

INFORMATION SOCIETY TECHNOLOGIES

AVANTI PROJECT



Added Value Access to New Technologies and services on the Internet



London-Lewisham ♦ Stockholm-Kista ♦ Edinburgh ♦ Ventspils ♦ Fujitsu and Microsoft

## D05 Demonstration Analysis and Assessment Report

### Part 1 Context and Conclusions



DG Info

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AVANTI External Report  
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## Demonstration Analysis and Assessment Report

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### **Approval of this report**

The technical validation of this report will be carried out in two stages. There will be an external and advisory peer review of the draft deliverable. The recommendations from this review will be incorporated by the Authors.

This will be followed by an external peer review delivered intact to the European Commission. Minor updates to the Deliverable may be made at this time before it is sent to the Commission.

**Editors: Angus Whyte, Ann Macintosh (Napier)**



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## **1 Executive Summary**

The report has been divided into two parts; part one “Context and Conclusions” comprises sections 1 to 4. These: -

- Profile the demonstrators and the problems of digital exclusion they were intended to address; and
- Summarise the results and how they were obtained.

The second part of the report, “User Experiences and Added Value”, provides in sections 5 to 7 the full results and details of the feedback sessions, the discussions of added value, and cost-benefit analysis. Also included are literature references in section 7, and two Annexes. The first Annex A gives samples of recorded user feedback and the questionnaire responses. Annex B gives some additional questionnaire responses from Kista.

In Part 1, i.e. this volume of the report, *section 2* provides an overview of the aims and scope of the assessment and its main results. This section provides a context for the evaluation, in the shape of current research on digital inclusion, current policies to support it in each of the cities, related research on avatars and evaluation of ‘conversational agents’, and the methodological issues addressed in the assessment approach. The section sets out the evaluation criteria, which are in turn related to 13 indicators. The results are summarised in the assessment of the demonstrators against the indicators. In all we considered 4 of the criteria to have been fully met, 7 partially met, and 2 not met. Among those that were met was perhaps the most important one – the overall preference of target users for AVANTI compared with alternative current channels. This section also gives the cities’ conclusions on the user requirements that would need to be met for AVANTI to be fully deployed after the project.

In *section 3* we profile the extent of digital exclusion in each of the local authority areas. Each city defines the characteristics of its target groups, and describes how the relevant services are currently used. Then the demonstrators are described to illustrate how they meet service needs, how they appear to the user, and how the ‘conversation’ is structured. The section is organised by city, to show why particular groups have been selected and the size of the target audience for AVANTI, by giving a profile of the percentage of the local population who fall into the categories associated with digital exclusion. Statistics are the most recent available and are given for the local authority area, or the closest available geographic area (e.g. city, region), for comparison with national figures.

In *section 4* each city provides an account of their work in terms of the criteria, indicators, and methods described in section 2. First the section describes how the core criteria and indicators described in section 2 were localised by each city. Each city devised questions that both fitted the local user requirements and provided evidence of ‘accessibility’ and ‘inclusion and appeal’. Then the demonstration feedback sessions are described. These were done in two phases; the first to allow a further design iteration, and the second to give the final assessment. Each city also describes the approach taken to discussion/interviews with managers of service areas interested in the project to assess the added value and cost-benefits.



Part 2 of the report begins with *section 5*, where each city provides their analysis of results from phase 1 and phase 2 feedback sessions, including changes made as a result of phase 1 feedback, and internal users' experiences with developing conversations using the Conversation Builder Toolkit. The analysis follows the main evaluation criteria identified in section 2.

Then in *section 6* the cities describe:-

- Potential benefits to the community at large, based on discussions with service providers from the local authority and civic groups concerned with digital inclusion. This focuses on intangible benefits of deployment of AVANTI in the selected service area and others identified by these stakeholders. The benefits here include the probable contribution that AVANTI would make to strategic objectives, and costs in terms of risks of deployment.
- Cost-benefit analysis. This attempts to quantify the savings that would be likely to come from deploying AVANTI. The major areas of identified savings stem from probable wider take-up of e-government services. However the project also impacts on quality of service and the greater likelihood of success with digital inclusion strategies.
- Each city's generally positive conclusions about the acceptability of AVANTI to its target groups and service providers.





## **2 Introduction and Summary of the Assessment**

In this section we provide an overview of the aims and scope of the assessment and its main results. Before discussing the results the section sets out the context, in the shape of current research on digital inclusion, current policies to support it in each of the cities, related research on avatars and evaluation of ‘conversational agents’, and the methodological issues addressed in the assessment approach.

### **2.1 Aims and Scope of the Assessment**

Wp6 was conceived as a city-led ‘hands on’ stage of the project, for citizens and stakeholders in service provision to assess the benefits of AVANTI’s novel ways of delivering Internet –based services to the public at large. The focus is therefore on usability, seen in the wider context of acceptability, accessibility and digital inclusion. These are all terms that have broad and varying definitions, with little consensus among researchers about what they should encompass. It is important therefore that we clarify what they have been taken to mean for the purposes of the project, and later in this section of the report we use current research to do that.

We also need to be clear about what is and is not covered by the assessment. The AVANTI Technical Annex sets out the 6 aims of WP6, and below we describe how they have been addressed:-

- 1. To develop a methodology for testing the prototypes, and for collecting and analysing user feedback.*

Following preparatory work throughout summer 2002, an initial document (ID6.1) was produced in September 2002 by Edinburgh, with Napier University in an external consultancy role. This described the principles behind the methodology and proposed high level indicators. Napier University then coordinated the evaluation, becoming an assistant contractor in the project in December ‘02. They worked with the cities to agree evaluation criteria and indicators to reflect the project aims and each city’s service area and circumstances; and methods to gather evidence for the assessment of the demonstrators. We comment on the rigour of the methodology and especially the measures taken to ensure representative and valid feedback, in section 2.2.4 of the report.

- 2. To demonstrate the technical feasibility of the prototypes in operational use.*

Getting citizen users’ feedback meant of course that the demonstrators had to be available for that purpose. The report is based on feedback from invited and self-selected citizens, service providers (including front-line staff) and service managers. AVANTI demonstrators were shown to users who fitted selected ‘target group’ characteristics (and some who did not). The sessions varied in length and in the extent to which users had the opportunity to attempt typical tasks that each demonstrator should support. Hands-on testing ranged from about 5 to 30 minutes per user, depending on whether sessions were structured to maximise the number of users or the opportunity for testing. This approach which is described in more detail in sections 2.4.4 and 2.4.5, allowed us to learn from the experience of a broad cross-section of target users. Participants’ responses to the demonstration sessions were recorded quantitatively and qualitatively through questionnaires, observation notes and video recordings of the demonstrations and subsequent discussions. The demonstrators were not deployed to allow longer-term study of their usage as a live service. That was not because the technical



configuration was problematic but because a sustainable service could not be guaranteed beyond the AVANTI funding period, and the difficulties and costs of introducing a fully tested live service for a short pilot period.

*3. To assess the prototypes against the user (citizen) needs analysis (WP3).*

The WP6 methodology pre-dated a documented set of user requirements that could be used as a benchmark for the evaluation. We (Napier) therefore considered the evaluation to be primarily of whether AVANTI made a difference to the acceptability of e-government services, in terms of the project aims. However since the user requirements were documented (post-hoc) early in 2003, we have been able to use them in drawing the conclusions of this report. The timescale for implementing the evaluation framework limited the scope for dialogue with the city partners about local evaluation criteria, and work was delayed owing to the cities' lack of available capacity and skills, as these had to be deployed on the post-hoc user requirements specifications as requested in the reviewers' Consensus Report. The consequent delays have limited the time for analysis and therefore its depth, although we are confident that the overall aims of the evaluation have been met.

The AVANTI user requirements have, to varying degrees, highlighted non-keyboard input as a means of overcoming accessibility barriers. The evaluation includes the feedback obtained from users about the various kinds of non-keyboard technologies that were deployed. These were third party products selected from those on the market, rather than developed within the AVANTI project or by its technical partners. So while it was important to assess how these add value to AVANTI, from the users' and service providers' perspectives, we did not believe it realistic to rigorously compare a range of products with each other, or to test all the permutations that any selected products could have been deployed in.

*4. To carry out continuous quality assessment.*

The assessment was carried out in two 'phases' with the first phase providing feedback to the implementers in each city and the technical partners, to allow them to make changes that were desirable from the citizens' perspective. Apart from these changes, the second phase also allowed the city partners to take stock and adapt their methods, given the phase 1 users' responses.

The methodology has assessed the demonstrator's quality and potential impact mainly by comparison with the cities' existing web-based services, rather than with in-person, telephone or print-based forms of communication. Where possible we have sought to include data on channel usage, as an indication of the relative current take-up by target groups (and thus the extent of the 'divide to be bridged'). In our conclusions from the analysis of target users' interactions with the demonstrators we also make brief references to the literature on human-human conversation.

*5. To assess the socio-economic value to the citizen and community at large. And:-*

*6. To assess the "European added value" of the prototypes*

We considered these aims to be separate but based on the same evidence, namely the social acceptability of AVANTI to target users', and the views of service managers and stakeholders on the potential of AVANTI to make an impact in terms of strategy, service quality and cost-benefits. While the "socio-economic value to the citizen and community at large" was a matter for each city's assessment, there were strong common themes. Thus the "European added value" relates these common themes to current EU policy on digital inclusion.



## **2.2 The Digital Divide and AVANTI**

### **2.2.1 Assessing Digital Inclusion**

The term 'digital inclusion' is a relatively recent one in applied research and policy-making and stems from the growing consensus that the 'digital divide' cannot be reduced to a divide between those who have access to ICTs and those who did not have access to ICTs. This simple 'have' and 'have-nots' access definition has attracted considerable criticism, for example by Wilhelm (2000). He refutes the notion that an information underclass can be defined in terms of access, and argues strongly against the previous definitions given by, for example, Raab (1996) and Civile (1995). He claims that what remains missing from these definitions is consideration of a person's information seeking behaviour, media use patterns, and social or cultural contexts.

