNICAM video panorama generation and scene processing	- Red Epic - Canon EOS C300
Audio object extraction	UOS T2.3	Real-time object extractor for both explicit and implicit audio objects with metadata output	
Content analysis and scripting block			
System component	**Partner, Task**	**Main advances**	**Main competition**
Production Scripting Engine	JRS T3.4	Multi-source information processing; Use of domain model to semantically lift the input and compute view options	- The interactive storytelling system (http://www.freepatentsonline.com/article/Informatica/262037001.html) and the narrative structured language (NSL) (http://www.ist-nm2.org/) focus on automatic view selection using recorded content. Both systems were developed within a research project and are not available as a product. - A virtual director was developed within the EU Project TA2 (http://www.ta2-project.eu). The intelligent software system attempts to automatically frame and select between multiple video camera views essentially replacing a human director and camera operator crow. The system supports group-to-group communication in scenarios of social video conferencing. - The EU project APIDIS (http://www.apidis.org) aims at automatically producing personalized multimedia content in the field of team sport. The system automates the production of video summaries. - The EU funded My eDirector 2012 (http://www.myedirector2012.eu) project aims to create context-aware and personalized media in real-time streaming environments for large scale broadcasting applications. This allows end users to direct their own coverage of large athletic events and to create their own personal Virtual Director. - Within BBC's Automated Coverage project (http://www.bbc.co.uk/rd/projects/virtual/automated-coverage) another example of an approach to automate camera selection was investigated.

Content Analysis	JRS BBC T3.3	Real-time feature point tracker and event detection; Content reframing based on person segmentation	- STATS's SportVU MV: (http://www.sportvu.com/PDFs/SportVU_Football_Technology.pdf) The system tracks (soccer, basketball) players, referees and the ball in real time deriving such statistics as shot distance, player speed and distance covered. The tracking technology is able to identify objects on the pitch and extract 3D positioning data of the ball and participants. The optical-based system utilizes six high definition cameras, each dividing the pitch into thirds. - In the course of the research project „Coarse Gaze Estimation in Visual Surveillance" (http://www.robots.ox.ac.uk/ActiveVision/Research/Projects/2009bbenfold_headpose/project.html) University of Oxford's "Active Vision Group" developed a multi-target tracking system. The pedestrian tracker is multi-threaded and combines asynchronous HOG detections with simultaneous KLT tracking and Markov-Chain Monte-Carlo Data Association (MCMCDA) to provide guaranteed real-time tracking in high definition video. The system uses a GPU implementation of the HOG detector and is able to providing precise location estimates for large crowds of pedestrians in real time. While there is a large number of research efforts in sports video analysis, most of it targets offline highlights summarisation. - The StarHome R&D Lab (http://www.starhome.sg/) provides a real-time solution for sports video analysis and event detection. The system aims at generating personalised summaries for mobile devices. - Kinovea (http://www.kinovea.org/en/) is a product for comparative motion analysis, among other targeting sports and art performance applications. The system does some basic automatic analysis (such as estimating trajectories), but the main functionality focuses on manual annotation and comparison between different instances of the same motion sequence. - Amisco (www.amisco.eu) provides tools and services for football match analysis, including tracking of players and view interpolation. The system relies on 3-6 dedicated cameras installed at the stadium. - Software for reframing video based on saliency is the subject or active R&D in various companies, e.g. Technicolor, but not commonly-available in products. Products for performing segmentation of foreground objects in moving camera views are currently limited to very rough region identification, e.g. highlighting regions containing people in security camera footage, and these typically require the camera to be stationary.

Editor User Interface	TII JRS T3.5	User interface for the human editor to support (semi-) automatic creation of content	- http://www.elitesportsanalysis.com/products.htm - http://tweakers.net/video/3208/video-de-technologie-achter-roland-garros.html - LiberoVision (http://www.liberovision.com/) offers products for near-real time annotation, game analysis, graphics and specific analysis tools such as offline analysis by rendering an appropriate view.
Delivery Scripting Engine	ALU T3.2 T4.5	Real-time Ingest and Proxy DSE	No direct competition known in that space. Use of semantic/production knowledge to steer delivery functions is significantly limited in current production-delivery interfaces. Most existing metadata describing media delivery structure (SDP, HAS manifests, RUBENS Playmaps…) can potentially be extended to support interactive spatial navigation / camera view switching. One example is : **Microsoft Multi-cam player**: the layer structure of HAS manifest has been extended to support interactive view switching in a Microsoft IIS Smooth Streaming showcase: http://www.microsoft.com/silverlight/iis-smooth-streaming/demo/#/multi-cam Another type of interactive video experience over HTTP-based delivery are **interactive Youtube movies**. This relies tree-based representations of the interactive scenarios (similar to the concept of playmaps developed in the Celtic RUBENS project). For delivery these maps are directly mapped to different video files and the script structure is embedded using clickable annotations. See http://www.youtube.com/watch?v=OMrMEydnFFA

Delivery block			
System component	**Partner, Task**	**Main advances**	**Main competition**
A/V Ingest	ALU TNO T4.4	Real-time view rendering and hierarchical content segmentation	- **SHV content segmentation** by NHK - **Class X system**: Stanford work by Mavlanlar et al. - **iROI** by Singapore Univ. The Class X system and the iROI system have been discussed in WP4 deliverables D4.2.1 and D4.4.1
PU/SUB delivery	ALU T4.3	Multicast & unicast channels and resynchronization buffers; Multi-stage delivery using A/V Relays	- Research : Publisher/Subscriber paradigm is used in many topic/content-based distributed system and is regaining interest in research on **Content-Centric Networking (CCN)**. But does not address specifically the combination and optimization of different transport modes for media streaming. Products such as **Flash Media Server** has a "Multicast Fusion" feature that allows one to combine native IP multicast and application-layer multicast (i.e. over IP unicast channels). Main targeted use cases are enterprise webcasting The eMBMS broadcast over LTE as demonstrated by Ericsson and Qualcomm at MWC2012.
Tiled HAS delivery	TNO T4.3	HAS manifest extensions, tiled adaptive streaming	- **Class X system**: Stanford work by Mavlankar et al. - **iROI** by Singapore Univ. The Class X system and the iROI system have been discussed in WP4 deliverables D4.2.1 and D4.4.1
A/V Proxy	ALU TNO T4.4	Real-time reframing, rescaling and compression; Live backhaul delivery of LSR, multi-view, trick-play, second-screen	- Personal view rendering by **KDDI** and **NHK EVS** C-Cast

