

This booklet has been made from...

Abstract

The paper will present the use of service notation tools to facilitate strategic conversation between stakeholders within a complex system of multiple actors. 2 case-stories will focus in particular the use of story-boarding and narratives techniques to support processes of co-design of new product-service systems within different contexts such as a partnership of industrialists or a scientific community of experts. In the 2 cases-stories, the innovation focused are aiming at a different mix of sustainable concerns especially focusing the socio-ethical dimension (i.e. enhancing socialization, protecting privacy...) and are all based on a high technological content.

The case-stories are:

- D3: development of a peer-to-peer per-

sonal device to support local connectivity between IT companies;

- PET: co-design of privacy enhancing design guidelines within a network of international research laboratories in computer science and interaction design;



Exploring applications for a peer-to-peer short distance communication device (D3)

1.1 Context

The first case presents the definition of the technical specifications of a peer-to-peer short distance messaging device aimed at facilitating connectivity and exchanges within people evolving in the same surroundings. The device can send and receive radio signals to other devices situated within a 50-100 meter distance. The particularity of the system is to be based on a communication protocol where devices are using each other as “hub” to circulate the information. No service provider is needed but only a certain density of devices in the same place in order to ensure a fluid circulation of the information among all the population of users. The device includes also a new technology flat display and touch screen display with particularly low energy consumption.

The project consortium organized by the TNO Industry & Science in Eindhoven is constituted of Orgatronic, a TNO spin-off producing the displays, Chess developing the communication software, Kooymans developing the device design and Strategic Design Scenario developing the scenarios of use.

The initial field of application focused by the two companies was the market of professional trade shows where the D3 device could be distributed as entrance badges and facilitate the exchange of information between exhibitors and visitors and between visitors themselves. Alternative scenarios of use have been developed in order to enlarge the possible applications of the device and define its technical specifications for a broader market.

1.2 Co-development of story-boards

Through iterative workshops and interactions the project partners defines story-boards of interactions in different contexts of use. Strategic Design Scenarios supported the process stimulating the strategic conversation between the stakeholders through inventing narratives making use of the many functionalities allowed by the original new device. Each of the narratives was visualized by a 6-8 pictures story-board and circulated among the different stakeholders for comment and upgrade (Figure 1).

7 contexts of use were defined for investigation:

1. a “e-Care” device to facilitate prevention and support open health care services between patients, their relatives and the medical staff;
2. a “Neighb-Connector” to enhance the socialization and mutual help between inhabitant and especially elderly of the same neighbourhood;
3. an “Active Leaflet” to guide visitors of an art festival or cultural event in a city;
4. a “Tourist Guide” to involve visitors into an interactive exploration of the city by foot;
5. a “e-Flyer” to invite the public to take part and interact during artists happenings;
6. a “Kid Game” to allow interactive role game between children outside the school;
7. an “Active Badge” to facilitate communication and exchange between the visitors and exhibitors of a professional trade show;

Each of the story-boards is based on a background image setting the context of the action and a rough drawing showing the main characters and artifacts involved in the interaction. A short caption on the image quotes the essential of the dialogue between the characters and specifies which functionality of the device is involved. Each story-board was circulated as a slide show by mail between the different stakeholders. Comments allows to fine tune and sometimes reorient the stories.

◀ Figure 1: 7 story-boards picturing a range of possible application of the D3 device in different contexts of use



Martha has organised a tea at 4 o'clock to thank Tom who answered her message [my washing machine is broken, help! Martha.]

→ shows possibility to use the device to ask for the help in the neighbourhood



While going out to buy some cookies for the afternoon, she sends around the message [shopping with me? Martha.]

Victoria waves at her window: "wait for me... I need to go downtown..."

→ shows possibility to send one-hub messages walking in the neighbourhood



At the supermarket: "but Victoria, you bought too many things, we can't carry them back"

"no problem Martha, at this hour with the neigh-connector, I never had to walk back!"

I send [anybody drives me home] and you will see!"

→ shows possibility to search for support around in unexpected situations



After a while, Ruth appears: "Victoria and Martha... Alone with all that shopping! Yes of course I can drive you home"

but... I have to stop a little while by our new neighbour..."