According to research conducted on behalf of the Greater London Authority (Foley, et al 2002) the digital divide is not just about socio economic factors. Although low-income, low levels of education, low skilled jobs, unemployment and lack of technology skills are a barrier to the adoption and use of ICTs, the research also highlighted socio-personal factors as important. These factors include low levels of awareness, interest, understanding and acceptance of ICTs. The report concludes that to date most research has centred on the socio-economic elements and that research on the socio-personal has been neglected.

Similarly the digital inclusion strategies of national governments increasingly frame policy initiatives in terms of a web of inter-related factors. For example the report *Digital Inclusion: Connecting Scotland's People*, from the Scottish Executive, lists the following factors as contributors to digital exclusion:-

#### *Perceived or Actual Costs*

- Perceived or actual cost of PCs and other equipment;
- Perceived or actual cost of Web-related phone calls;

#### *Access*

- Lack of near-by/affordable facilities providing public access to the Web/ICTs;
- Lack of work-related access to ICTs and the Web to build skills and awareness;

#### *Skills*

- Lack of literacy and numeracy skills;
- Lack of ICT skills;
- Lack of knowledge/appreciation of the information and services that can be found on the Web;

#### *Cultural Issues*

- Lack of a critical mass of other Web/PC users among community/family/friends;
- Cultural barriers;

#### *Personal Factors*

- Lack of confidence;
- Lack of credit card/bank account;



- Fear of technology;
- A feeling it is too late in life to learn about new technologies;
- No interest in the Internet;
- Physical difficulties such as poor eyesight or manual dexterity and co-ordination.

Rather than a single 'digital divide' indicated by lack of access, digital exclusion has a complex set of indicators. The AVANTI technical annex recognises the complexity of its objectives. It focuses on "the delivery of municipal services across Europe with a particular emphasis on enabling access by those in the community who may be left out, such as the disabled, the elderly, those with learning disabilities and those from minority ethnic groups." The contribution to social objectives is to "enable many citizens who are at risk of falling between the digital divide or becoming socially excluded, to participate in the information society" (pp.4).

It would be wrong therefore to focus solely on those citizens whose reason for not using current e-government services is that they do not have (convenient) access to a computer or the Internet. The growing provision of public Internet access points makes this a fuzzy distinction anyway. There is a much stronger case for targeting those citizens who find access difficult, have little experience, and have (perhaps deservedly) little interest in services that do not engage their attention or address their particular needs and circumstances.

While government digital inclusion strategy has typically asserted the need to combine increased availability of public access points, skills training, and measures to address social exclusion, AVANTI is relatively rare in its focus on the acceptability of the means of e-government service delivery. The relation between acceptability and accessibility needs further discussion, and we return to that in section 2.3 below. Meanwhile we can conclude that we should evaluate the acceptability of AVANTI for citizens who:-

- Have limited or non-existent experience of the Internet, and particularly current e-government services; and:-
- Have social-demographic characteristics associated with social exclusion.

## **2.2.2 Common themes in current practice**

This section provides the local policy context for AVANTI, outlining the city partners current measures to address the digital divide, and referring to national initiatives where relevant.

### **2.2.2.1 Edinburgh**

The development and implementation of the AVANTI project within the City of Edinburgh Council links to the Council's business transformation and modernisation programme: Smart City. The Smart City Vision aims to change the way the Council delivers its services to make them more efficient, effective and customer focussed. It takes as its focus the use of Information and Communications Technology (ICT) to deliver these services by means of a 'city portal' – a single port of entry or gateway to all relevant services and information - across a range of access methods such as the Internet, digital TV, mobile phone, call centre or local one-stop-shop. The key strategic themes of this programme are: Customer Service, Continuous Improvement and Working Effectively, Partnership, Active Citizenship and Maximising Opportunity for All. The AVANTI project and its associated technologies can be seen as a key enabler for the delivery of the Smart City programme by the Council, particularly under the theme of Maximising Opportunity for All.



In identifying the theme Maximising Opportunity for All, the City of Edinburgh Council recognised the importance of its social inclusion policies. Onecity - the Lord Provost's Commission on Social Exclusion (June 2000) - identified six key themes for inclusion: achieving civil rights and social justice; tackling extreme income inequality; excellent communication and information; developing preventive, innovative services; working together across sectors and agencies; and providing the resources for inclusion. In addition, the City Plan for Older People seeks to ensure Edinburgh is a place where older people can live positive, contributing lives; has a positive approach to older people in all its services; enables older people to participate in inclusive, mainstream activities; addresses issues most commonly identified by older people as problematic, such as accessing services; enables older people to remain in their own homes as long as possible; and ensures the welfare and inclusion of those in nursing and residential homes. These policies - Smart City, Onecity and The City Plan for Older People - are all concerned with the delivery of services to the sizeable AVANTI target market in Edinburgh, namely the socially and technically disadvantaged.

Access to computers and the Internet by Edinburgh's citizens is a key goal of the Council. The People's Network supports free public access to the Internet throughout the city's public libraries. Almost £500,000 was awarded by the Scottish Executive's New Opportunities Fund to the Libraries Division of Culture and Leisure. This sum, together with a departmental contribution of 10% match funding, was to enable the installation of a free public Internet service in all Library locations across the city as part of the Government funded scheme - Community Access to Lifelong Learning. One hundred and forty new PC's were installed in city libraries in 2002, operating over the upgraded Metropolitan Area Network. In addition, 170 existing PC's have been added to this network. Fully equipped learning centres have also been provided in nine community libraries and the Central Library. Wherever possible these centres have been located in areas of social exclusion thus fitting in with the principles of the national People's Network which states that "Libraries will play an important part in providing assisted access for those who do not have access to a computer terminal at home and those uncomfortable with electronic media."<sup>1</sup> In addition, this supports the Culture and Leisure Department's (where Libraries sit) own ICT strategy of which a key element is promotion of digital inclusion in line with the Government's agendas and targets.

### **2.2.2.2 Kista**

In Sweden, for a number of years, many authorities as well as the private sector have begun to use the Internet to provide their customers with information and services. For example banks and insurance companies enable customers to handle their financial affairs via a website, and retailers have created websites allowing customers to order goods via the Internet. On the other hand, statistical results (SCB, 2002) show that by the end of year 2002, only 20% of the total of 826224 who are 65 years of age or older use the Internet in Sweden.

The situation in Kista is not much different from the rest of the country. Today, about 29,000 persons live in the borough. Nearly the same number work in Kista, which has a strong and expanding commercial sector. Roughly 9% of the total population in Kista are 65 years of age or older, within which we believe there are many potential Avanti technique users. If we add other groups like immigrants and the disabled, it would be realistic to believe that about 15% of the borough's total population could make good use of Avanti enabled information and services.

Kista's IT policy in the past 5 years, since the formation of the Borough structure, has been outward driven with many different projects and efforts to increase citizen's ITC use and to

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<sup>1</sup> "New Library: the People's Network": the Government Response (April 1998)



decrease the so-called digital divide. The borough's participation in broadband access projects, the EU financed Infosond and CyberVote projects, national financed e-democracy projects are some examples of these efforts. Thereby, the Avanti project is seen as a logical extension of other Kista Borough's outward efforts for providing more effective services over the Internet and specifically via web services. The well-developed Meeting Point Kista – a Front Office concept – is another leading example of the outward efforts and a key point for current Avanti project integration.

### **2.2.2.3 Lewisham**

Local e-Government offers a chance to breathe new life into local democracy and to transform local services. Within Lewisham, e-Government is central to our ambitions to reform and modernise all our public services. It is an integral part of the overall programme to realise the benefits of the internet for all our citizens. e-Government is not an end in itself. It is at the heart of the drive to modernise government, which in itself is about enhancing the quality of local services and the effectiveness of local democracy:

Each year Lewisham publishes its electronic government statement which sets out its objectives for the coming year. Over the life of AVANTI it has been a council priority to improve access to and accessibility of information and services on the internet. As an inner London Borough with areas of high deprivation, the digital divide has been a key concern.

Lewisham is committed to providing services electronically and has signed a PSA (Public Service Agreement) with central Government wherein it undertakes to make all services available electronically by the end of 2003 (1 year earlier than the national target). Within the Borough there are a range of initiatives including London grid for learning ( which includes linking all schools to the internet by broadband : <http://www.lgfl.net/>), The People's Network ( provision of ICT and connection in libraries <http://www.peoplesnetwork.gov.uk/>). Further, there are other national pathfinder projects which are being led from the centre (often implemented in partnership) for example LEAP Life events access project and the regional community portal development. It is within this context of change, development and innovation that AVANTI has been developed locally. It adds value to earlier European Projects such as DALI which established open internet access in libraries and Tellytalk – a video conferencing facility which links citizens to the Council and its partners using a one-to-one videoconference system.

General development of internet information for the council ([Lewisham.gov.uk](http://Lewisham.gov.uk)) and the current project to develop a community information portal further emphasise the growing importance of electronic information and access to services. Lewisham is confident that the AVANTI avatar will play a role in bridging the digital divide and assisting and encourage a range of people to use the internet. We feel that it may be particularly useful in helping to engage those currently dis-engaged from the democratic process – young people, and help with increasing the confidence of new and unsure users (particularly older people).

### **2.2.2.4 Ventspils**

The City Portal aims to develop a single gateway to all relevant services and information. Evaluation of customer needs is at the centre of implementation and in the actions in taking forward this service. Customers are able to access information as preferred through the Internet, mobile phone or local one stop shop.