Rendering and User Interaction block			
System component	**Partner, Task**	**Main advances**	**Main competition**
Video Rendering Node	DTO T5.1	Real-time streaming and script-controlled scene rendering of cylindrical panoramic video sequence.	webcast service that offers over-the-top or online functionality making hardware requirements irrelevant. Here any pay per view webcast service can be considered.
Audio Rendering Node	DTO UOS T5.2	Delivering and real time decoding of full 3D sound field description as Higher Order Ambisonics format, which can be decoded to any loudspeaker setup. (Format agnostic). Full rotation in any view direction is supported. Support for Wave Field Synthesis (WFS) and full interactivity; Use of scripting information to position audio objects in correct locations	3D Sound Rendering (including competing sound formats) - DOLBY ATMOS http://www.dolby.com/us/en/professional/technology/cinema/dolby-atmos.html For theaters, multichannel sound fields plus audio objects, decoder hardware for up to 64 speakers - IOSONO http://www.iosono-sound.com/ For theaters, WFS system, new is the 3D extension - IRCAM Spat Room Acoustic http://www.fluxhome.com/products/plug_ins/ircam_spat Tool for room acoustics simulation and localization, incl. Ambisonics - Longcat: http://www.longcat.fr/web/en - Barcelona media: http://barcelonamedia.org

User Control Node	UPC T5.5	Static and dynamic gesture recognition, face recognition.	- Samsung Smart Interaction: It allows you to control the graphical user interface of the TV with your voice and hands. The hand control is limited to move a mouse pointer through the screen. - Panasonic Gesture Control: it allows controlling your TV through some basic gestures. You can change channels and access specific contents waving your hand. The system only works if the hand is close (10cm) to the screen. - Microsoft Xbox360 entertainment system: Together with the Kinect accessory the Xbox360 allows the user to navigate through the graphical user interface using gestures. - Leap Motion: It allows the user to interact with the system using its finger. The hand must be located close to the sensor and has a high resolution of 1/100th of a millimeter. It is expected to be release Q1 of 2013. - Oblong Industries: The g-speak platform allows the possibility of interact with the system using both hands. They offer a SDK platform for partners to develop their specific solutions. A glove is needed to recognize the user gestures.

9.2.1 The PMC

Because there is only a slight difference between the iDirector for viewing of live sports and cultural and music events, these concepts will be described in a combined fashion[2]. In Figure 9-4the PMC is illustrated. The specific facts that are different for each of the concepts are mentioned when necessary.

The iDirector service concept provides the home viewer with director-like functionality during live events. Users can orchestrate the different views that are available from the layered scene capture. Interfacing with this service concept is implemented by using gestures or a secondary interface like a tablet. Objects- and areas of interest can be defined by the user and presented in Picture in Picture (PiP) mode on the TV. Examples of the iDirector functionality are selecting a favourite football player by showing him as a Picture in Picture on the TV set, or following a favourite musician on a stage. Additional functionality, which could enrich this service concept, could be information of the tracked object as overlay or banner information. Main values offered to the user are personalisation and interaction.

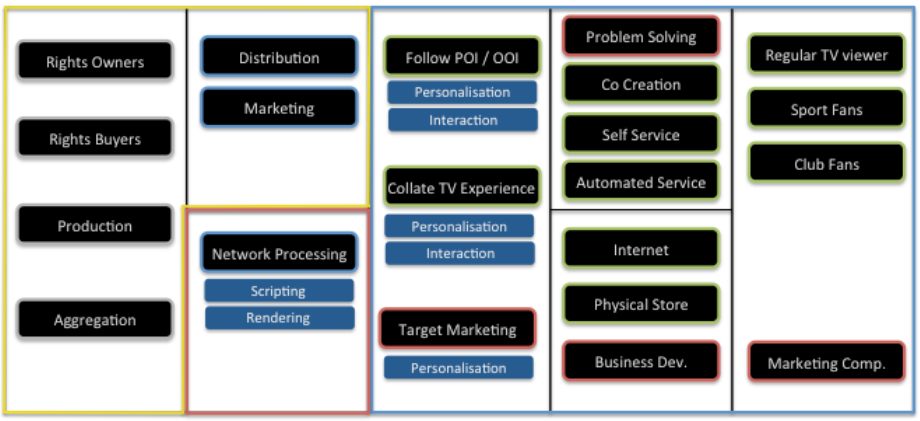


Figure 9-4: Overview of the iDirector PMC as proposed in D4.1.1b

[2] The abstract model. The differences from the business perspective (e.g. potential customers reached) can be huge.

For both markets different partners can be identified as owner of the content. These partners vary depending on the type of content; other partners are involved when we are talking about other events like opera, formula 1 or ballet. Content is one of the key resources for iDirector. It is important for the operator that delivers the iDirector, to maintain a good relationship with the content owners. The key activities that are performed by the cable company or telecom operator are focused on distribution of the content and on the marketing of the product. The first activity will deal with production; namely creating and delivering the product in superior quality. Because iDirector is an experience product a flawless experience of the consumer is essential. For this activity the technical attribute is indispensable, but also acquiring the hardware, the network and the right personnel is inevitable.

