Air Quality Portals - Designing Citizen-centred Supply Chains for the Dissemination of Air Quality Information

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Abstract

Environmental information represents an attractive business asset once perceived as levels of comfort improving the daily life of citizens. The need for high-quality information services is further supported by several European directives to inform the citizen about environmental conditions as well as ongoing initiatives concerning access, dissemination and exploitation of public sector information (PSI). Although elementary publishing services are available, e.g. web servers on air quality, the question arises of how to reach and eventually impact the citizen with information on air quality and how to establish sustainable supply chains for environmental content. In this paper, we will present the air quality portals designed and evaluated in project APNEE and APNEE-TU which implement citizen-centred information services by employing a complementary array of technologies in a customised fashion. Operation of these information services requires a specific business partnership to implement a supply chain of trusted content from the source of environmental information, i.e. the environmental management systems, to the citizen, i.e. the customer of high-quality content. This paper reports on the innovative design of the service platform for pro-active content dissemination, as well as stakeholders and business perspectives for a sustainable operation of APNEE/APNEE-TU.

1. Introduction

In APNEE (Air Pollution Network for Early warning and information Exchange in Europe), we have been designing information services that draw upon various information channels, i.e. mobile technologies, interactive portals for the Internet, as well as street panels for municipality usage scenarios (APNEE 1999).

APNEE put forth a uniform information portal for information on air quality. In a conceptual stance, this uniform information portal is founded in a central repository approach. Information on air quality originating from already existing air quality monitoring and forecasting systems are uploaded according to a standardised

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schema, which reflects the experience on air quality information from several projects. Once uploaded, information are processed and disseminated according to individual and region-specific preferences. While different user sites share the structure and content of the information, the type of presentation varies significantly. Rather than sacrificing information content due to technical limitations of end-user devices or communication technologies, one has to explore new ways to communicate content. For instance, an interactive map appears attractive when surfing the web, while an iconic visualisation appears more appropriate when employing a WAP service as communication channel.

Environmental information is certainly a business asset once communicated as level of comfort. In this project, we have been following a trans-disciplinary partnership to implement a seamless supply chain of trusted content from the source of environmental information, i.e. existing environmental management systems, to the citizen, i.e. the customer of high-quality content.

In this paper, we firstly report on the conceptual approach of APNEE(-TU). Secondly, we give an overview of business perspectives of such environmental services based on the experience made in APNEE.

2. Approach

APNEE does not implement a new air pollution management system, but provides a conceptual and technical umbrella for already existing ones, that is, a bridge which allows the export of data to one common regional database from where it can be extracted from different service providers. Thus, the APNEE architecture allows new users sites, new interface providers as well as alternative types of data to cover new information domains, such as pollens, weather information, bio weather, or real feel temperature to connect easily. APNEE provides in principle the dissemination core, i.e. broker platform, employing several communication channels to be used by content providers, in our case information on air quality and levels of comfort.

Content providers can be telecom operators as well as information portals. Each can determine its service portfolio based on regional and country specific preferences, i.e. which service to offer for which type of customer:

- mobile: via mobile phones, smart phones, PDAs, and street panels.
- stationary: via PC on the Web, or via local phone calling a voice server.

While the mobile phone interfaces have to be tailored to individual telecommunication providers, the web solution as well as the subscription service are based on one common platform, open source and freeware for all user sites. Separation of layout and content allows easy adaptation to new user sites reflecting their individual corporate identity as well as cultural issues. Mobile access and street panels for new user sites are also easily connectable, but individual technical architectures and modules of telecommunication providers require additional implementation efforts.
Two dimensions for the improvement of information services towards the citizen have been followed: Firstly, sophisticated means for information visualisation are provided to elevate the intuitivity of information encounter (Böhler et al. 2002). Rather than presenting raw data of some environmental management systems, a new interaction metaphor for navigation and access in information spaces is employed. Special attention has been turned to means for visualising data in a cartographic stance and for providing interactivity amid exploration (Peinel & Rose 2001). In addition, customisations of information visualisation due to technical limitations have been explored. Secondly, information services had to mature from a passive delivery task towards a pro-active, customisable service, that orchestrates data for a specific purpose and employs appropriate information modality whilst reaching citizens, that might have even subscribed to specific profiles (Johansen et al. 2001).