Services and information are personalised to match user's own requirements and circumstances. A common citizen/property/taxes database ensures that essential information is retained, so that citizens are remembered and services are delivered as promised. Thus bureaucracy is minimised and a focus is being placed on continuous improvement.

In particular, it is intended that the Portal will:

- Realise improvements in productivity, effectiveness and efficiency;
- Improve information resources, external and internal communication within the Council and citizens/businesses to promote innovative thinking and collaboration and to engage Council staff as well as citizens in the process of local decision-making;
- Deliver new "value-added" services to citizens, visitors and local businesses using leading-edge technology to improve their quality of life, their experience of visiting the city or competitiveness.

Therefore the AVANTI project supports the City portal encouraging inclusion in the information society, and the intelligent assistant the AVANTI project delivers, in future may take over the interface to Internet services.

There are national projects Ventspils participates in that directly contribute to provision of Public Internet Access points, namely National United library Information project, Latvian Education Informatisation project, Unified Information System for Local Governments, along with local activities like giving basic ICT education to various less protected social groups like unemployed, disabled or poor people.

Ventspils has partnered with various NGO's like Regional NGO's support centre, Child and Youth support centre and Ventspils Entrepreneur support centre.

## **2.3 Issues in the Acceptability of Conversational Agents**

### **2.3.1 Acceptability, Accessibility, and Usability**

Government efforts to tackle digital exclusion, as we remarked earlier, tend to focus on improving access on the one hand and social inclusion on the other. E-government strategy on the other hand has increasingly focused on improved usability and accessibility (e.g. *Guidelines for UK government websites: Framework for local government* (E-envoy, 2003)). In this context *accessibility* is often tied to emergent standards such as the W3C *Web Content Accessibility Guidelines* (W3C,1999). The terms accessibility and usability are frequently used interchangeably however, and the relation of either to acceptability is not well defined in the e-government literature.

Usability research is relatively longer established than research on 'digital inclusion'. The International Standards Organisation defines usability as "...the effectiveness, efficiency and satisfaction with which specified users can achieve specified goals in particular environments" (ISO DIS 9241-11). Researchers have different interpretations of what this definition means in practice and there is debate about whether it covers all the elements of usability. The three

characteristics of effectiveness, efficiency and satisfaction are a valuable starting point for developing evaluation criteria. According to Jordan (pp. 5-6) “effectiveness refers to the extent to which a goal, or task, is achieved”, whilst efficiency “refers to the amount of effort required to accomplish a goal.” Yet these commonplace terms exclude many of the contributory factors to usability that researchers have identified.

In section 2.3.1.2 we consider how avatars might contribute to the acceptability of a web-based interface. The claim that anthropomorphic interfaces, human-like or cartoon characters that have a ‘dialogue’ or ‘conversation’ with a computer user, are inherently a more natural or acceptable way of interacting with computers, is a controversial one. Nor would linguists claim that natural language processing (NLP) provides software with the capability to play the part of a human in a conversation (see e.g. Button 1992). The concept of a ‘conversational agent’ on the computer screen that understands and responds fluently and obediently to our spoken command is not a new one, and has been criticised by leading researchers on usability and human-computer-interaction. For some (e.g. Suchman, 1997) the idea that software might have the capability for ‘autonomous’ human-like behaviour, and at the same time do our every bidding, rests on poor reasoning and little understanding of the social contexts of computing. For others (e.g. Schneiderman, 1997) the concept lacks empirical evidence that it works, compared with ‘direct manipulation’ of visually represented objects such as ‘desktops’. For others, the arguments against synthetic conversational characters as an interaction metaphor are challenges that can in principle be overcome (e.g. Hook, 2002).

We do not have the scope here for a more comprehensive review of academic evidence for or against the efficacy of NLP or agent technologies. There is in any case very little user-oriented research on its social acceptability (though see e.g. Pitt et al’s work on the KIMSAC project). For our purposes it is enough to consider the ‘conversational agent’ as a metaphor, a way of talking about and working with computers that draws on some aspects of human-human interaction. The key question is which attributes are more or less socially acceptable and usable than the now taken-for-granted metaphor of a web of linked documents – or hypertext.

One of the most widely used schema to relate *acceptability* to *usability* is Nielsen’s ‘attributes of acceptability’ shown in Figure 1 below.

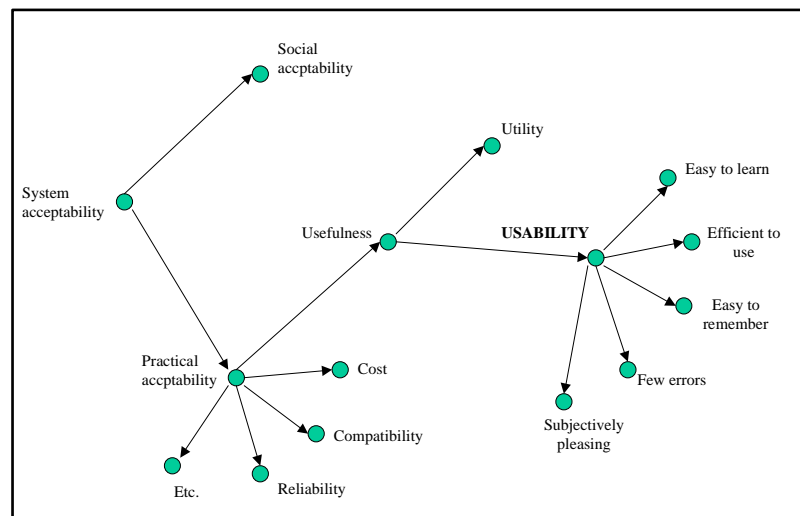




Figure 1. Attributes of acceptability (Nielsen, 1993, pp. 25)

Social acceptability is not however well defined in Nielsen's approach to usability engineering, or addressed by it. Social acceptability is implicitly concerned with whether or not a system's intended users and other stakeholders think the system is a legitimate, worthwhile, or ethical use of resources - regardless of how well it works by other criteria. Nielsen (ibid.) uses the example of fraud detection technologies and it is not difficult to see how similar factors would apply to e-government systems that impact on privacy and data protection.

For our own purposes we can define the social acceptability of AVANTI in terms of the demonstrators' acceptability to the project's various 'digitally excluded' target groups, and the added value that they represent for the community as a whole according to stakeholders in service delivery. Thus our criteria for acceptability ought to include questions of the level of trust and credibility that the avatar-based service has for the target groups. Trust and credibility are likely to be critical factors for any e-government service.

In principle though, the idea that an avatar-based service has a 'conversation' with users suggests that we look at other attributes of social acceptability – whether or not it provides a more 'sociable' kind of interaction that contributes more to acceptance than the equivalent web-based services do. We first consider more conventional aspects of 'practical acceptability' and their place in the evaluation.

### 2.3.1.1 Aspects of practical acceptability

Practical acceptability was defined by Nielsen in Figure 1 in terms of cost, compatibility, reliability and utility, as well as usability. 'Accessibility' could be defined as any and all of these everyday terms. We need to be specific about what we take those relationships to be when we were defining the evaluation criteria. In this section we outline sources for those definitions in e-government and accessibility literature.

#### *Acceptability and accessibility*

A recent *Governments Online* report on electronic consultation (Poland, 2001, p. 9) defines accessibility as follows:-

*Access* means "the real possibility of consulting government information electronically".

*Accessibility* means "the ease with which one can actually make use of the possibility of consulting government information electronically", and is characterised using 7 further aspects:

- *Recognizability and localizability*: the public must know what information is available from which government body, and how and where this can be located.
- *Availability*: the information must be stored in a standard digital form
- *Manageability*: the public must not drown in the quantity or complexity of the information, but instead be able to find their own way through the system.
- *Affordability*: particularly if content has general social importance.
- *Reliability*: i.e. correctness, completeness and authenticity of the information.
- *Clarity*: in terms of content, context and presentation.



- *Accessibility*: to people with visual and other disabilities.

The third of these, ‘manageability’, is defined in terms that are synonymous with usability. More generally, the scope of ‘accessibility’ here is almost identical to that of Nielsen’s ‘practical acceptability’. The latter seems the more appropriate phrase, given that ‘accessibility’ also includes ‘accessibility to people with visual and other disabilities’. It is that aspect of accessibility that is more commonly associated with the term, which has become synonymous with efforts of the Web Accessibility Initiative (WAI), among others, to identify barriers to web access that affect the AVANTI target groups, and to define generic principles against which web design can be assessed. In fact the Web Content Accessibility Guidelines define accessible content as that which “*may be used by someone with a disability*” (W3C, 1999, pp.25, emphasis added).

General principles to improve accessibility distinguish between broad categories of disability. For example Nielsen (2000, pp.298-311): -

- *Visual disabilities*: meeting the needs of people with visual disabilities is considered the most pressing accessibility requirement given the current emphasis on the web as a visual medium. The needs vary for those who are slightly colour blind, through those with impaired vision to those who are completely blind.
- *Auditory disabilities*: these may affect use of spoken audio and video clips, which is expected to increase with “the trend towards multimedia” (ibid.)
- *Speech disabilities*: these may affect use of speech input, including Internet telephony.
- *Motor disabilities*: physical disability can prevent people from easily using a mouse or keyboard, and the ability to use these effectively is of course a learned skill that ‘novice’ users will by definition not have.
- *Cognitive disabilities*: these vary widely, ranging from ‘limited intelligence’, through people with below average reading skills, to conditions such as epilepsy unrelated to intellect, and others associated with ageing, among the most common examples of which is reduced short-term memory.

