

CITIZEN MEDIA – Technological and Social Challenges of User Driven Media

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Abstract

CITIZEN MEDIA is a collaborative research project which unites leading creative and technology experts from across Europe on research, development and validation of A/V systems to enable multiple non-professional users to co-create networked applications and experiences based on their own user-generated content. In this project new ways are investigated on how to exploit the huge amount of user-generated content in innovative ways to support people in their daily lives and how technology will enable social change to strongly involve users for co-creating networked applications. To build successful applications that assure strong user involvement to co-create the application by uploading their user-generated content, user-centric design methods are used. This work will introduce novel methods that allow for the end-users to become application developers themselves and to enable them to co-create networked media experiences. It will also introduce new concepts that may modify the role of stakeholders in the classical value chain for content delivery.

User Driven Media

In the past media production and distribution was considered a one-way system. The media experts would produce the content, the telecommunication and broadcasting stations distribute it, and the user (audience, reader, viewer, etc.) finally consume it. This situation will dramatically change in the future. Triggered by the widespread availability of digital recording devices as well as display and rendering devices makes the end-users the largest content producer and consumer of the future. Besides sharing this content, the *end user is also looking for new ways to participate in networked A/V systems*. This opens the way for a new kind of networked multimedia applications where the end-users will strongly participate in the production of audiovisual media and as a consequence professional content will merge with user-produced content.

This project is about the *citizen itself becoming the major media producer* and distributor, and about exploiting this media created by different citizen at different moments of time to generate a co-created CITIZEN MEDIA experience [1]. Such an application is not a static framework, but is a dynamically evolving application that is continuously adapted whenever users contribute their user-generated content towards the network. In other words the end-users are becoming applications developers themselves together with other end-users. This anticipates on the fact that society is shifting from mainstream markets to individual and fragmented tastes where citizens evolve from

a passive media consumer of mainstream content towards an active role in the media chain (see figure 1). [2]

Similar to the explosion of textual content in the Internet 10 years ago, we will soon observe a dramatic increase of net-based audiovisual material that has been produced by the users themselves. The growing video-blogging scene and the formation of small video-based peer-to-peer networks (darknets) are already indicating that a whole series of novel applications and services will emerge. Especially in the range of big cities audiovisual information for nearly all concerns of public and private life will be available. The technical question we have to answer is: How can we enable end-users to produce and publish their own content and to create and manage their own audiovisual networks for their specific areas of interest? This means that we need user-friendly authoring tools and interfaces for end-users that allow for the production, annotation, uploading, voting, self-controlled monitoring and searching of user-maintained audiovisual networks.

The CITIZEN MEDIA project tackles a number of different issues (Networks, Applications, Tools, Design Methods, Business, Society and Policy) and tries to go beyond the state of the art in each field.

State of the Art and Challenges

Networks: The increasing penetration of different broadband access technologies (xDSL, cable modem, satellite, UMTS, WiMax, 802.11, fibre to the home/building, etc.) fuelled by the availability of the infrastructure for offering triple play services (voice, data and multimedia) opens the way to a myriad of *new networked A/V applications*. A more intense and higher level of interaction as users rip, swap, compile and share A/V material on the network will lead to what are becoming known as *content networks*, rather than pure infrastructure, demanding of network operators that they understand not only the implications of seamless access across networks but also the management concepts for future interactive demand.

Applications: The increasing participation of users in A/V content production is the major new, demand-side driver of new applications. Current IP and broadcast applications suffer from a) high cost and complexity (broadcast content production) or b) low level functionality (current IP applications – flickr.com). The *biggest barriers to growth* are the complexity of A/V production and its cost.

Tools: Search and retrieval across heterogeneous networks is inhibited by the limitations of conventional metadata created by humans. A way forward in A/V content

would appear to be some form of proxy metadata, comparable with the use by Google of webpage links as a proxy for popularity. Currently, social network software is

networked applications and experiences based on their own user-generated content.