3. Complementary services versus convergence

Convergence in the sense of technology (creating content for different end devices), economy (specialisation not more on a medium, but content), and platform (one device for different media formats) is described as the main future technical driver.
But until yet no “one for all” device is available on the market. Contrariwise the market concentrates on specific devices for different purposes, arguing that “over-functionality” will not be accepted by the customer due to complexity and capabilities of devices (Deininger, 2002).

So if the users will continue to use different devices based on location and interest, we argue that the complementarity of services based on the device available, the location and the interest might be the next future service market. Users at home can use PC and television, while being mobile laptops, smart phones and PDAs are available. Each device offers different capabilities in display size, bandwidth, and interactivity, and spreading information to these different access channels requires to scale and customise the amount and interactivity of information to this target device:

- On the web: large amount of hyperlinked information, including sound and videos, allowing interactions and feedback assuming better bandwidth and interface capabilities.
- On mobile phones via SMS: short message service with small iconic images.
- Via WAP: short notes hierarchical structured.
- Via PDAs on future 2,5 – 3 G networks: images, smaller videos and sound, larger text, interaction and links.

This creates an ubiquitous information service (UIS) which provides relevant information to the users anytime anywhere based on one common subscription to such a service bouquet. The APNEE services provide with their multi-access architecture such a UIS taking also into account regional diversities like acceptance and rates of usages of devices. Yet, more validation exercises are needed “to explore the efficiency” of each technology in terms of impact on the citizen.

4. Designing Citizen-centred Supply Chains of Air Quality Information

Citizen-centred applications require several co-operating partners:

- **content provider**: creating or collecting, owning, and processing data
- **content presenter**: structuring, relating, presenting and advertising data of one or more content providers (on the Internet mostly named directory portals)
- **telecommunication or platform providers**: adapting and disseminating data over different communication channels (also mobile operators)

Even some of these roles can fall together (i.e. an organisation creating, presenting and distributing data physically) most content-centric applications are built by a supply chain of different roles. Each member of the supply chain earns revenues from the overall fees of the customers, and the overall service should be at least self-supporting.
Most well known information services are News, games, financial information, transport, music, and edutainment. Health as well as environmental information like in APNEE are new to this market.

Public bodies are by far the largest producers of information in Europe and due to EC directives all EU governments now have a strong web presence and in general make information available on websites free of charge or at a very low, direct cost-based charges (European Commission 2000). But a prevailing share falls short concerning intuitive presentations and user interfaces for navigation, in particular taking into account normal citizens as customers. Instead, raw numbers and/or a large amount of reports dominate. One reason for this lack of customer orientation are diverging perceptions of the information strategy of authorities: giving the public access to information versus pro-active information dissemination (Craglia & Masser 2001). The latter requires citizen-oriented thinking and processes taking also into account modern information technologies. Mobile technology is in the starting blocks for active information dissemination services, but how should authorities be able to develop and maintain the technical challenges of new communication technologies with their rapidly change of standards.

Telecommunication providers, on the other hand, do not know about the quality and semantics of data, but they can provide the technological backbones of information dissemination. Portal operators are experienced in information presentation, structuring and of course marketing. But they in turn need help for interpreting data to information as well as for operating a technical dissemination platform.
The combination of these partners creates a valuable business service, where each partner contributes its experience and receives revenue from the overall customer fee. Taking into account how much data is available on the authorities site, this business model can help authorities to market their service portfolio, allowing them to improve their services with the revenues gained, and therefore lower the burden of state expenses.