A key point is that any of these disabilities may be present in various combinations and to varying extents in one individual, and that many are associated with ageing. However the need to consciously address each aspect is recognised in official guidelines for e-government, for example the Guidelines for UK Government Websites (available at [www.e-envoy.gov.uk](http://www.e-envoy.gov.uk))

Some common accessibility problems can be addressed by following web design principles such as the WAI Content Accessibility Guidelines (e.g. by not using fixed text sizes). Others may only be addressed by *assistive technologies* (e.g. voice browsers or screen readers for those with little or no sight). To be more precise, one of the WAI goals is to facilitate the integration of assistive technologies with conventional web interaction methods – hence for example the Guidelines’ recommendation not to use tabular layouts that do not work well with screen readers. This is so that web sites follow the principle of ‘*graceful transformation*’. This means that pages remain accessible whether or not a user has any of the disabilities mentioned above (W3C, ibid.). This is an important principle that we refer to later in our conclusions about the accessibility of AVANTI.

### *Accessibility and usability*

Given that accessibility is commonly understood to cover a broader range of factors than usability what are the differences between them and, conversely, how are they linked? The difference between accessibility and usability is often only implicitly defined. Typically



'accessibility' is used to mean a threshold that is more or less easily crossed by someone with a given set of capabilities, or lack of them (e.g. Arquette, 2002), and 'usability' to mean whether or not that person has a satisfactory experience after crossing the threshold. Accessibility can therefore be seen as a necessary condition for usability, but not a sufficient one. Following a generic set of guidelines does not guarantee that an application will be found efficient, easy to learn, and pleasing to use by those who are supposed to use it.

Usability is, as we have said, a more commonly assessed and researched quality than acceptability. Nielsen's usability attributes, shown in Figure 1, have their counterparts in many usability guidelines, for example Schneiderman's principles for usable interface design (e.g. Schneiderman et al. 1997, PRISMA, 2001). These are to strive for consistency, to provide informative feedback and simple error handling, including simple reversal of action, to support user control of the interface, including short-cuts for experienced users, to reduce short-term memory load, and design for closure (clarity regarding the completion of tasks). These can be summarised using the following categories:-

*Navigation consistency:* the interface should provide consistent cues as to the user's current position within the site organisation, the path taken, and possible routes.

*Error recovery:* the user should be able to 'undo' their previous action, and be guided on what they should do to continue the task without significant distraction or hesitation.

*Flexibility:* differences in user skills and knowledge should be provided for, in terms of navigation (e.g. short cuts for users familiar with the interface) and/or content presentation (e.g. personalisation based on profile preferences).

*Clarity of prompts and instructions:* a user with basic internet experience and no specialist knowledge should be able to understand the prompts and instructions.

Usability therefore entails some of the same issues as accessibility. For example the WAI Content Accessibility Guidelines (W3C, op. cit.) include the recommendations to:-

*Provide clear navigation mechanisms,* such as information about the layout of a site, and different types of search mechanisms for different skill levels and preferences (Guideline 13); and:-

*Ensure that documents are clear and simple* so they may be more easily understood, which also entails a consistent style of presentation across pages (Guideline 14).

These are the same factors that Poland (op. cit.) called *manageability* and *clarity*, and we return to them in the evaluation criteria in section 2.4.3 below. Note however that the WAI Content Accessibility Guidelines often assume that content is presented using a document and page metaphor, since that is the current norm, although the guidelines also promote an approach that separates 'content' from the 'user agent' (e.g. personal computer, mobile phone) used to access it. We consider 'user agents' in more depth below in section 2.3.1.2. We also note that (as their name suggests) these guidelines do not provide guidance on specific interaction mechanisms, especially error handling ones, or on how to assess usability.

### *Utility and relevance*

A question that is related to an application's accessibility yet is different from it, is whether it fits its purpose, in other words its *utility*. Utility is not normally considered an 'accessibility issue', although as can be seen from Nielsen's typology in Figure 1, (following Grudin, 1994) it is strongly related to usability. For AVANTI applications, which are concerned with providing advice and information, utility is also close to what is called 'relevance in context' in the evaluation of information retrieval systems (e.g. Schamber et al 1990)



Relevance is typically thought of as a matter of whether or not the results retrieved by a system are ‘topical’ to the user’s query. However a system may provide advice and information that is topical but, for other reasons, is of limited practical use. These reasons might include, for example, that the information is not provided at the relevant time, in an easily transportable format, or other practical matters of the task at hand. We shall resist attempting an exhaustive list of such reasons, except to say that relevance, utility or ‘fitness for purpose’ may only be assessed by looking at cases of the system being used for the particular purposes it was designed for, and in the settings where it was intended to be used.

The utility of AVANTI can therefore be thought of as partly about the test users’ satisfaction with the relevance of demonstrator results, and partly the more general question of its ‘added value’ – whether for the service areas that are the focus of the demonstrators or other areas that stakeholders think the technology can be applied to from their experience of the demonstrators.

### **2.3.1.2 Designing Agents with Social Appeal**

The practical and social acceptability of e-government services are a key aim of AVANTI, but the demonstrators are designed to promote acceptability by providing the public with what we may call ‘more sociable’ or ‘appealing’ way of interacting than a conventional web site provides. We have already identified ‘manageability’ and ‘clarity’ as key factors in delivering accessibility and usability. In this section we consider how we might expect avatars – synthetic, anthropomorphic or cartoon-like characters – to contribute to manageability and clarity especially when endowed with ‘conversational’ capabilities.

#### *Avatars and agents*

In this report we use the terms ‘avatar’ and ‘agent’ more or less interchangeably, although they have different derivations and applications. To avoid misunderstanding we should be clear about the various uses of the term ‘agent’, and how they relate to ‘avatars’. An ‘agent’ is usually used in computing to refer to software designed to operate semi-autonomously from human control and interact with other (human or non-human) agents to perform functions delegated to it. However that is a very broad definition and two more specific meanings flow from it, the first concerned with accessibility and the second with functionality.

Firstly concerning accessibility, the WAI defines a ‘user agent’ as “software to access web content, including graphical browsers, text browsers, voice browsers, multimedia players, plug-ins, and some software assistive technologies used in conjunction with browsers such as screen readers, screen magnifiers, and voice recognition software” (op.cit. pp.30). This is clearly relevant to AVANTI, which in a sense can be thought of as ‘assistive technology’. However it does not encompass the AVANTI concept, since that includes the idea that avatar characters should be able to perform their task on a range of devices. More to the point, the key AVANTI concept *is* that avatar characters perform tasks that users request, which brings us to functionality.

The second common use of the term ‘agent’ in Computer Science and more particularly Artificial Intelligence (AI) research, is meant to invoke the characteristics of human ‘agents’ (travel agents, theatrical agents etc.). Software agent designers seek to emulate some of these characteristics, especially that agents are themselves ‘intelligent’ but have a role that is limited to certain tasks carried out to provide a service, the user of this service can specify all relevant requirements through a dialogue with the agent, and the user is more interested in the outcome than how it is accomplished. Agents may be designed as anthropomorphic representations of humans, although the concept does not necessarily entail that. Some ‘multi-agent’ systems are



conceived as models of human roles that deliver an outcome through transactions between agents, communicating across networks on behalf of users (Pitt et al 1999).

The term ‘avatar’ on the other hand is associated with graphical characters that may either represent ‘virtual’ humans, or real ones (e.g. Schroeder, 2002). A virtual human is no more than a fictional cartoon character. In the latter case, a synthetic character may be chosen by its user to represent real or imagined aspects of his/her identity to other users, so that they may interact in a shared virtual environment (i.e. usually separated by distance but not time). However in neither case are avatars thought ‘intelligent’. Their appearance and gestures follow a script or are manipulated in real-time by the users they represent.

### *Evaluation criteria for conversational agents*

The term ‘Embodied Conversational Agent’ has come to be used by AI researchers who aim to develop screen-based characters that are so convincing in their appearance and conversational behaviour that they are indistinguishable from real people communicating by video. Although this is a fast developing research area it remains largely ‘in the lab’ rather than in commercial or public sector use.

It is important to note that AVANTI does not seek to advance the state-of-the-art in the ‘intelligence’ of AI conversational agents. It aims rather to provide a toolkit that non-specialists in local authorities can use to create avatar applications, which are framed in conversational terms and should show some ‘intelligent’ properties. Nevertheless the Embodied Conversational Agents (ECA) area of research gives useful pointers to the characteristics of agents that are thought likely to influence users’ responses. Recent work has sought to establish the range of characteristics that should be used to evaluate ECAs.

In developing the evaluation criteria for AVANTI described in section 2.4.4. the feedback from the cities suggested that we focus on the appeal of the avatars as a key factor in their contribution to accessibility and inclusive design. This is echoed in ECA research, an important claim of which is that agents are “attention grabbing and people make natural assumptions about the intelligence and abilities of those agents” (Xiao et al, 2002, p.1). Work by Ruttkay et al (2002, pp.6) for example lists the following factors that should be considered alongside established usability characteristics like those mentioned in section 2.3.1.1 above:-

*Helpfulness*: this is the perception that the ECA “communicates in a cooperative way to assist the user in achieving his [sic] goals and resolving difficulties”. This is related to navigation and the *manageability* of an interface.

*User satisfaction*: which should incorporate “aspects such as likeability and affect”, or the *appeal* of the character and whether the user “would prefer to use it in the future” (ibid.).

*Believability*: an ECA is believable if it acts according to the expectations of the user. Xiao et al point out that this is judged by the user on its look and communicational behaviour, which should be consistent over time. This is related to how we defined clarity and reliability earlier in section 2.3.1.1.

*Trust*: This is “the individual’s beliefs about the extent to which a communicating partner behaves in a way that is benevolent, competent, honest or predictable in a situation”. Again this is related to reliability, but is “determined by the content and services of the application behind the ECA” (ibid.). This is an important characteristic that we consider later as a potential social barrier that AVANTI may overcome provided that the demonstrators are seen to be credible.