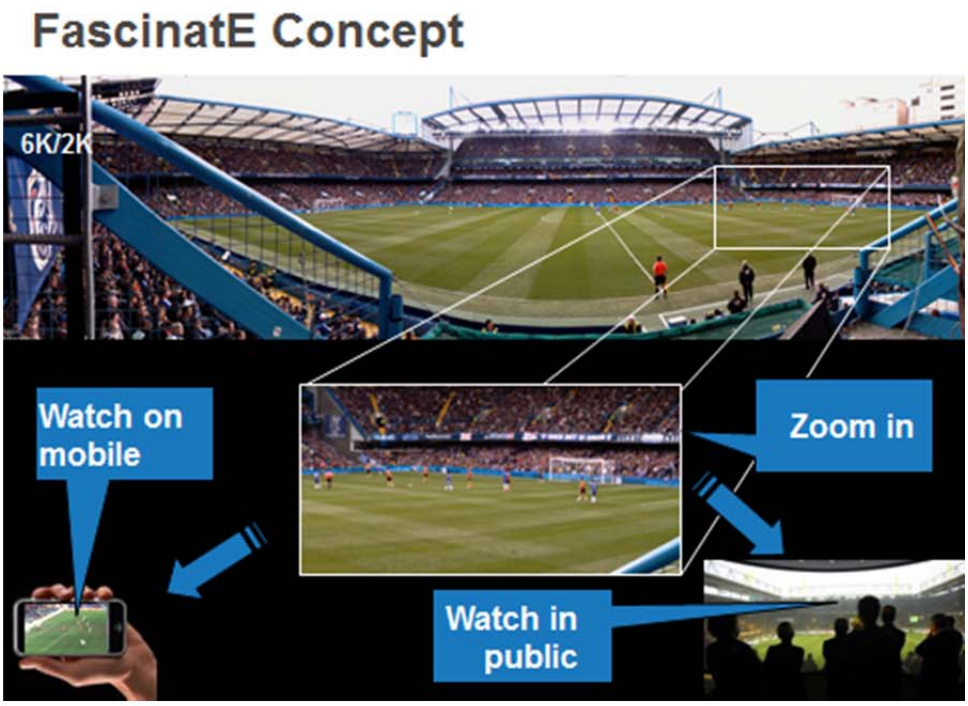
9.3 Input for and Report of the SMARD Workshop – NEM Summit 2012

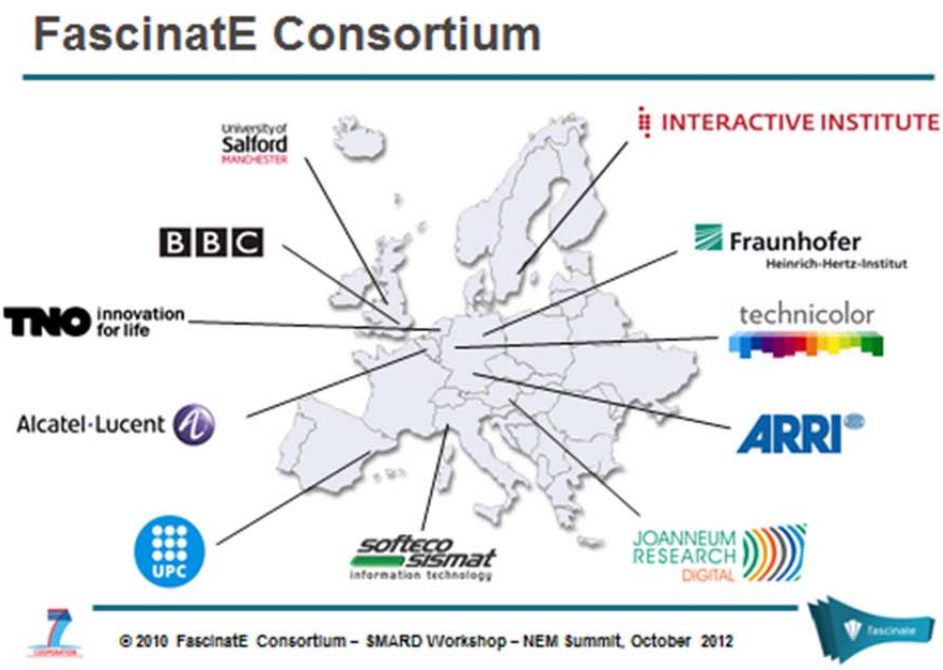
Below, the slides of the presentation are shown, as input for the SMARD workshop.

Format Agnostic SCript-based INterAcTive Experience

NEM Summit 2012
Input for SMARD workshop

Thomas Bachet, Omar Niamut (TNO) / Georg Thalinger (JRS)





Project Key Figures

- Start: February 2010
- End: July 2013
- Duration: 42 Months
- Overall budget: 14.1MEUR / EC Funding: 9.3MEUR

- 11 Partners:
  - 2 Academic Partners (UoS, UPC)
  - 4 Research Partners (JRS, FHG-HHI, TII, TNO)
  - 5 Industrial Partners (ALU, ARRI, BBC, DTO, SES)

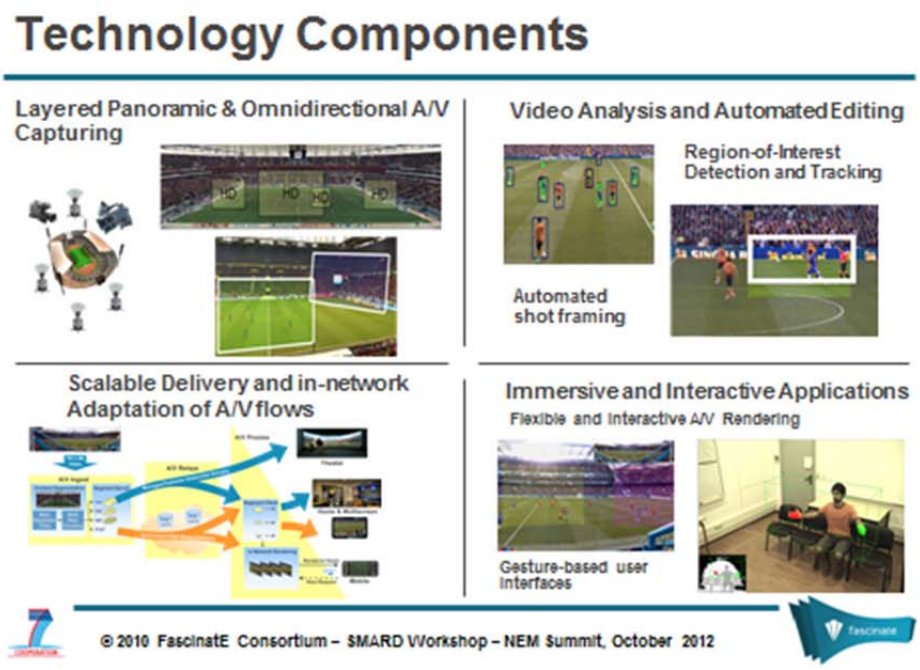
- Major Milestones
  - October 2011: First demonstration @ IBC2011, Amsterdam
  - July 2012: Interim demonstration @ BPO, Berlin
  - May 2013: Final demonstration