"Yes it seems that Paul, a 'young gentleman' of just 70 just moved in near your house Martha: didn't you receive his welcome presentation?"

→ shows the possibility to register profile and broadcast it locally

(i.e. when someone call moved in)



Leaving Paul, the 3 women receives a message: [Join us in the town hall to participate to the 5th bridge competition at 4 o'clock]

Victoria: "What a nice opportunity... Should we join?"

Martha: "Not for me, a so called Tom is coming to adjust my washing machine this afternoon and we will have tea together..."

→ shows the possibility to broadcast messages and receive them across the network

A first pilot was made with one story-board to align the team on the new working process. After, the 6 other story-boards were completed in a period of 3 weeks for the all process.

The following steps consisted in the precise definition of the technical requirements of the device for each of the 7 different applications. A clustering allows to see which ones were easily compatibles. A strategic choice was finally made as a trade-offs between market potentialities and technical development costs. The project team agreed to focus on 3 of them: the Neighb Connector,, the Active Badge and the Kids Game.

1.3 Discussion of the co-design process

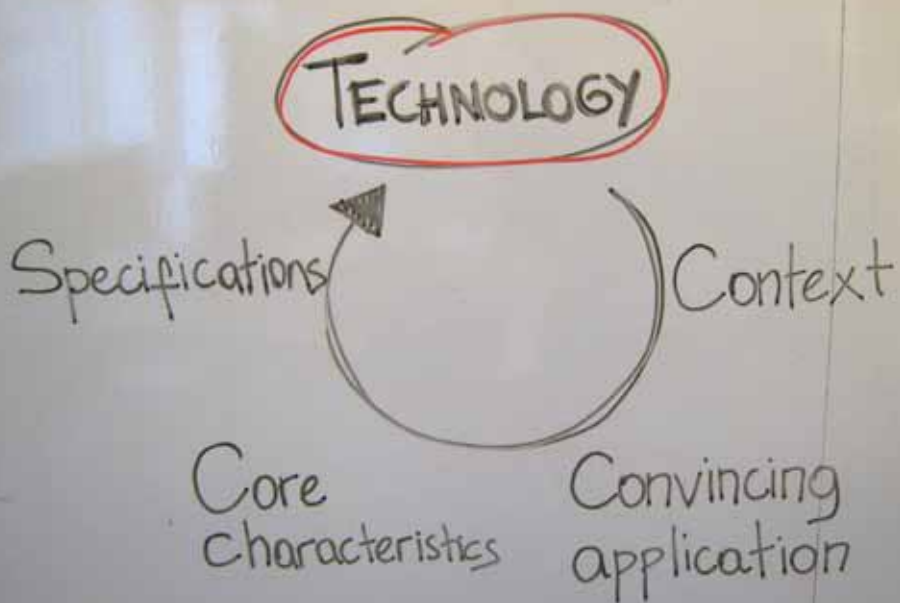
This experience underlines 2 important aspects of the use of story-board as a tool to define new product-service systems.

The first aspect is the research and specification of technical requirements through the definition and discussion of narratives. The invention of a user story as the basis of the construction of the story-board is used as an elliptic mode to define the new solution: The creative team looks within a given context of use (i.e. elderly in a neighborhood), for the story that will illustrate in the most convincing way the use of the device in the focused situation (i.e. how to facilitate contacts, enhance socialization without too much cognitive overload or risks to disturb people privacy...). In a second time, the story is assumed as typical and core application of the device and technical specifications are derived from it. This apparently slightly tautological construction process – where technical characteristics of an artifact inspired a new application that in return redefine the initial technical characteristics – is a very efficient “specification loop” (Figure 3) to orient technical potentialities onto a user centered application.