*Engagement*: this is described as related to believability. The “relevance of the services of the ECA and its design aspects (aesthetics of body, gesturing and speech) and its ‘personality’” are contributing factors to its *appeal*.



Similar features are proposed by Xiao *et al* (2002), who have more to say about the ‘personality’ of ECAs, which they suggest should be adaptable to the personality of the user. This and other characteristics like ‘initiative’ are beyond the scope of AVANTI. However Xiao *et al* also emphasise that speech quality is likely to affect user views of an agent.

These features usefully elaborate on the characteristics of ‘practical acceptability’ we started with. Although AVANTI avatars have more limited functionality than ECAs, there is a strong case for assessing their acceptability in terms of their appeal. In section 2.4.4 we relate the conventional aspects of usability to the more affective factors described in this section. Cities themselves did this when they drew up the questions used to ‘localise’ the indicators and we return to that in section 4.

## **2.4 Summary of the Assessment Approach**

### **2.4.1 Devising the Methodology**

An appropriate selection of evaluation criteria, indicators, and methods depends on a coherent ‘logic’ for putting these together and analysing the results, in other words the underlying set of assumptions about how to do research. This is often characterised in terms of quantitative and qualitative methodology, but it is possible to combine elements using a case study approach.

A *quantitative* approach, or statistical ‘field experiment’, would be focused mainly on questionnaire design and statistical survey analysis, with the object of evaluating the ‘net effect’ of the demonstrator on certain key variables that would correspond to the evaluation criteria. This would depend on certain conditions being in place. Firstly it would be necessary to define the essential variables and how they vary in the target population. Then it would be necessary to carefully select the user groups, and control groups who would not be exposed to the system. The major drawbacks are that :-

- Control groups would need to be excluded from using the demonstrator services,
- The analysis would exclude all ‘extraneous’ factors, i.e. those assumed to be irrelevant before the evaluation. However our understanding of ‘what works’ in deploying the demonstrators depends on discovering how relevant various factors are.

A *qualitative* approach would be focused mainly on interviews, observation and focus groups. It would not assume that variables could be predefined but would seek to establish them through continual comparison of cases and testing of assumptions. The analysis would be interpretive, based on close reading of field notes and discussion transcripts. It would therefore pay close attention to the particular details of each application area, but comparison between cities would be very difficult. Also since analysis is time consuming and very descriptive, it would be difficult to draw out the design implications in the time available using a completely qualitative approach.

A *case study* approach should combine qualitative and quantitative methods to best effect, and it is this that we have adopted. Common criteria have been used to allow comparisons between cities and application areas, and measurements taken on indicators. However measurement is complemented by description, aiming to distil the experiences of end-users and service providers on the ground, so as to provide recommendations on how to successfully deploy the demonstrators, and conclusions on their overall added value.

## **2.4.2 Rigour and relevance of the approach**

The AVANTI Technical Annex emphasises that in Work Package 6 the methodology used for evaluation and analysis should be “scientifically sound”. Results should be robust and be able to be relied upon to provide valuable and constructive evidence in order to inform the further development and exploitation of the Avanti demonstrator. All research needs a balance between the rigour of the methods and their relevance, and in this section we clarify how this balance has been drawn. Since quantitative and qualitative research methods employ different concepts of ‘rigour’ it is important that we address two main questions:-

- How have we ensured representative feedback?
- How valid is our evidence?

### **2.4.2.1 Representative feedback and sampling issues**

The need to ensure *representative* feedback has statistical connotations that need careful consideration. We also need to consider that in qualitative and case study research, cases are selected to be representative of the conceptual categories or phenomena being investigated, rather than of populations. Similarly in usability research, there is a stress on involving people who are ‘representative’ in a less rigorous sense of having a typical set of skills and experiences, or even in the political sense of representing colleagues or members of a community.

It is important to note that the issue of sampling does not apply only to the number of test users (citizens) recruited to take part. The assessment is not an assessment of individuals but of the demonstrators. The samples required are therefore also samples of test users’ interactions with the system. We also of course need individuals’ opinions about the demonstrators, and a representative range of views. The sampling of individuals has not followed the premises of statistical survey research but we should address the rationale for that.

Our aim, if we *had* adopted a statistical approach to the evaluation, would be to show a correlation between a preference for the demonstrators, and the characteristics that define the theoretical population (the digitally excluded). Our short discussion of the literature on digital exclusion has shown that, although there is some consensus about what these characteristics are, they are very wide ranging. There is little previous research on how particular methods of delivering e-government services impact on digital exclusion, or how that could be measured.

None of that means that we should not have an operational definition of ‘the digitally excluded’, i.e. that AVANTI targets people who have little or limited experience of the selected e-government services and one or more of the social exclusion characteristics that are considered barriers to take-up. However, identifying correlations between AVANTI and such factors would be a complex project in its own right, since the variables that are highlighted in the literature and in the project aims (disability, age, literacy, social deprivation etc.) are already inter-dependent.

There are also other constraints on selecting a statistically representative sample in AVANTI:-

- Sample size calculation depends on random sampling, which would not be appropriate mainly because it would be highly unlikely to provide a usable response rate.
- Sample size calculation depends on an estimate of the rate of acceptability of the demonstrator, and the variability of the target population on all the demographic characteristics that we operationally define as ‘digital exclusion’. This is neither feasible nor desirable since it *presumes knowledge of the outcome of the evaluation*. The



previous research on avatar-based local e-government services that would be required to make such estimates does not exist.

- Moreover we cannot assume that because certain demographic characteristics are associated with digital exclusion in the research literature that the same factors affect take-up of e-government services to the same extent. For example, although elderly people may be less likely to have used the internet, those who do may be more inclined to use it to access local authority services.
- The demographic characteristics that define what the sample is representative of, i.e. the target population to whom results should be generalised, varies a lot between the cities, for example ethnic minorities are a target in Lewisham, but not in Ventspils or Edinburgh (where they are a much smaller proportion of the population). One group's reasons for liking or disliking AVANTI may be entirely different from another. The evaluation should aim to establish what aspects of AVANTI matter, to whom, and why – not to try to statistically control for differences between, say, Vietnamese immigrants in Lewisham and dyslexic pensioners in Ventspils.
- The demonstrators differed between cities, service areas and over time, since changes were (rightly) continually made to them in light of feedback. Within each city, demonstrators varied in the reliability and clarity of particular conversation sequences, in the synthesised speech and other agent characteristics, and in the availability of assistive technologies, quite apart from other circumstances of the feedback sessions. Demonstrator users' overall preferences for AVANTI over other 'channels' may change depending on any of these characteristics, or others we have not considered. We could not assess this simply from analysis of questionnaire results without prior knowledge of which demonstrator (and session) characteristics were the relevant ones to ask questions about, repeatedly asking the same questions with the same users after every change, and testing the same sequences of interaction with them in the same circumstances.

The sampling approach in AVANTI is known as *purposive* sampling. That is, the samples of test users have been selected by purposefully seeking individuals that fit target groups, for example through voluntary groups that serve their interests, and in places likely to help us understand users needs because they are aware of where services are currently provided (e.g. public libraries).

However this does not mean that the size of the sample should be of no concern. The 3 - 5 individuals considered normal for in-depth usability lab testing, or the 6 – 9 people usually involved in focus groups, or the 30 considered the minimum for questionnaires combined with task analysis (Nielsen, 1993) would not be sufficient given the diversity of target groups in each city. In theory these numbers need to be multiplied for each target group and each major change in each city's demonstrator. Since target groups vary in their diversity, and only experience can tell us how that diversity affects their response to the demonstrators, there is no 'magic number' of test users. In practice we have sought between 100 and 200 participants in each city, depending on the range of target groups and the methods used to involve them in testing. We return to the question of how target users were identified and recruited in section 2.4.5 below.

Finally, purposive sampling has also been applied to transcripts and notes made from observing the demonstrators in use. We know that notes made during or immediately after the feedback sessions were a reliable record of problems experienced by users since (at least in Edinburgh and Kista) video recordings of the sessions identified the same kind of problems. Video recordings are a rich source of data but extremely time-consuming to transcribe and analyse. Their analysis involves sampling the exchanges between avatars, their users, and others present



in the feedback sessions and focusing on those that contribute to understanding the user's views and experiences, whether positive or negative. Thus their value lies in understanding 'what happened' in greater detail than any individual participant might describe at the time.

### 2.4.2.2 Validity of the evidence

The validity of case study research is defined differently from quantitative survey research (Yin, 1989). While the emphasis may vary according to the particular qualitative research perspective used to analyse cases, validity encompasses:-

*Construct validity*: or the establishing of correct operational measures for the concepts being studied. In AVANTI these can be seen as the evaluation criteria, and their validity can be met using three tactics:

- *Using multiple sources of evidence*: This is often referred to as triangulation. In AVANTI triangulation of data collection methods has been possible, using questionnaires, video transcripts (in Edinburgh and Kista), observation notes from demonstration sessions, and interview notes.
- *Establishing a chain of evidence*: The principle here is to "allow an external observer - the reader of the case study, for example - to follow the derivation of any evidence from initial research questions to ultimate case study conclusions" (Yin, op. cit. p.102). It is partly the task of this report to demonstrate that, but evidence may also be followed to reports of the demonstration sessions maintained by the city partners, according to the adopted methodology.
- *Participant Review*: Inviting participants to review research findings helps maintain construct validity since it reduces the likelihood of falsely reporting an event, or misrepresenting the various perspectives represented in the case study report. In AVANTI that has taken the form of continued opportunities for city partners to comment on draft reports. However, time constraints have meant that it has not been practically possible for citizen participants to give their feedback.