Project Key Highlights

- First demonstration @ International Broadcasting Convention, October 2011, Amsterdam

- Second demonstration with Berlin Philharmonic Orchestra, May 2012, Berlin

- Winner of the 2011 Engineer Award, Consumer Products; several best paper and presentation awards


Technology Components
Layered Panoramic & Omnidirectional A/V Capturing
Video Analysis and Automated Editing
Region-of-Interest Detection and Tracking
Automated shot framing
Scalable Delivery and in-network Adaptation of A/V flows
Immersive and Interactive Applications
Flexible and Interactive A/V Rendering
Gesture-based user interfaces
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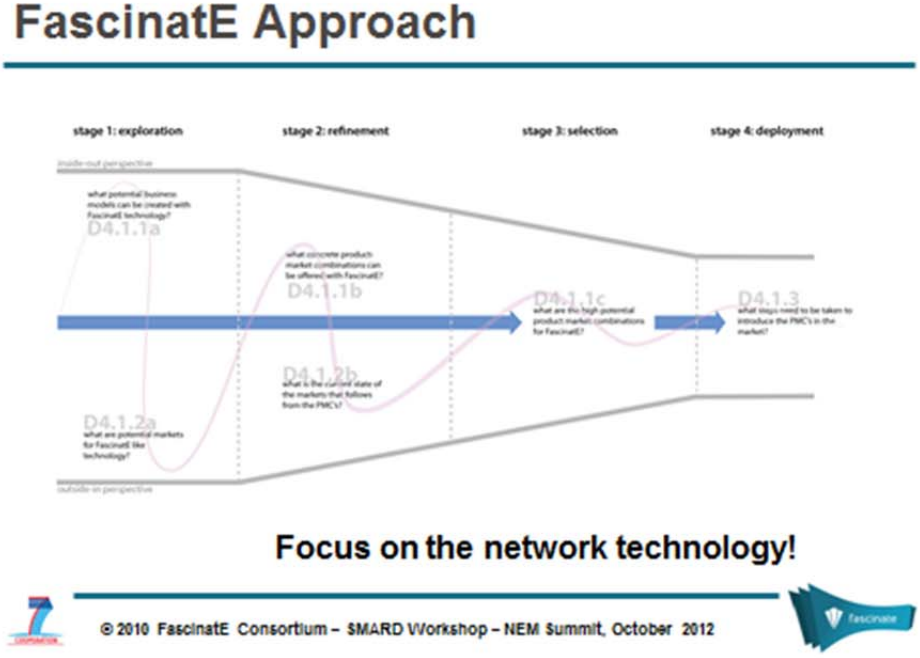
FascinatE Approach
stage 1: exploration
stage 2: refinement
stage 3: selection
stage 4: deployment
D4.1.1a
D4.1.1b
D4.1.1c
D4.1.3
D4.1.2b
D4.1.2a
Focus on the network technology!
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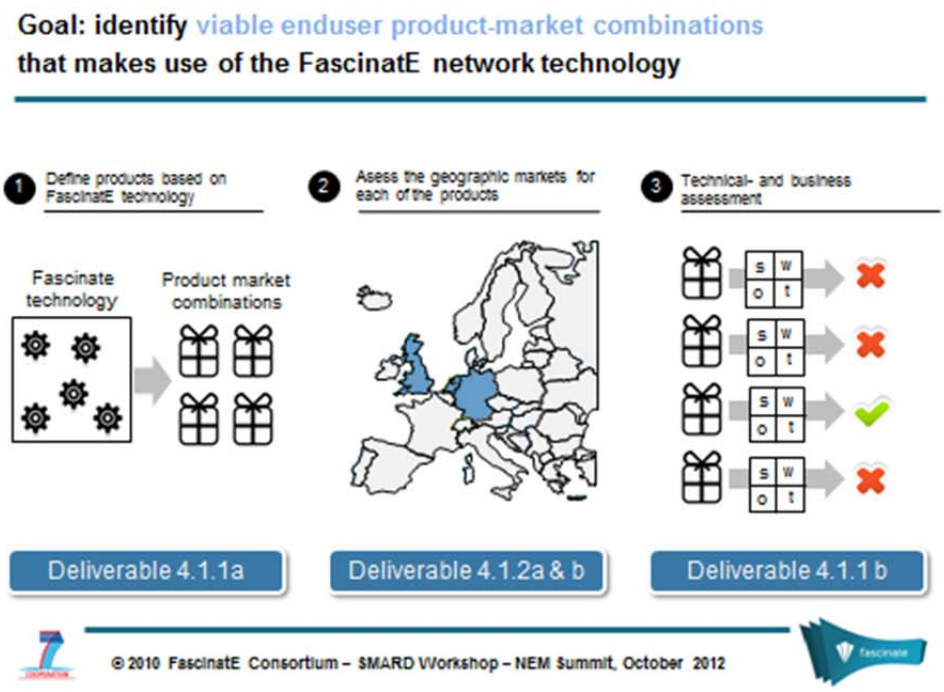
Goal: identify viable enduser product-market combinations
that makes use of the FascinatE network technology
1 Define products based on FascinatE technology
2 Asess the geographic markets for each of the products
3 Technical- and business assessment
Fascinate technology
Product market combinations
S W O t
Deliverable 4.1.1a
Deliverable 4.1.2a & b
Deliverable 4.1.1 b
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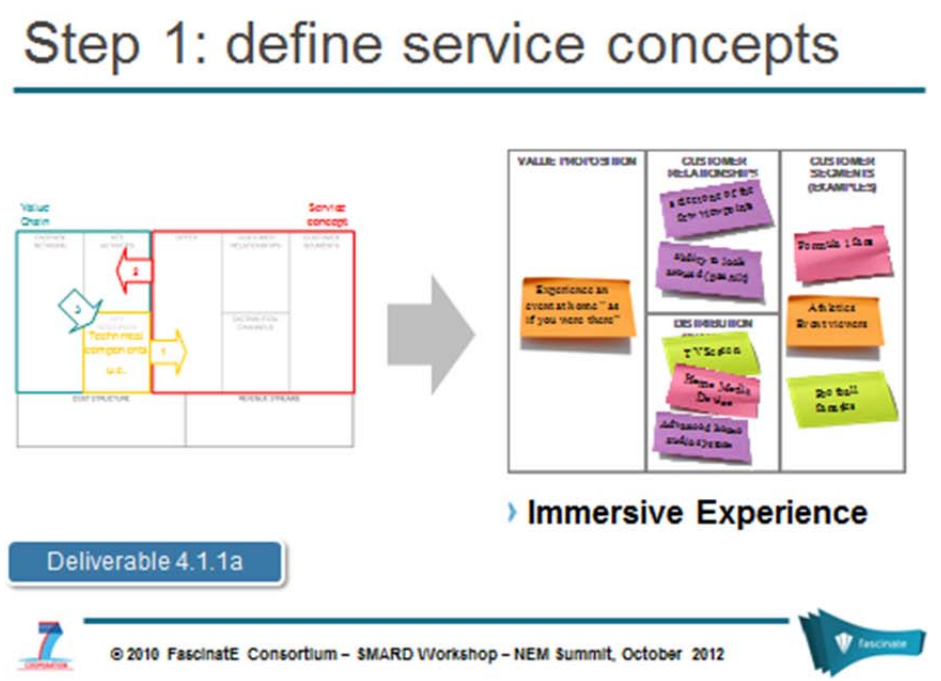
Step 1: define service concepts
Value Chain
Service concept
Technical components
VALUE PROPOSITION
CUSTOMER RELATIONSHIPS
CUSTOMER SEGMENTS
DISTRIBUTION
Experience an event at home "as if you were there"
Immersive Experience
Deliverable 4.1.1a
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Step 2: create market overview