The second aspect is the facilitation of the exchanges within multi-disciplinary teams. The project presented here emerged from a technological push looking for market application. The use of sto-

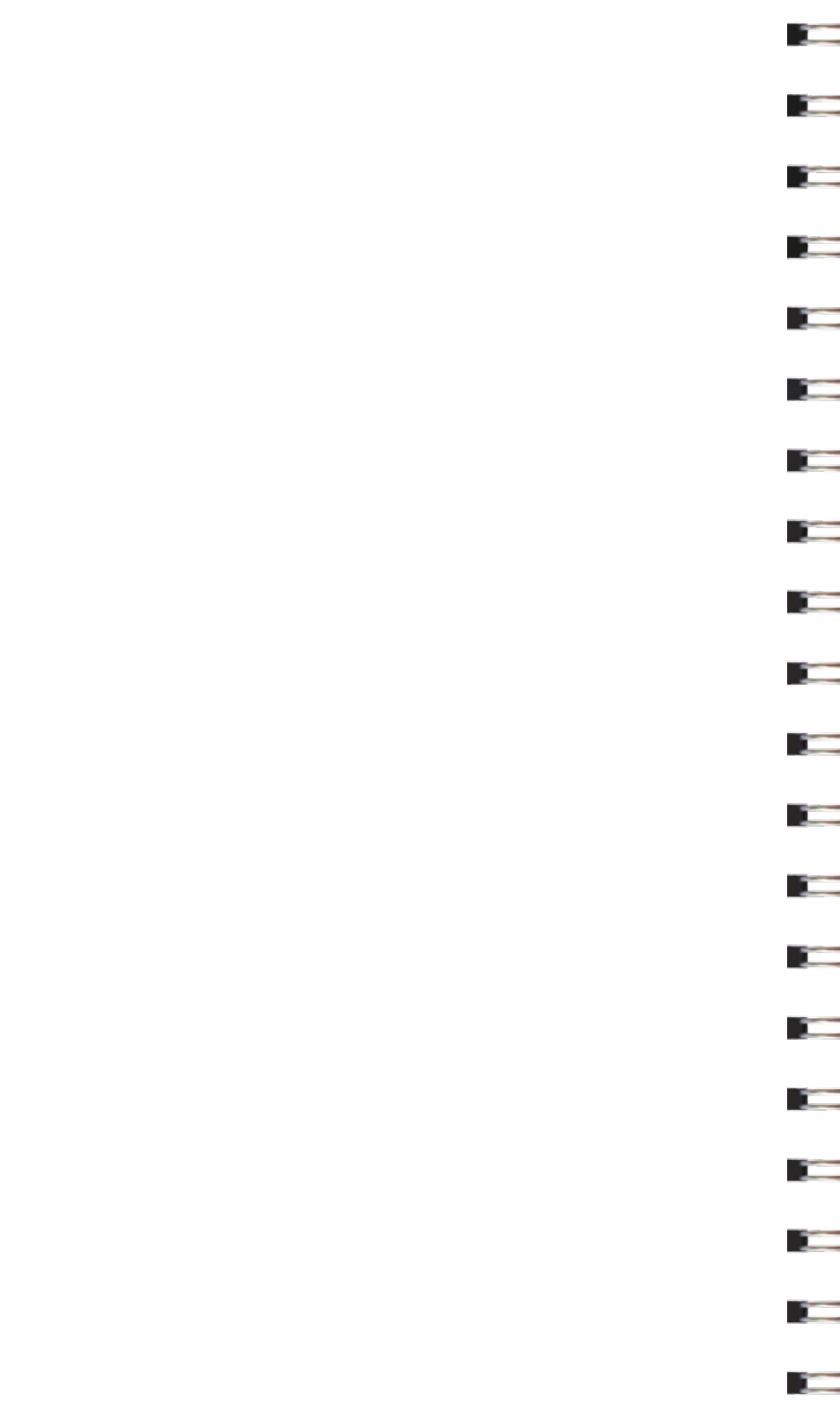
◀ **Figure 2: Example of story-board of the D3 application as a “Neighb-Connector” to enhance the socialization and mutual help between inhabitant and especially elderly of the same neighborhood**

Specification Loop:



ries allows to reintroduce the user in the center of mainly technical discussion. Compared to lots of user centered approaches based on the explication and discussion of users motivation and perception, the story-boarding is a more direct process enabling non user experts to participate and give inputs. The story speaks to the personal experience of a technical expert, diverting him or her for a moment from the technical expertise to facilitate a discussion from a user point of view. On top of the use of stories a enabler of dialogue, the visualizations in the form a story-board gives event more access and attractiveness in a collaboration process towards the construction of shared views.