*Internal validity*: this requires "explanation building", an iterative process of making initial statements about the research data, revising the statement in light of new evidence, and continually seeking other "plausible or rival explanations" (Yin, *ibid.* pp. 113-115). Through the course of the evaluation changes have been made in the indicators used, in light of changes to the demonstrators and users response to them. Draft conclusions have been drawn by each city, and revised in light of new feedback and through the sharing of experiences in consortium meetings. The scope for explanation building has been limited by the time available for analysis, and by the very practical focus on evaluating the demonstrators rather than theory-building for academic purposes.

*External validity* is the basis on which generalizations are made. Yin notes that:

*"...The analogy to samples and universes is incorrect when dealing with case studies. This is because survey research relies on statistical generalization, whereas case studies (as with experiments) rely on analytic generalization. In analytic generalization, the investigator is striving to generalize a particular set of results to some broader theory" (op.cit. pp.43-44, emphasis in original).*

In AVANTI the broader theory we aim to contribute to takes two forms; firstly, the 'best practice' literature that informs policy-making on the digital divide and e-government strategy; and secondly the academic literature on digital inclusion and ICT usage. We should



nevertheless emphasise that statistical generalisation is not possible from the data presented in this report.

### **2.4.3 Shared target groups, criteria and indicators**

To evaluate the overall acceptability of the AVANTI demonstrators, and thus whether they meet the project objectives, we have adopted a core definition of evaluation criteria, indicators and target groups that is shared across the participating cities. These reflect the project's aims of enhancing accessibility and digital inclusion as discussed in section 2, and are described below.

The assessment against the indicators needs to be based on both quantitative and qualitative data. Given that feedback sessions are the main method for gathering data, the quantitative assessment is mainly of users' satisfaction ratings. We cannot however just base the evaluation on those ratings. These would have little meaning without qualitative evidence of why citizens like or dislike the demonstrators. Also, since they are 'demonstrators', or working prototypes, qualitative data is needed to define which requirements are essential for a fully deployed system to be accepted, and to explore the organisational issues that would need to be addressed if the system is to benefit the community at large.

The core target group for AVANTI has been defined to allow local variation, as follows:-

**Citizens who do not use the current online service (if there is one), and/or make limited use of the Internet, and have at least one of the characteristics associated with social exclusion that each city wishes to target.**

These characteristics or specific target groups are detailed in Section 3.

The evaluation criteria were first proposed in an internal report ID6.1 and then revised following feedback from Lewisham. The first set of indicators were drafted on the assumption that the demonstrators would be deployed on each city's web servers so that they were publicly available as an alternative to the current web-based services. They were therefore worded so the assessment could compare usage of avatar-based and more conventional sites, rather than focusing on avatar-specific attributes such as the appeal of the agent character. Following feedback from Lewisham and Edinburgh that the demonstrators would be deployed only on a demonstration basis, many of these indicators (such as service downtime) were dropped and greater emphasis given to the appeal of the Avatar.

Following from section 2.3, we take the overall criterion to be *acceptability to the target users, service providers and other stakeholders*, with the main focus being on the target users. In our discussion of current literature we noted the wide range of factors related to acceptability and digital inclusion. AVANTI addresses the accessibility of e-government services, but accessibility is tied to social, technical and time/place barriers, some of which an avatar-based e-government interface might help overcome. There are many factors, such as the provision of Public Internet Access points that are easy for the digitally excluded to access, that the project cannot directly change but which need to be taken into account. Other aspects of digital inclusion are within the project's grasp – and we discussed these under the headings of practical acceptability, and appeal to the target groups the cities want to include as users of e-government. We also identified relative costs, and utility or 'relevance in context' as important criteria in their own right.

We have therefore broken down the overall criterion of acceptability into further criteria: *accessibility, added value, and inclusion and appeal* which we characterise as follows:-

*Accessibility* means the realistic possibility for members of targeted user groups to access and use the local authority’s digital services, and the extent to which they prefer them over currently provided channels (online or not).

*Added value* refers to the benefits (cost and qualitative utility) of using avatar-based services, as perceived by citizens, service providers and other stakeholders. These may include elected representatives and others who influence policy in the relevant service areas, including other public agencies and partner organisations in the civic sector.

*Inclusion and appeal* refers to the ease with which target users can actually make use of the avatar-based services, and find them useful, relevant, and enjoyable.

In each of the above cases we need indicators that state the nature of the data to be gathered and what that data should show in order to give a positive assessment. Figure 2.4.3 below illustrates the various levels of this framework.

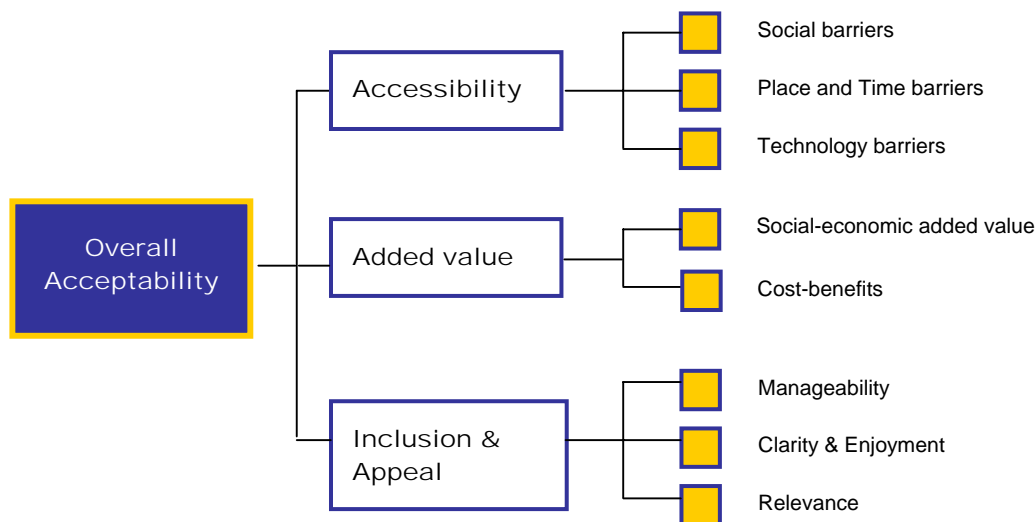


Figure 2.4.3 Evaluation Criteria

The *accessibility* and *added value* criteria broadly represent the outcomes that AVANTI aims to achieve, while the inclusion and appeal criteria represent the means by which (it is hypothesised) the demonstrators should achieve those outcomes. In other words, the demonstrators should reduce barriers to the accessibility of e-government, with tangible (cost) benefits and a qualitative social value. They should do that by providing people who are typically ‘digitally excluded’ with an interface that they find more manageable and enjoyable to use, and which enhances the clarity and relevance of online channels for citizens who want or need to use those services.

Accepting these broad definitions, we then need to clarify what the more detailed criteria shown in the figure above should be taken to mean. For each of the criteria we have provided indicators that are of two general kinds: -

- a) Those that may be assessed according to subjective user ratings of the demonstrators (satisfaction ratings), given in questionnaire responses. The questions to be used to assess these indicators were not pre-specified (although examples were given). Rather the cities used the criteria and indicators for guidance in developing questions to reflect the specific requirements and characteristics of their local demonstrators.



- b) Those that may be assessed on observed user behaviour and opinion, i.e. the extent to which the test users manifestly had problems with the demonstrators or expressed satisfaction with them, whether in the course of using them or in later discussions. Since these indicators were to be assessed on qualitative evidence it was more appropriate to use them as guidelines on what to assess, rather than define more specific statements for each city.

For each of the indicators we have also shown the kind of data that we considered best met the aims of the assessment, i.e. questionnaires, and observation/discussion. Generally, where questionnaire responses are appropriate these should be enriched by discussion data.

We compare the approaches taken by each city in section 3.4.4. Section 4 of the report describes how the indicators were adapted by each city.

### **2.4.3.1 Accessibility**

The criteria and indicators used here should assess how effectively various *barriers to access* are reduced for the demonstrator users or, conversely, how these barriers also affect the target users' use of the demonstrator:-

#### *Social barriers reduced*

These refer to personal and social characteristics that are associated with digital exclusion, such as poverty, language proficiency, literacy, disability, and fear of technology. Reducing these barriers means, in effect, that most people belonging to the relevant target groups for each city should say they would be satisfied with using the demonstrator. The indicator corresponding with this criterion can then be stated as: -

- I-1. A majority of target group users should state that they would use the demonstrator if it were deployed. *Questionnaire***

This can be also regarded as the most important indicator of overall acceptability. Further indicators are needed for the assessment, because AVANTI must be acceptable to various groups that face exceptional barriers to using technology, and in various circumstances such as public internet access points. These cannot be accounted for in simple quantitative terms and so we need further criteria and indicators.

#### *Place and time barriers reduced*

- I-2. Target users should perceive benefits in using the demonstrator to access the service outside office hours, and from home or other locations with Internet access. *Observation/discussion; questionnaire***

- I-3. Any practical constraints on using the demonstrator at Public Internet Access Points should be no greater than for the current online service. *Observation/discussion; questionnaire***

#### *Technology barriers reduced*

These refer to the difference that the non-traditional input/output technologies that are integrated with the avatar system make to the 'threshold' that users cross to make effective use of the e-government services on offer.