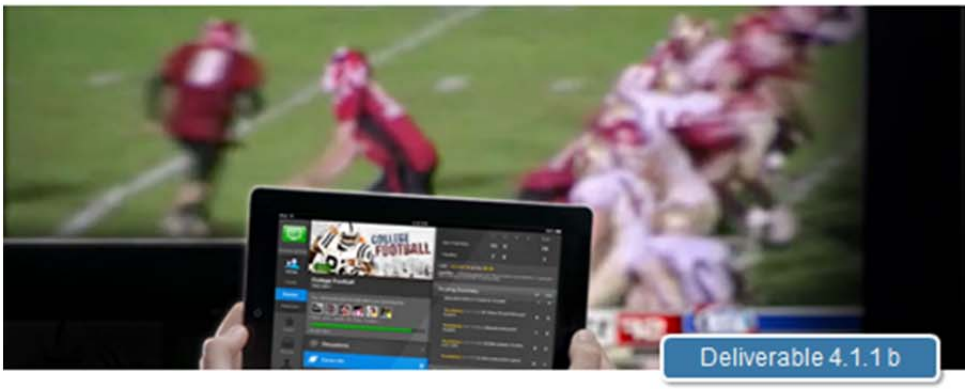
› Service Value Radar

› Competition Heat Map

Deliverable 4.1.2a & b

Step 3: select Product/Market Combination

SWOT analysis shows that iDirector for Live Sports is the most viable PMC for network technology



Deliverable 4.1.1 b

Step 4: how can this product land in the consumer market?

Who will do this? What is their business model? How will they make money?

What are the decision criteria of potential users to adopt the technologies developed within FascinatE ?

Deliverable 4.1.1c

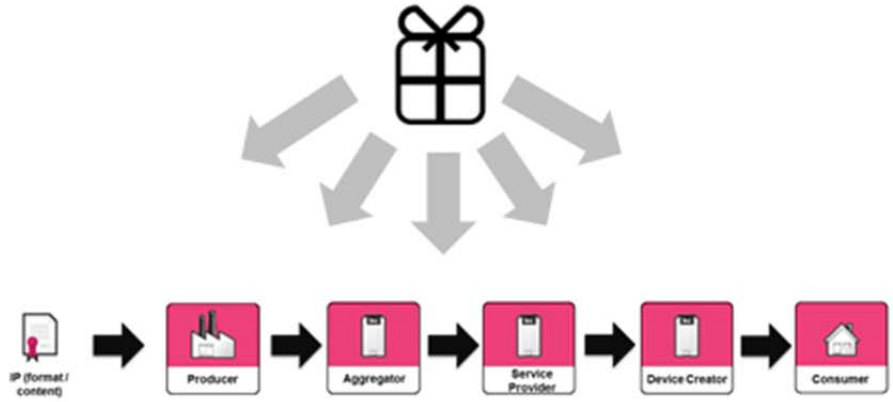
Interviews: Still looking for participants!

What is a good design for exploitation?

New technology: so technology push instead of customer centric

As there is no articulated demand, we focus on what technology could offer significant improvements of existing services in the domain of live video

Who will benefit from using the (improved) product?