◀ Figure 3: “specification loop” process starting from a technology to define a convincing application from the user point of view and feeding back from this application to redefine the core characteristics and the technical specifications of the initial technology.





Co-design of privacy enhancing design guidelines for IST (PET)

2.1 Context

The second case presents an experience of co-construction of privacy design guidelines within the Ambient Agoras research project within the IST Disappearing Computer Program. Ambient Agoras was developed between 2000 and 2003 and was focused on the development of ambient intelligent environment to support working spaces. As most of the IST Disappearing Computer research projects, Ambient Agoras was dealing with a series of promising concepts on the sharing of personal information, on context aware systems, self-learning processes and augmented working and living environments that may constitute a serious threat to the preservation of the people privacy in the near future. Already today, a growing number of privacy problems are to be seen with the digitalization of personal information (i.e. in health, travel, education, payment, work, leisure...) and the growing of the connectivity between the distributed computing power. The high speed development of information technology exceeds from far the capability to develop appropriate legislative protection instruments and the national and international institutions of defense of citizens rights as well as consumers associations struggle to fight abuses. On the user level, the permanent request for more convenience and service in consumer electronics leads producers to develop ever more complex and opaque systems.

Conscious of this growing threat for citizen privacy, the Commission agreed an additional workpackage within the Ambient Agoras to explore the possible development of a first draft of Privacy Design



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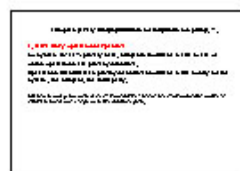
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Guidelines to orient the work of developers and interaction designers toward privacy enhancing products and services systems.

2.2 Story-telling material to stimulate interviews.

The Ambient Agoras consortium and particularly the Cognitive Design Laboratory of EDF in Paris and Strategic Design Scenarios in Brussels elaborates a first draft of the guidelines consisting of the series of simple and sometimes counter-intuitive design principles inspired by the day-to-day practice of co-design with users in IT sectors and a first review of the privacy problems in the literature. Although privacy is recognized overall as a relevant concerns, the level of consciousness among the large public as well as between IT experts is still very low. The main reasons is that concrete problems occurred (i.e. illegal transfer of private information, interconnection of users personal data, falsification of electronic payments, abuse of private mail box...) have not yet reached a level of diffusion to become a public focus as well as a concerns for the developers.

Therefore, it was necessary to define concrete applications of the guidelines in order to support their discussion. A series of 8 narratives were developed picturing situations of everyday life (i.e. buying an airplane ticket, visiting a conference, losing his pin code...). Bits of life of an hypothetical character equipped with a personal digital device and evolving in different service environments designed according the Privacy Design Guidelines are described. Their purpose was to allow a third party to compare between the current situation (i.e. how he/she today buys a travel ticket) and the new privacy enhancing situation. From the comparison it was possible to appreciate benefits and risks, assess technical and business implication and finally reacts on the design principles proposed.

For each of the situations a visual animation is played on a remote server in order to support a session of interview. 12 experts from majors international laboratories working on augmented collaborative environment and human computer interface were involved in one hour online session in a shared mediaspace.

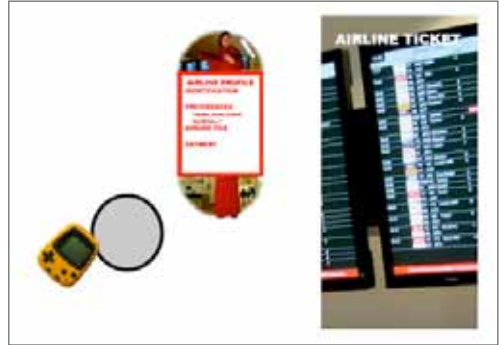
◀ **Figure 4: 8 illustrated narratives showing interaction based on the design principles of the guidelines were developed to support interviews of experts.**