The convergence of IP and broadcast networks and of

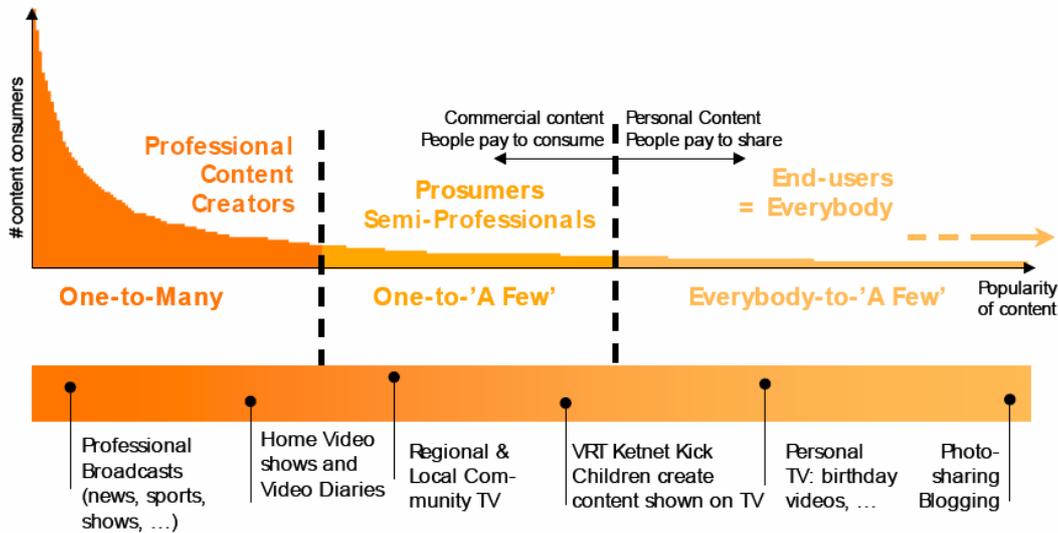


Figure 1: The Long Tail

using usage and interaction patterns (folksonomies) as proxies for metadata. Content personalisation is on the threshold of significant breakthroughs with the advent of location based services and geographical awareness based on the mobile phone, which will be particularly relevant to CITIZEN MEDIA applications. Multimedia creation tools are sophisticated from the point of view of the average user. Many Tools (Flash, Dreamweaver, etc) offer ease of use for the professional media producer but not for the average citizen. Moreover they are all PC centric. Transcoding is another technical problem. Typically material created in one format is not playable by others. There are also limitations in rendering image formats across devices.

Design Methods: In ICT design remains largely techno-centric though social software is beginning to create pressure for substantial change. [8] [5] [6]

Business: The level of user involvement we are witnessing is coinciding with dramatic changes in the structure of the A/V industries. The value chain is being superseded by value networks that are yet to be exploited by the A/V industries. New knowledge on the functioning of the A/V value chain is needed. [7]

Society and Policy: The A/V industries are predicated on a model that is becoming outdated because of social innovation and technological innovation that facilitates social networks. We see widespread disengagement by citizens in a world where content is only delivered through a broadcast one-to-many model. [4] [5] [6]

Main Objectives of the Project

The overall objective of CITIZEN MEDIA is the research, development and validation on A/V systems to enable multiple non-professional users to co-create

content on various devices is coupled to new social dynamics: the eagerness of media consumers to be producers of media content and to create multiple human networks with whom to share personal data. The evolution of user-generated applications presents formidable challenges in the management of large scale interaction across networks, the rendering of A/V data across devices, creating ease-of-use, reducing the cost of applications development, and in overcoming barriers in the value chain. User-generated content applications, however, will drive the development of broadcast/IP convergence. The purpose of CITIZEN MEDIA is to bring tomorrow's mainstream user-generated and co-created networked media experiences into being.

To this end, the project will address three core objectives:

- Develop an open/scalable A/V System Reference Architecture for highly interactive, co-created applications on converged IP/Broadcasting networks
- To provide the tools and network services to facilitate low-skill but high quality co-created, media applications within the Reference Architecture
- Ensuring widespread adoption and contributing to growth, the development of horizontal markets and viable new business models

The Scientific and Technological Approach

To achieve these objectives a dual approach is taken: *social innovation driving technology* and *technology driving social innovation*. In 'social innovation driving technology' user-centred methods will help designers and developers to understand the citizen needs and requirements for innovative networked multimedia applications: who are

the future users of Europe, what are their current practices and what are their needs? In addition, to bridge the gap between designer, developer and user, a user-involved co-design will be introduced in different European countries to identify applications that will be deployed and validated in rural and large towns. From these applications technological requirements will be derived regarding service delivery, business evaluation, etc.