- I-4. Target users should be able to complete typical tasks using non-keyboard input at least as effectively with the demonstrator as with the current online service (or its closest equivalent). *Observation/discussion; questionnaire***



**I-5. Text to speech capabilities of the demonstrator should be at least as acceptable to visually impaired users as currently deployed screen-reader software used in conjunction with the current online service (or its closest equivalent).**

*Observation/discussion; questionnaire*

### **2.4.3.2 Added Value**

This refers to the cost benefits and social impacts that all stakeholders who would be affected by the full-scale deployment of AVANTI consider realistic. Guidelines on how this assessment should be carried out were given to the cities, and the approach is outlined in section 2.4.4 and described in more detail in section 5. We foresaw that the benefits would primarily be:-

- Wider take-up of e-government by citizens
- A more effective service to citizens

The first of these, wider take-up, overlaps with our first indicator for ‘accessibility’ above – i.e. a preference for AVANTI among the target users should also indicate wider take-up (since target users are those who do are not current e-government users). We have not specified more detailed criteria and indicators for added value however, for several reasons. Firstly we did not think it desirable to pre-judge the cities’ consideration of the potential qualitative benefits. Secondly the service areas vary widely between cities, and sensible indicators would therefore be very difficult to agree. Thirdly the assessment of added value is more speculative than assessment of the demonstrators by their users, so it would be misleading to use indicators to report the outcomes.

### **2.4.3.3 Inclusion and Appeal**

These criteria refer to characteristics of the avatar-based service that should contribute to accessibility for the target users, and they entail a number of further indicators: -

#### ***Manageability***

This refers to the ease with which target users can navigate the demonstrator and particularly the structure and flow of the ‘conversation’ with the avatar. It also encompasses the accessibility and usability of the Conversation Builder software used by internal (Public Authority) users.

**I-6. Target users have fewer serious problems with navigation, task completion, feedback, and error handling, than with the current online service (where there is a comparable service available).** *Observation/discussion*

**I-7. A majority of target users say they are satisfied with the ease of use of the demonstrator, or that it is easier to use than the current online service (where there is a comparable service available).** *Questionnaire*

**I-8. Conversation management and content integration software facilities should not be considered more difficult to use than the current facilities by their users.** *Observation/discussion*

#### ***Clarity and enjoyment***

This refers to the target users’ enjoyment and ease of understanding the information presented by the avatar (i.e. this criterion is concerned with the content of what the avatar ‘says’ rather than with the structure or flow of the conversation since these are assessed under manageability). It also encompasses the attractiveness of the avatar and screen layout.



**I-9. Target users have fewer serious problems understanding the words and phrases used by the avatar, or displayed in instructions, than with the current online service (where there is a comparable service available).** *Observation/discussion*

**I-10. A majority of target users say they find the language used by the demonstrator easy to understand, or that it is easier to understand than the current online service (where there is a comparable service available).** *Questionnaire; observation/discussion*

**I-11. A majority of target users say they find the avatar and screen layout appropriate for its purpose, or that it is more attractive/appealing than the current online service (where there is a comparable service available).** *Questionnaire; observation/discussion*

### **Relevance**

This refers to the credibility (accuracy, completeness and reliability) of the information provided to citizens. Additionally where the demonstrators provide an information retrieval service, i.e. where users are provided with a range of 'hits' to information related to a question they have asked, the relevance of these results should be assessed.

**I-12. Target users have no problems with the relevance or credibility of information presented by the demonstrator.** *Questionnaire; observation/discussion.*

**I-13. A majority of target users say they are satisfied that information presented by the demonstrator is relevant to their query.** *Questionnaire; observation/discussion*

### **2.4.3.4 Categories of problem experienced by users and their severity**

The categories listed below were used to classify the problems experienced by target users with the demonstrators during feedback sessions, allowing the most common problems to be identified and rated for their severity as follows:-

*Low:* The user could continue after encountering the problem – i.e. a minor distraction; or the user points out something they dislike but which would not affect their choice to use the demonstrator.

*Moderate:* The user had difficulties, but continued or successfully tried alternatives; or said they would be unlikely to use the demonstrator without a particular change.

*Serious:* The user performed the task wrongly, or could not continue without help; or said they would be unlikely to use the demonstrator at all for some reason.

The problem categories are: -

1. *Accessibility:* user has difficulty seeing text; and/or hearing text-to-speech.
2. *Navigation:* user has not enough (or inconsistent) information about their current position in the 'flow' of conversation, where they have been, or what their options are.
3. *Error recovery:* the user cannot 'undo' their previous action, and/or is not guided on the correct procedure so they can continue the task without distraction or hesitation.
4. *Flexibility:* the user does not have the short cuts or alternative methods that they expect for doing repetitive or familiar tasks.



5. *Clarity of dialogue and instructions*: the user has difficulty understanding the language used by the avatar, or displayed in instructions.
6. *Comprehension*: the user does not understand what particular words or phrases mean.
7. *Relevance*: the information presented is not sufficiently related to the user's request (in their opinion).
8. *Credibility*: the user does not feel that the information presented is accurate, complete, or reliable, or they do not trust in the reliability of the service provider.
9. *Context*: the user does not like using the demonstrator, or does not agree that it meets its purpose, for some other reason.

## **2.4.4 The methods used**

### **2.4.4.1 Sources of evidence**

The sources used for the assessment varied according to city and the differences are described in section 2.4.5. In general however: -

- Each city identified target users through local service providers and partner organisations whose clients or members share the target group characteristics. The contact with test users was either through an invitation by the provider or partner organisation – we refer to these as invited sessions – or by attending an event or visiting a place that was normally used by the target group anyway and asking people to take part, which we refer to as open sessions.
- Each city used a combination of hands-on testing, discussion, and questionnaires to get feedback from users and observe how easily they could use the demonstrators.

In more detail, the sources were as follows.

#### *Discussions with service providers, managers and front-line staff*

These were typically one-hour discussions, preceded by a presentation of the project aims and demonstration of the avatar-based service. Since their main role in WP6 was to elicit views on added value, the discussions were structured around key topics for that. The actual questions used by city partners varied of course depending on the service area and participants' own areas of expertise, and are outlined in section 4.

#### *Invited Feedback Sessions*

The format of these was similar to a focus group. Participants were invited to a meeting place equipped with computers – where possible a public internet access point where citizens would be expected to use AVANTI if it were fully deployed. They were given an introduction to the project aims, and then invited to try out both the current web-based service and the avatar-based demonstrators. The sessions were structured to allow hands-on testing by as many attendees as possible.



Figure 2.4.4 Feedback session in Edinburgh

Hands-on testing was structured around *test-scenarios*, i.e. typical tasks that each demonstrator should support were presented on cards, along with the circumstances of a typical user. For example one scenario from Edinburgh's library demonstrator tests was:-

### Joining the library if you don't live in Edinburgh

You don't live in Edinburgh but you work here and would like to borrow books from the library in your lunch hour.

Is this allowed?

What identification documents will you have to show library staff?

The scenarios only gave limited description of the users circumstances. We did not feel it appropriate to develop more extensive narratives, given that the target group included many who would be likely to find that off-putting, especially if they were already wary of using the Internet.

Following the hands-on testing, the participants were asked for their comments about

- Whether they would use it if it were available in future, and for what purposes
- How the appearance and performance of the avatar could be improved

They were then asked to complete a questionnaire. The sessions were video taped (in Edinburgh and Kista) for later analysis. The session facilitators also made field notes to record the main comments and problems experienced by participants.

Invited test sessions were in two phases, with the first running roughly until Easter '03, and intended to allow changes to the demonstrators to be made following feedback. In the second phase there was more emphasis on testing assistive technologies (speech input, screen readers etc.) using this session format.

### *Open test sessions*

In the interest of maximising the number of test users in phase 2, there was much less opportunity for hands-on testing and open discussion of issues. These were similar to the above





in that they were carried out at public internet access points. However the format was rather more like an interview in that the participants were: -

- Presented with information about Avanti, including a short demonstration
- Asked to try out a short task using the demonstrator (one that could typically be performed in several minutes).
- Invited to give their initial reactions, then asked to complete a questionnaire

In Kista, the participants in open sessions were invited to watch a video scenario rather than actually use it.

### *Questionnaires*

The questions were in two general categories. Firstly, questions were designed to identify the test user with one or more of the demographic characteristics used to define target groups, including their level of experience with the Internet. Secondly, the evaluation criteria and indicators were used by the cities to design questions that also reflected the local demonstrators service area and functionality. Questionnaires were distributed in print form to the test users at the end of invited and open test sessions. Generally they were self-completed, but where the participants with disabilities had difficulty in doing so they were given help.

### **2.4.4.2 Analysis**

The evaluation involved quantitative and qualitative analysis of questionnaire responses and qualitative analysis of field notes and video recordings. There were differences in the weight given to each between the cities, which we return to in section 2.4.5, but broadly the analysis took the following form.

#### *Quantitative analysis*

Questionnaires were analysed using spreadsheets to produce basic statistics on the responses from target groups, after first selecting these from all responses received.

#### *Qualitative analysis*

Field notes and video transcripts were analysed to identify problem categories and the more common and serious issues under each category. The test user's interactions with the demonstrator were recorded and the notes or transcript assigned one or more 'problem categories' and 'level of severity' given earlier in section 2.4.3.4. These 'interaction records' were then related to the same users questionnaire (by a name or other identifier) so that it was clear which target group characteristics were associated with which issues. Examples are given in the Annex in section 8 (part 2 of the report).

Themes from discussion during the feedback sessions and from interviews with service providers were also summarised from field notes.

Video recordings of the 'invited sessions' were used in Edinburgh and Kista. Independently of the analysis of field notes, video recordings were played repeatedly to select interaction sequences where users experienced serious problems with the tasks they were asked to do, and discussion sequences where the users offered their conclusions about the demonstrator (Suchman and Trigg, 1991). The aim here was to explore what was going on in more detail, and account for those details. Then the interactions were studied in more detail to relate the categories to the evaluation criteria. This was to identify for example what was happening to make the flow of interaction more (or less) manageable when comparing the demonstrator with



the current web site and to describe how the participants framed their unfolding interaction with the avatar.