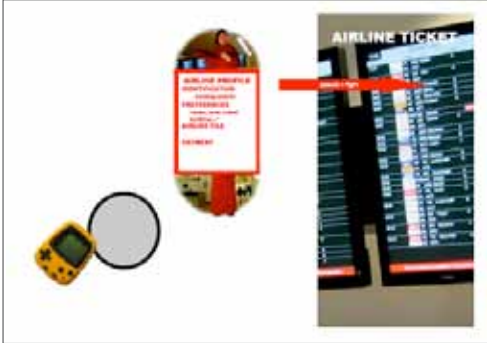
Yan-Dee want to book a flight;



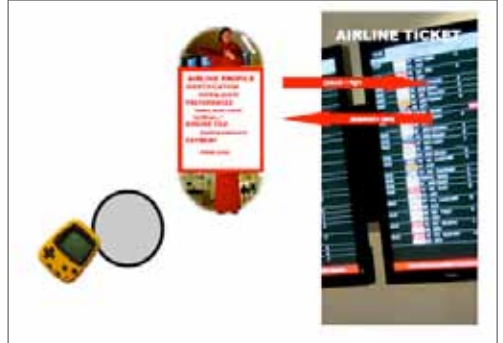
She opens her "airline profile";



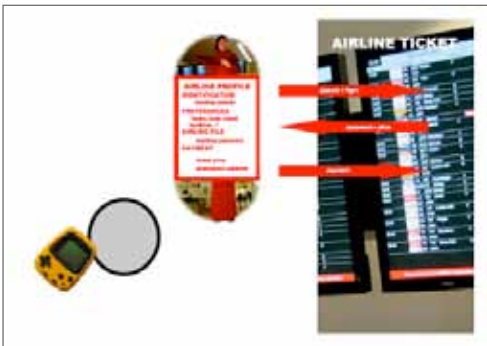
Her "airline profile" contains no identification but just travel preferences;



The PDA issue a "pseudo" when Yan-Dee require a flight;



The airline company confirm the booking with a temporary password and give the price;



Yan-Dee make an anonymous payment corresponding to the booking pseudo. The password became permanent.

2.3 Discussion of the interaction process

This second experience shows a new aspect in the use of story-board based narratives. The flexibility of the teasing material to support progresses of an on-going discussion is key to facilitate an interaction process between third parties. The material quickly upgrade to match participants comments. The story-telling and its visual presentation in a story-board-like animation is a very efficient support to stimulate the discussion of concepts between multidisciplinary population. The fact-based narration and the presence of visual support allow to quickly focus a question across professional but also cultural and personal sensitivities. Technically it allows also to differentiates between critics of the concept discussed and comments triggered by its instantiation in the narrative.

The story-board quoted in Figure 4 shows a good example. The initial narrative visualizes an airport situation and focused the booking process of an airline ticket. The privacy enhancing guideline number 4. called "privacy razor" illustrated here stated that: "Subject characteristics seen by the system should contain ONLY elements which are necessary for the explicit goal of the activity performed with the system. No data should be copied without due necessity". In particular, applied to selling transactions, it suggests that the identification of the purchaser is seldom necessary for the transaction. As a common sense, nobody would give its name at the corner bakery to purchase a loaf of bread but it is now common sense to disclose personal identity for any important purchase. The narrative proposed in Figure 4 is intending to question this practice and suggests other alternatives such as the exchange of temporary pseudo. This hypothesis was highly criticized and regarded as unlikely to occur by the first series of experts interviewed, especially by American experts compared to European. The common sensitivity to airplane security due to recent terrorist attacks was far too important to allow the consideration of the concept behind its instantiation. A new context of use was substituted after the first 5 interviews to change the reference from airplane to high-speed train ticket booking. It resulted in a complete shift in the comments in the last group of interviews and considering the limitation of personal identification as a much more interesting and progressive ideas. In terms of visualization tools to support strategic conversation processes, the flexibility of the material is key to accommodate cultural barriers in the co-design process.

◀ Figure 5: animated sequence presenting visually the interaction of a user using her PDA to book a travel ticket with a remote travel agent.



Narrative storyboards as a co-design support tool for sustainability

In terms of sustainability, the examples presented in the 2 case-stories focused socio-ethical dimensions of sustainability and in particular the “touchy” question of potential conflicts between information technology and privacy protection.