In 'technology driving social innovation' the CITIZEN MEDIA Open Reference Architecture will be created early in the project based on advanced but existing technologies

Some overall technological challenges:

- Creating an advanced framework for User-Centred Media: Personal, participative and collaborative audiovisual networks where user content and professional content merge
- Developing the tools and interfaces that allow for the end-users to create and manage their own audiovisual networks and IP-based broadcasting stations
- Providing ease of use for all user-centred tools and interfaces
- Providing tools and interfaces that allow for the live

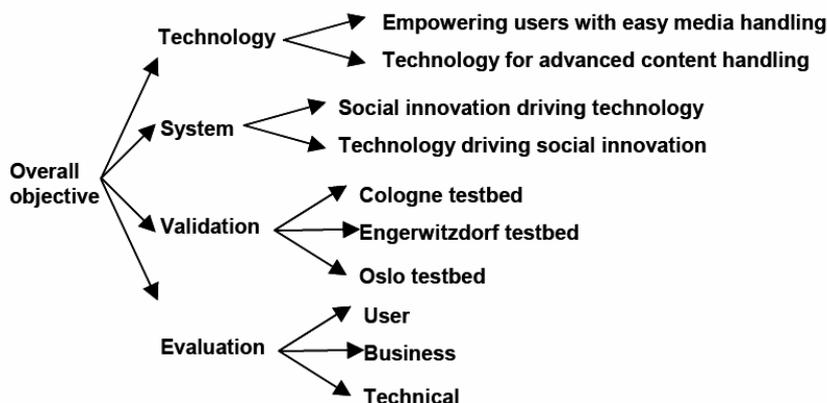


Figure 2: Objectives of CITIZEN MEDIA

in a test-bed with diverse communities. Next an innovative CITIZEN MEDIA application will be deployed and run over the architecture. Based on the user monitoring, testing and acceptance, the framework will be adapted to a better concept. Meanwhile, the CITIZEN MEDIA service framework and core technology components will be gradually developed as part of the project. Once ready they will immediately be integrated into the reference architecture and in this way extend the functionality of the architecture as well as the features of the applications.

Both approaches are complementary and enrich each other in order to arrive to a single application reference architecture framework at the end of the project. Most often, user needs are only taken into account prior to the technological development or after the development to validate the outcome. Such an approach is impossible in our project because the match between user needs and technology is very thin in this project. In general, this will provide essential information to assist both designers and developers in the process of creating new networked media experiences supporting social networks as well as compelling co-experiences for the citizen. Taking this dual approach avoids an often encountered problem in research projects where the development is postponed due to lack of system requirements, but system requirements cannot be defined until it is clear what the technology can deliver (chicken-and-egg problem).

staging of city events (e.g. pervasive games, sports events, fairs, music festivals)

- Providing seamless connectivity, resolution, access and control across the home and mobile networks and services

The true innovation inside the project will be enabled by the technology components inside the CITIZEN MEDIA Open Reference Architecture. These components will enable CITIZEN MEDIA applications to do co-creation of networked applications. Without these technology component the network would be a passive storage place to exchange media. The process to facilitate co-creation by multiple non-professional users based on their own user-generated content requires that the system is able to handle a massive amounts of user-generated content in different formats in real time, annotate and store this content into huge databases, search, retrieve, process and render all these pieces of user-generated content to create a new experience.

The technological innovation comes from building scalable, open components that can be delivered to different terminals over different kind of networks. [3] The envisaged work will formulate answers to following questions?