(European Commission 2002) recommends the following to the European Commission and the EU Member States:

_In order to break this vicious circle of “wait and see” behaviour, the European Commission and the EU Member States could promote the development of applications that build upon public sector information (PSI). [...] While representing substantial added value to the end-user, the revenues they will generate are likely to be limited. On account of their usefulness to society, however, national authorities could grant equal access to this information to third parties and stimulate companies to develop compelling applications with the citizens’ needs in mind. Attractive value added PSI applications could prove to be one of the mechanisms that initiate a virtuous circle._

The public sector information industry in the USA is five times larger than the European ones thanks to the Freedom of Information Act. A study conducted for the e-Content programme of the EC calculated that if Europe's public sector was to drop the charges it currently imposes for this data, European governments should easily win back more money in taxes and employment benefits (European Commission 2000).

5. Business perspectives

Yet, the question arises of how to finance this kind of services. Several business models have been elaborated. Services on a charged basis seem unattractive, although SMS services for traffic information and metro/subway information have proven successful in metropolitan areas. Service bundles for “greening purposes” appear as natural solution. But there is evidence that once turned into levels of comfort acceptance raises. Rather than receiving raw data, the citizen is interested in high quality information services: “give me a forecast replenished with recommendations for individual activities”.

Field trials in Grenland revealed further business opportunities. Once individual behaviour is affected, citizens are voicing pricing confessions: “once this information service is in place, I would afford 4 Euro for subscribing to this service”. Regardless of the pricing scale, this experience backs the experience of the Marseilles trial; people are prepared to subscribe to this kind of services on a charge basis, once they can “grasp” the value-added for their live.
The project attracted new commercial partners for a follow-up project named APNEE-TU (APNEE Take-Up). The APNEE information service platform will be extended in APNEE-TU to new mobile devices (PDAs and smart phones based on 3G technology) as well as new regions (in Germany, Norway and Greece) and additional information services (levels of comfort). The new partners expressed their clear will to evaluate this environmental content for new technologies like WAP, PDAs, GPRS and UMTS. The new 2.5 and 3G mobile technologies GPRS and UMTS are currently lacking content to be successful on the market and accepted by users as startup pushing this technologies: the success of services of the 3G mobile technologies offered for example by UMTS (Universal Mobile Telecommunication System) depends strongly on structure and marketing of the service bundle, marketing strategies have to take into account customer requirements and concrete benefits instead of concentrating on technical details (Pricewaterhouse-Coopers TC, Technology Forecast 2001–2003).

6. Conclusion

APNEE has developed an information service platform for the dissemination of air quality information. The portfolio of services serves a variety of communication modes in order to reach the citizen in a custom-tailored fashion with respect to his personal preferences. This portfolio has proven necessary for the implementation of APNEE at various European user sites, although individual sites apply a subset of this services adapted to cultural and regional needs.

Yet, commercial content providers have to be attracted to offer this kind of services, be it as portal or messaging services. In this paper we report on the design of an information supply chain that is implemented by non-governmental and commercial organisations. Field trials unveiled the preparedness and willingness of the citizen for services on a charge basis if the value-added can be “grasped”.

Commercial exploitation of PSI is not a new phenomenon in the EU. It is an established practice that the public sector creates, gathers and distributes information for the public good and that the private sector finds ways of exploiting that information and those processes for commercial gain by delivering products and services that benefit their customers. [...] The opportunity to meet the diverse needs of citizens and users for such products and services demands entrepreneurial and publishing skills that are more evident in the private sector. The market needs are best served by commercial exploitation of PSI.

(European Commission 2000)

APNEE is rolling up the market for air quality information for citizens in Europe. The combination of air quality professionals, authorities, telecommunication operators and portal providers proofed to be successful in APNEE, while APNEE-TU will extend
this service to new mobile technologies and further user sites in Europe. Even the EC and state authorities did not yet succeed to provide a unique European index on air quality, the APNEE projects will test to solve this issue from a bottom up approach in elaborating levels of comforts as well as information index which checks towards limits, displays the highest class, and gives additional information on what triggered the index.

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