Our exploitation strategy considers both single and combinations of independent technologies, rather than finding the Holy FascinatE Grail

Partner	Technologies
JRS	Real-Time Person Tracker; Production Scripting Engine
DTO	Audio Acquisition; Real-time Audio and Video Rendering
HHI	OMNICAM – Omni-directional mirror rig-based panoramic camera and calibration software; Real-time Stitching Engine
BBC	IP-based production framework; camera registration/tracking; segmentation tools for broadcast camera images
ALU	End-to-end delivery system for interactive audiovisual services
ARRI	Evolution of Alexa M cameras
UPC	Gesture Recognition Human Interface; Real-time User Control Node
SES	Semantic Layer Management System
UOS	Audio object and automatic mixing software for football
TNO	Tiled HTTP Adaptive Streaming software framework

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Workshop to create three exploitations models that are possible with the different technologies subsets

Immersive media experience	Remote Control – Second Screen	FascinatE Portal App
HHI, DTD, Uo S and ARRI	Alcatel & Technicolor	JR S, TNO / Alcatel
Omnicam, Stitching, Alexa	Rendering Node, Proxy Delivery Network, Proxy Rendering Node	UHDTV, Panoramic Capturing, App Rendering, Metadata of predefined views
Real-time immersive Media Acquisition & Demonstration	Watch content on Second Device, Preset navigation and Fly through, by using both network and STB	Advertising, Automatic Summary, ITV + social share of interaction and views, portal, metadata layers
Content Owners (Muses, public screens, Olympics)	Service Providers (Telco's and Cable companies)	External content provider, service network provider, platform owners (e.g. Netflix)

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SMARD Canvas Mapping

Need	Solution	Business model	Customer
• What is the need you are trying to respond to? • What kind of problems do you solve? • Where do you find these problems? What is your use case? • Who currently tries to solve these same problems (with similar or different solutions)?	• How do you solve the customer's need / problem? • What is the benefit or added value of your product compared to existing solutions? • Is your product/service unique and (if yes) how? • (How) is it protected? • Are there any dependabilities of your solution with other technologies? • Did the consortium make any upfront agreements on the ownership of newly created knowledge?	• How will you bring your value or your solution to your customers? • How do you intend to make money from customers (e.g. asset sale, usage fee, licensing, subscription fee, advertising)? • What additional revenue streams (e.g. additional paying services) can you generate? • Which other organisations do you need to bring your solution to the customer?	• Who will use this? • Who will pay for the product/service? • How will you sell to customers? Where will they buy / purchase your product or service? • How will you reach your customers (marketing-wise)? • How will you present and position your product/service (communication and branding)?

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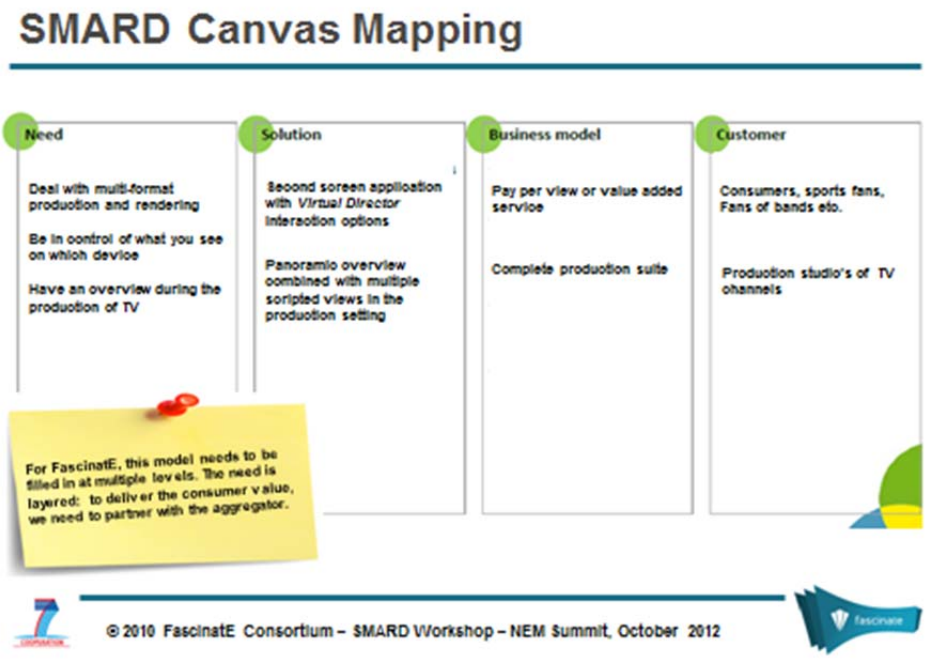


Below, the report of the SMARD workshop is provided.

FascinatE – SMARD Workshop

NEM Summit – October 2012
T.T. Bachet, O.A. Niamut (TNO), G. Thallinger (JRS)

Notes of the SMARD Workshop

During the NEM summit 2012, TNO and JRS represented the FascinatE consortium by joining the SMARD workshop and facilitating the group discussions at one of the discussion tables.

SMARD

SMARD is an FP7 EU project that has as specific aim to help small and medium sized media and internet enterprises (SMEs) to implement and make use of research and development activities in the networked media field.

There are many outstanding technologies developed as part of EU-funded research projects. Despite their high innovation potential, those technologies are rarely applied in the digital media and internet industries. Besides, those companies have difficulties in accessing EU funding. One consequence is that the technology transfer between research institutions and creative enterprises is delayed or does not happen at all. This prevents the integration of new technologies into next generation products and services.

Connection with FascinatE

The connection between FascinatE WP4 / T4.1 and SMARD is the common aim to discover strategies to overcome the gap between research outcomes and business. The connection between FascinatE WP7 and SMARD lies in the aim of increasing the potential for exploitation of research results.

The differences is the level of analysis. In the SMARD project a top down approach is used, while FascinatE aims to use a bottom-up approach from a technical FP7 research project.

Both views came together during the SMARD workshop. This resulted in the insights presented in the following slides.