- Authoring: how to help citizens to contribute their own content

- Media: how to convert the citizens' input in a format appropriate for internal analyses (quality, automatic annotations)
- Annotation: how to generate (automatic) meta-data of media inputs after the upload, how to generate context related meta-data while content consuming (live user annotations) and afterwards, how to evaluate the annotation methods
- Modelling: how to build / to complete models best with a great variety of modelling software, how to implement and coordinate citizens' participation, how to assure content quality of heterogeneous skilled model producer
- Visualizing: how to visualize meta-data readable for citizen (e.g. with topic maps), how to render images and videos on low performance devices with remote rendering techniques, how to enrich the user experience with context data
- Collaboration: how to coordinate collaboration activities, how to communicate in collaboration
- Multimodal: how to integrate visual, audio, (vibro-) tactile feedback, how to include speech and gesture recognition, how to involve impaired citizens, how to render best the modal senses (remote and/or user-centred)
- Search: how to retrieve content and meta-data, how to construct user accepted user interface techniques simplifying the phrasing of queries, how to navigate in the multimedia databases e.g. via topic maps
- Profiling/Ranking: how to build profiling and ranking mechanisms, how to analyse and promote the statistics, how to evaluate and analyse the citizens' contribution
- Nomadic citizens: how to build and implement location based context data for tracked nomadic citizens, how to offer navigation techniques for nomadic usage, how to support user experience with augmented reality techniques

The Social Dimension

The i2010 strategy and previous EU social policy recognises that despite all available technology, people in modern societies feel more excluded from society, more isolated with respect to their communities, and more disenfranchised from the system of government and democracy. People have become more individualistic and pursue goals independently of each other. In addition there is an acknowledged "digital divide" further exacerbating problems of disenfranchisement. [6]

The *mainstream collaborative creation* process lying behind citizens' media is a move in the opposite direction, bringing people together again, enabling everybody to participate and to contribute to a common goal, and re-enforcing stronger user involvement and empathy in social communities. CITIZEN MEDIA will show that collaborative creation can have significant social impacts, if for example citizen groups began co-creating around democracy issues and re-engaging in the political process, and creating their own e-Government content services, as

well as e-tourism applications etc. The tendency of citizens to interact, and to show creative engagement, is one that needs to be seized for societal and democratic benefits.

These challenges raise the important questions:

- What kind of content do users want to produce and share?
- Whom do they want to share content with?
- Where and when, in what context, do they want to produce and share content?

In order to understand the requirements potential users have for CITIZEN MEDIA applications, we suppose that the adoption of new ICTs takes place against a backdrop of preceding techniques and practices, and new uses are often an extension of what has gone before. The users will approach these new applications with a clear reference to their present usage of media. Therefore the users' requirements for the CITIZEN MEDIA applications must take into account potential users' present access, practices, skills and attitudes towards digital media in general.

We propose that potential users are characterized by their present Usage Patterns. In this context, a Usage Pattern is defined as the usage of media technologies by a significant proportion of the general population, characterized by the media technology, user characteristics, context of use and the user's content preferences, goals and experiences related to using the technology. A representative picture of Europe will be achieved by analysing statistical data of present usage in Europe. Such knowledge will offer a better insight to how CITIZEN MEDIA applications should gain market entry and how it should be designed to fit different types of users, with different types of background and different types of use.

Usage Patterns is therefore a promising approach for modelling user behaviour, and is highly relevant as a basis for the modelling of user requirements for future networked applications. These requirements will be gathered in characteristics of potential users and the potential contexts of use. The objective of acquiring user requirements is three fold:

- Firstly, this will provide substantial new knowledge on actual user and context requirements for collaborative networked media experiences. These requirements do not exist at present. This new knowledge will include the identification of a core of typical applications for collaborative networked media that European citizens will demand in the near future.
- Secondly, this will provide new methods, tools and techniques for capturing user and context requirement for emergent networked media technologies, supporting creation, participation and collaboration.
- Finally, this task will identify context and user requirements for the applications to be used in the test beds of the project.