From a broad point of view, the development of information technology is seen as a positive factor for sustainability. The increase of the information flow means most of the time a reduction of the material flow and related need of energy of the system. The diffusion of computer networks, data exchanges, digital communications... tends to reduce drastically the needs for transportation of both goods and people. The general dematerialization of economy tends to reduce environmental impact.

From closer also in the research of new scenarios of living, information technologies tend to play an important role in the activation of sustainable solutions. Networks of users, systems of exchanges, the sharing of products and infrastructures... require better co-ordination and synchronization between people, the faculty to match in real time offers and demands and to enable local groups of users to organize themselves. “Car-sharing solutions”, “solidarity purchase groups” or “local exchange trading systems” as for already quite developed alternatives to the mainstream consumption patterns, are based on booking software managing the fleets of cars, integrated order forms on the web or even simple use of mobile phone and texting.. The information technology infrastructure is key in these solutions to again reduces intensity of transportation, increases and /or intensifies the use of products.

◀ **Figure 6: evolution of one of the visualisations of the narrative from airline to train context in order to overcome personal sensitivity of the participants to the conjuncture.**

On the social side, there is also much to gain through better connectivity and interaction between people. Information technologies tend to offer more layers of communication facilities especially in urban context where modern urbanization tends to isolate neighbours. At the local scale, networking technology has great potentials to support short networks and community building.


As focused in the scenario shown in the first case story, simple peer-to-peer devices dedicated to local communities facilitate linkage, mutual help, exchange and barter, elective relationship building in the neighbourhood.

Said all that, it is important also to focus the potential threat that the diffusion of information technology is constituting for socio-ethical dimension of sustainability.

Information technology may operate also as a barrier between individuals affecting highly direct human relationships, mediating one-to-one interaction through tools, reinforcing individualisation and isolation...

This ambivalence of communication and information technologies is also to be watched within the design of the new sustainable solutions as described before in this paragraph. The increase connectivity between people may leads to too much interaction providing cognitive overflow. The development of communication enablers goes together with the request of filters, authentication, access restrictions... and all sorts of protections from connectivity. In more general socio-ethical terms, the diffusion of information technology is a threat to people privacy. And the development of new sustainable solutions leads very often to privacy trade-offs. Let's take the first case-story as example. Facilitating exchanges in the neighbourhood implies the sharing of personal identification and personal information on personal capabilities and resources available. Matching people means most of the time to be able to localize them at any time. Promoting mutual help means targeting personal profiles and therefore disclosing proper identity. Taking opportunity of socialization implies to be exposed.

The development of promising solutions in terms of sustainability



based on high technological content must integrate privacy concerns and in general the ambivalence of information and communication technologies supports.

The design process of these new product-service systems is therefore a very complex task to balance trade-offs between positive and negative effects of the same solution. On the socio-ethical side in particular, the increase of access to solutions and the maintenance of the quality of the social relationship is a very delicate operation. And in complex social systems involving many players of different nature the design process has to be in the form of a conversation process. Users and all stakeholders must be involved and able to express themselves to progressively define the specifications of the solution taking into account the interests and requirements of each of them. The co-design process is not only a convergence process but also a learning process. Experimenting the solution through simulation tools such as simple story-boards enable to discover new aspects of the problem, counter-intuitive rebound effects that were not obvious at the beginning of the process.

The 2 cases presented and discussed in this paper show the main contributions of the use of story-boarded narratives in a process of co-design of a product-service system between different populations of stakeholders.

In particular, the analysis of the co-design process pointed 2 important benefits of this approach:

1. It facilitates the dialogue, the exchanges and the interaction between actors from various cultural horizons and professional backgrounds;
2. More than a static support of dialogue between parties, it is likely to participate to the co-design process it-self and evolves with it.

In terms of sustainability the examples presented focused socio-ethical dimensions. Other examples could have been brought using the same approach to co-design new solutions in the perspective of sustainability.

Solution notation tools in general and story-boarded narratives in

particular have a great potential to support strategic design processes to investigate the possible improvement of current solution but also they are particularly adapted to system innovation processes to redefine current solution and explore possible new configuration of players to implement them in respect to environmental and socio-ethical aspect of sustainability.





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