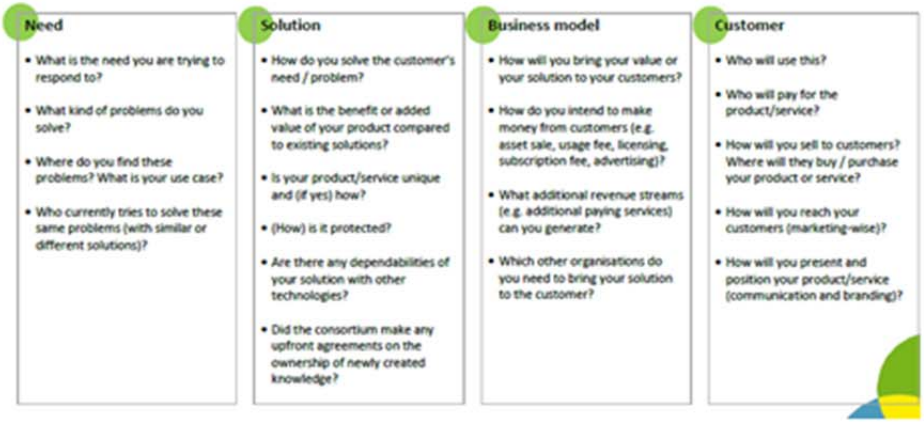
Approach of the Workshop

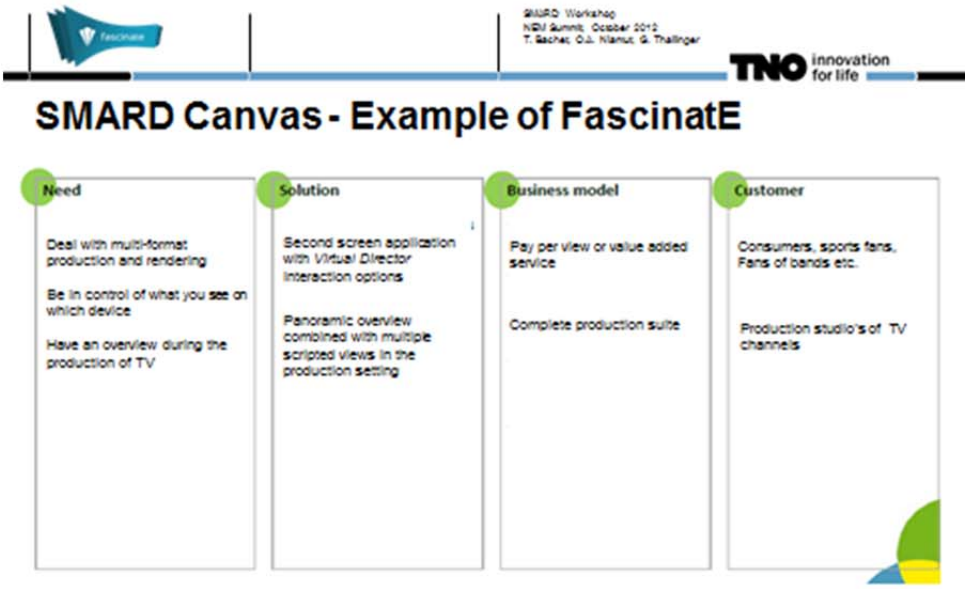
The workshop consisted of two sessions. In the first session the background of the models and outcomes used in the SMARD project were presentated. Special attention was focused on the SMARD canvas. This canvas is similar to the Business Model Canvas used in the FascinatE project.

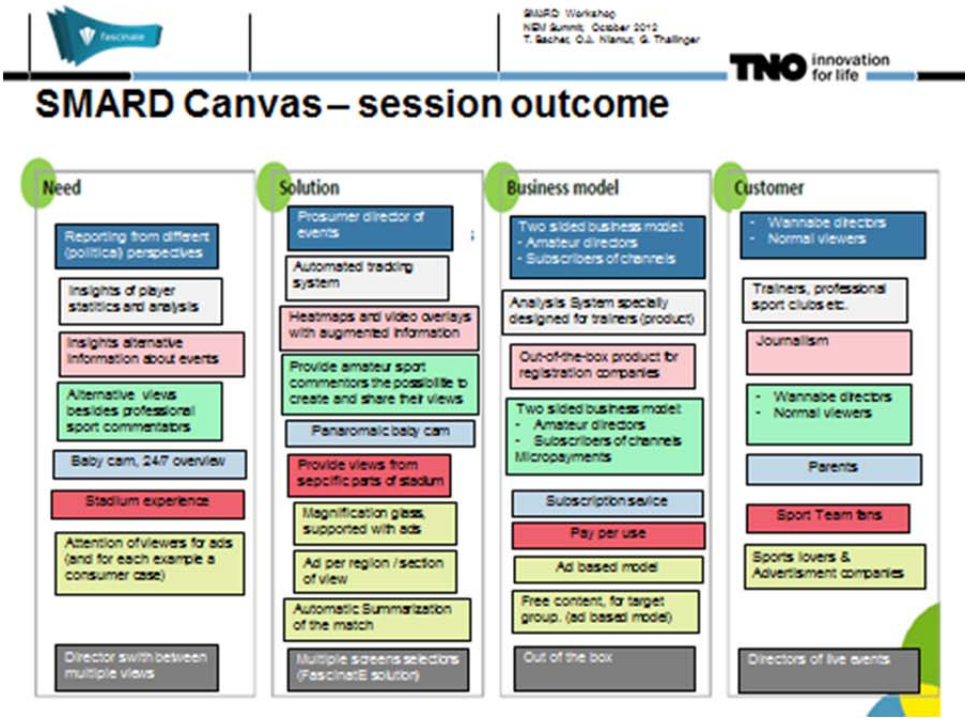
During the second part of the workshop, particular FP7 projects were used to perform a case study of the models presented in the first part. FascinatE was one of the three projects. The groups consisted of ten participants, with both academic and business backgrounds.

During the workshop we presented the FascinatE project to the participants of the group. After the presentation we explored with all participants how the SMARD Canvas can be used to gain insights into exploitation of the technology developed in the FascinatE project. The outcomes of the presentation can be found in the slides: SMARD canvas (goals of the SMARD workshop) and other findings (insights that we gained from the discussion).