Strong social involvement is a key factor for successful co-creation of networked applications. Besides a quantitative approach addressing all users in a

representative way and a usability-oriented approach, we have to look at social requirements for CITIZEN MEDIA applications. This, by taking an interpretative approach based on ethnography and communication studies. We look at how people from within their everyday life setting interpret and give meaning to the (future) use of specific media for social contacts. More in particular this task will investigate in depth the social behaviour of people interacting with CITIZEN MEDIA applications within a specific sociality or community, by putting state-of-the-art technology in the house of these people. The basic challenge of this assignment is that we need to do research on interaction of people with appliances and applications that do not yet exist, because they are to be developed within the project. In standard market research on future products this is done by interviewing people or by presenting triggers like drawings, mock-ups or prototypes, in for example a focus group. However in this way the interviewed people still only get an abstract feeling of the product or service they are discussing, outside their natural environment. This kind of approach is insufficient for ethnographic purposes. If we really want to understand how people feel and make sense about emerging networked media technologies, the trigger needs to be much 'thicker'. [8] The latter term refers to the classic denotation within ethnography for thoroughly describing and analysing naturalistic socio-cultural behaviour. In order to thoroughly assess future behaviour regarding CITIZEN MEDIA applications, we will examine terminal devices and applications that incorporate as much as possible similar functionalities and characteristics. These kinds of technologies are indicated as 'proxy technologies'. Given our ethnographic approach the outcome will be different from the quantitative data approaching all users, as well as from technology-oriented advice like specific user requirements. This work will deliver a set of so-called 'sensitising concepts'. The latter term stems from the grounded theory tradition, where one starts from the basic empirical data in order to create inductively theoretical findings. In the project these sensitising concepts will take the form of guidelines based on the social sensing through proxy technology assessment and they will channel the further development of the CITIZEN MEDIA applications. More in particular they will set the course of how to develop the application in such a way that they fit the natural usage patterns. These patterns can for example refer to social rules that lead to favouring choices of content creation and content sharing. The different social networks can have their own communication norms. Within social groups or networks there can be rules and expectations about the appropriateness of different media for different circumstances. The sensitising concepts will identify issues like (new) media habits, exploring consumption behaviour (time and money spending) or scouting socio-cultural trends. The goal is to relate these concepts to different user groups or user profiles. This entails the identification types of users that play a key role in content creation and sharing. For performing the social sensing representatives of these

profiles will be confronted in their home with the proxy technologies and applications.

Conclusions

The CITIZEN MEDIA Open/Scalable Reference Architecture goes beyond current network concepts by centering control issues on participating end-users rather than on monolithic content producers. It focuses network concepts for data handling, access, rendering etc. on highly interactive audio-visual content development, and long tail multiple hyper niche markets. Important technological innovations consist of building generic applications frameworks and technologies for end-users, promising extreme ease-of-use at lowered costs. Tools and interfaces will allow end-users to create and manage their own application frameworks and decrease the complexity of media handling. CITIZEN MEDIA tools include an advanced metadata model that will allow the service modules to interact and will serve the content creation, management, and personalisation sides of the user experience by combining traditional metadata concepts with concepts derived from use patterns, user annotations, and folksonomy/ social network techniques to improve personalisation and relevance. The project incorporates a module to take data from different media players and to deliver in a commonly playable format.

Tools development will also include trans-scaling of image formats across devices. Project techniques including user-centric and co-design, as well as extensive research on user motivation in networked media applications are innovations in design that are well adapted to a project focused on user-creativity. They will lead to new design guidelines for user-generated networked media applications. The growing emotional dimension of media consumption is addressed by a multidisciplinary evaluation framework that is sensitive to the user-definition of quality rather than to techno-centric judgements. Taking active steps to prefer user perceptions is a qualitative step forward in technology evaluation. By lowering cost and creating ease-of-use content production facilities the project will ease the two major bottlenecks in A/V content production (cost and complexity) and will facilitate European growth, competitiveness, and horizontal markets in the A/V and converged network value chain.

CITIZEN MEDIA captures the new social dynamics of user-generated content. Collaborative networked media co-creation applications might include: a citizen built city guide with multiple views and narratives on city life; e-democracy, where intending voters create profiles, biographies, policy summaries of candidates; e-health where prospective and previous patients create well-being and healing stories that incorporate professional medical information with personal patient experiences; e-government where service users create networked use-manuals to allow each other to get better services from government departments. CITIZEN MEDIA focuses people on shared activities.

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