SMARD Canvas







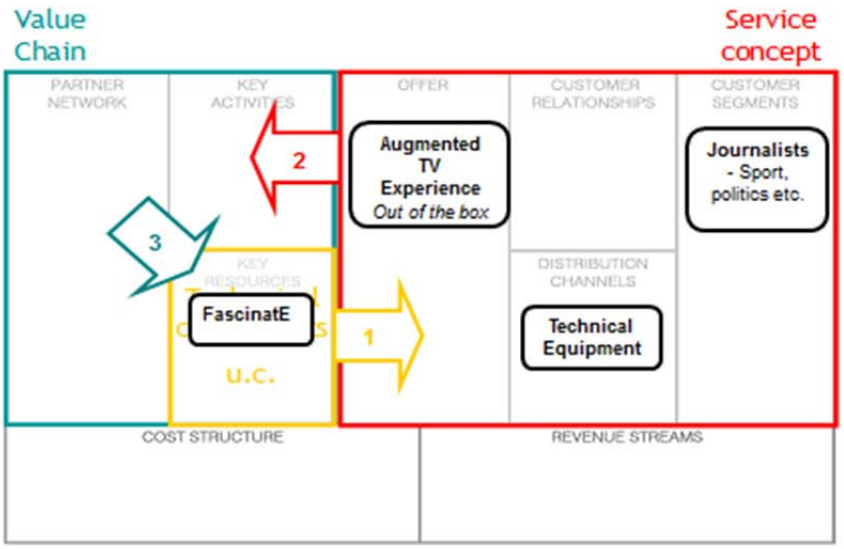
Usefulness of the brainstorm

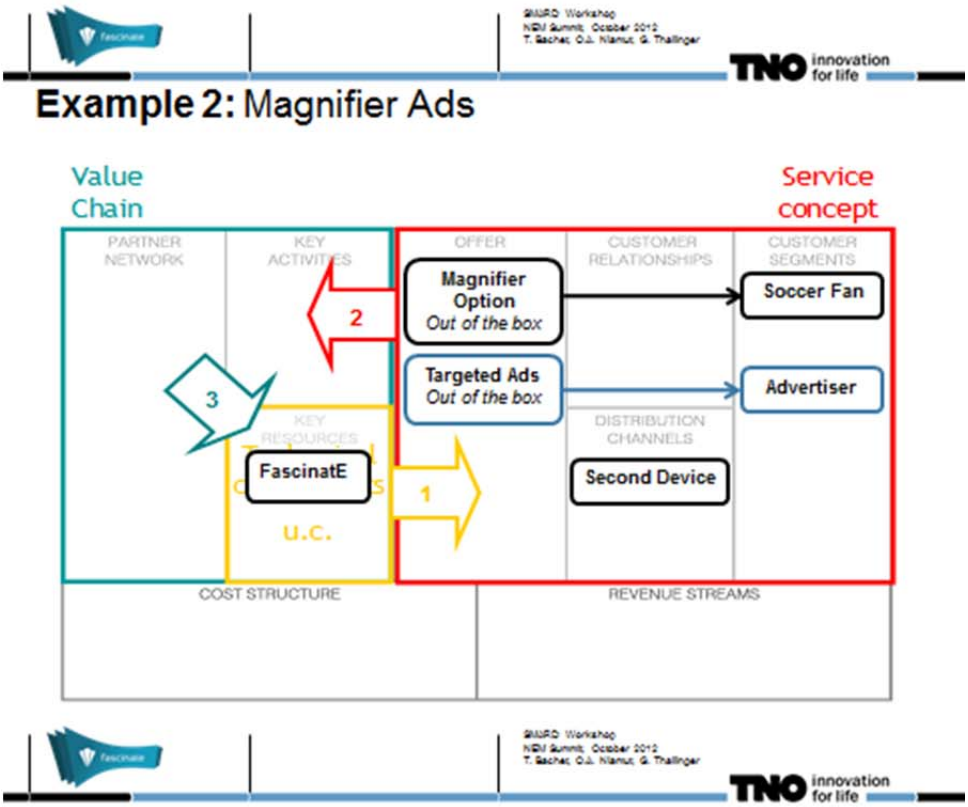
The approach of the SMARD was very similar to the approach in the early days of the FascinatE project. The technology developed in the project was the starting point of the discussion / brainstorm. From there on the potential customers, need, solutions and business models were explored. Because of the similarities between the approaches, the information gathered in the brainstorm was very useful to extend the findings of our own workshops. In the following slide the building blocks from the SMARD canvas concepts are plotted in the business model canvas (used in FascinatE).

The similarities are:
- **Technology as starting point**; in our case the FascinatE approach is slightly more sophisticated, as we used technical attributes instead of all technology available in FascinatE.
- **User centric**; in both approaches the consumer and their challenges are central.

Differences are:
- **Value chain**; we aim to select a viewpoint from the party that is going to deliver the product. That is vague in the SMARD canvas. We also take the value chain into account.

Example 1: Augmented Video Overlays





Other findings

- The main area of impact of the FascinatE technology lies in the production side and user-content interaction.
- Scene complexity is decisive factor. When a scene is complex, augmentation of the video can be very helpful.
- Alternative views (multiple directors) of the same live events, that fits a specific niche can be interesting. Challenge is finding directors that are capable to deliver such an experience. A potential solution could be the usage of prosumers.
- Augmentation of video content could be an interesting case as there are multiple advertisment options. Especially as advertising becomes more content and event related (targeted advertisement).

Conclusion

The SMARD canvas provide a good framework to discuss the exploitation of new technologies such as FascinatE. Comments from the participants were positive about the FascinatE technology, especially from the people that had experienced the demo's on the stand at the exhibition.

The feedback from the SMARD partners regarding the approach that we presented to find solutions to overcome the gap between research and market were very positive. One of the facilitators stated that for each EU research project an approach similar to that in FascinatE should be used.