The questionnaire analysis may be seen as a ‘top-down’ analysis, since the test users were asked to match their perceptions of the demonstrators to pre-set questions, which in turn were written to fit pre-set indicators. By contrast the qualitative analysis of field notes and videos can be characterised as a ‘bottom-up’ analysis, starting with the recordings of the users experience with the demonstrators and fitting them to categories after first coming to an understanding of how the demonstrator helps or hinders the user to complete a task.

### **2.4.5 Differences in approach between cities**

The approach required a trade-off between the breadth and depth of feedback; breadth in terms of numbers of users; and depth in terms of the time that each user was given to use a demonstrator to carry out a task. This in turn meant a trade-off between quantitative analysis of questionnaires and qualitative analysis of the longer sessions. That balance varied between the cities and can be summarised as in Table 2.4.5 below.

<b>Phase 1</b>	<b>Number of test users involved</b>	<b>Approx. time per user (minutes)</b>
Edinburgh – invited sessions	22	25
Kista – invited sessions	15	30
Lewisham – invited sessions	77	30
Ventspils – invited sessions	54	45
<b>Phase 2</b>		
Edinburgh – invited sessions	68	25
Edinburgh – open testing	109	10
Kista – invited sessions	23	2
Kista – open testing	102	See note
Lewisham – invited sessions	49	30
Ventspils – invited sessions	37	35
<b>Wp6 total</b>	<b>557</b>	

Table 2.4.5 Differences in approach to feedback sessions

Note: in the Kista ‘open testing’ sessions the participants were asked for their responses to a video scenario rather than after testing the demonstrator. This was felt to be the most effective way to minimise time per participant. Results were not obtained until late in the compilation of the report and since hands-on testing was not involved we have included them as Annex B (in part 2).

## **2.5 Summary of the Assessment**

### **2.5.1 AVANTI Users Experiences**

In this section we draw common themes from the city’s results against the evaluation criteria and indicators, and their user requirements. We have focused on areas where improvements could be made to match user requirements stated in *D01 Addendum to User Requirements*.



The evaluation criteria under the accessibility heading are used below to assess the impact of AVANTI on the test users and to describe the social, circumstantial, and technical factors that AVANTI did not affect (whether or not it should have done). Under the inclusion and appeal heading we assess which aspects of the demonstrators contributed to the impact it had. For each of the indicators, we use qualitative data to illustrate or elaborate on the quantitative data from questionnaires, and in some cases the assessment is based on qualitative data alone.

Against each of the criteria and indicators we show one of the following symbols: -

- ✓ Demonstrators met this criterion for all cities
- Partially met
- Not met.

These ratings are based on the main authors' assessment and are intended to reflect each city's own conclusions.

### **2.5.1.1 Social barriers reduced**

The indicator corresponding with this criterion was stated as: -

- I-1 A majority of target group users should state that they would use the demonstrator if it were deployed.** ✓

On the basis of the questionnaire responses this criterion was met, and easily met in all cities except Lewisham. However the qualitative evidence suggests there were minorities whose needs were not met to the full extent implied by the project aims, or which could not be addressed. Note that here we are not talking about aspects of the demonstrator that people did or did not like, or found problematic, as these are discussed under other criteria.

The indicator refers to a simple majority of test users, but the criterion also refers to factors that affected the demonstration sessions but which the demonstrators were unable to affect. These are personal and social characteristics that are associated with digital exclusion, such as poverty, language proficiency, literacy, disability, and fear of technology. In each city there were some test users who could not or would not use the demonstrator.

- All cities reported examples of people who were simply not interested in using computers to access local government services. They tended to be in older age groups, and mostly those aged over 70.
- In Edinburgh, Kista and Lewisham there were cases of people who were willing to take part but could not manage with a keyboard. These are considered under technical barriers below.
- Lewisham indicated that support for British Sign Language might significantly reduce access barriers for deaf people.
- Lewisham's work with ethnic minority communities encountered cultural barriers. Some of the intended test users were not willing to take part because they preferred to deal with the council indirectly, through carers or support groups. There was insufficient evidence to say whether this was because they did not feel confident in dealing with the authorities, were not confident enough in using English, or preferred to seek help through an extended family or faith community rather than through local authority support structures.



Without diminishing the importance of these points, we do not believe that differences in the design of the demonstrators could, within the scope of the project, have made a significant difference in these cases.

Further research would be needed to test the acceptability and appeal of avatar-based e-government services:-

- With text-to-voice capabilities in Swedish, Latvian, Russian and other European languages.
- With support for British Sign Language, whether through animation or video of human signers.
- To people who do not speak the native language of the local authority, especially socially excluded ethnic minority groups, but with support for a language they do speak. Research would be needed to establish which languages should be supported to have the greatest impact on digital exclusion.
- To carers and those they care for, when sitting side-by-side with the carer acting as mediator.

### **2.5.1.2 Time and place barriers reduced**

**I-2 Target users should perceive benefits in using the demonstrator to access the service outside office hours, and from home or other locations with Internet access.** ○

In terms of questionnaire responses a positive assessment of the first ‘preference’ indicator also implies a positive assessment on this one. There were clear indications from all cities except Lewisham that target users saw benefits of online access outside office hours and locations, to the particular services offered.

**I-3 Any practical constraints on using the demonstrator at Public Internet Access Points should be no greater than for the current online service.** ○

The major issues here were:-

- The audibility of text-to-voice for people other than the user. The implications were firstly, that in places such as libraries where noise is considered undesirable, using the demonstrator could lead to disapproval from other members of the public. Secondly, for services such as benefits advice, audibility adds to the risk of invasion of privacy.
- The ‘conversational’ approach entails the user entering more words and phrases than would be required with a web-based interface. This places a greater reliance on input technology which, except in specialist facilities for the disabled, is normally the keyboard. Speech input would only be a viable alternative in public places if sound-



proof booths were provided. Touch screen technology would only allow the user to select from a fixed set of options.

Both of the audibility issues could be addressed by the provision of headphones, securely attached to public access points. However we have no evidence of the acceptability of headphone use.

In other respects the constraints are no more than for a conventional web-based system.

### **2.5.1.3 Technology barriers reduced**

These refer to the difference that the non-traditional input/output technologies that are integrated with the avatar system make to the 'threshold' that users cross to make effective use of the e-government services on offer.

We decided not to include an indicator for technical reliability, because the cities used different platforms for the demonstration sessions on different occasions. However system failures or other problems gaining access to the demonstrator software are relevant to the assessment. The main ones were:-

- The demonstrator could not be used on non-Microsoft platforms (operating system and browser).
- To run the demonstrator, the user had to download and install system library files, and target users would probably not be able to do this unaided.
- Slow response time was a frequent complaint, and the demonstrators would be unlikely to be usable over domestic dial-up connections.
- System failures were frequent in the Edinburgh feedback sessions, mostly when the user attempted to give a 'deep' response. These were where the system was required to break out of the algorithm for a conversation element, to handle a response from the user such as 'pardon' (to repeat the last turn in the conversation).
- In Edinburgh, failure also often happened when data was called from external database sources. Edinburgh's screen layout also made it impossible to display the results of searches so as to enable the user to judge whether they were relevant

In defence of the demonstrators they were a working prototype rather than a fully deployed system, and the technical partners are capable of addressing the above issues in any post-project exploitation.

#### **I-4 Target users should be able to complete typical tasks using non-keyboard input at least as effectively with the demonstrator as with the current online service (or its closest equivalent).** ○

There is no evidence to suggest that non-keyboard input was less effective with the demonstrators than with the current (or any other) web-based service. Arguably speech and handwriting should be easier to use with an avatar-based approach. The avatars drew the user's attention to responding to one specific question or statement, whereas the user of a conventional web page or form is often faced with choosing between several places to enter text. However



we have only limited evidence of any difference in effectiveness from the sessions. Because AVANTI focuses on new and inexperienced users, with a consequent emphasis on using it at public access points, it would be misleading to say that the criterion was met.

Unfortunately, although speech input was tested in Edinburgh, and Lewisham, the results there were not satisfactory without prior training of the speech recognition software to the users voice. The most promising results with third-party software were in Kista, who had successful results with untrained software. However we do not know if similar results would be obtained using speech input with the current online services.

An interesting aspect of the results from both Kista and Lewisham is that the combination of avatar and speech recognition seemed to exaggerate the users' expectations of the 'intelligence' of the system, and its ability to converse as a competent human speaker would. Since these expectations were not met, this would probably result in novice users having a frustrating first experience with the system.

A handwriting electronic pen/tablet was tested in Edinburgh with frail elderly people who had been unable to use the keyboard in a previous session. Their response was very positive, but unfortunately it was not practical to compare the demonstrator and current web site in the session.

**I-5 Text to speech capabilities of the demonstrator should be at least as acceptable to visually impaired users as currently deployed screen-reader software used in conjunction with the current online service (or its closest equivalent).** ●

The text-to-voice capability was thought helpful by visually impaired users in Edinburgh and Kista (Ventspils used a recorded voice that was also thought helpful by their users). However only the Edinburgh demonstrator was tested with blind people who were familiar with screen-reader software in Edinburgh, and they found it less acceptable. Vocalising the user's response would greatly improve acceptability for blind users, as would a more controllable 'replay' function.

#### **2.5.1.4 Inclusion and Appeal**

The criteria and indicators that follow below refer to characteristics of the avatar-based service that should contribute to accessibility for the target users.

#### **2.5.1.5 Manageability**

This refers to the ease with which target users can navigate the demonstrator and particularly the structure and flow of the 'conversation' with the avatar. We consider the Conversation Builder software used by internal (Public Authority) users separately under Added Value below.

**I-6 Target users have fewer serious problems with navigation, task completion, feedback, and error handling, than with the current online service (where there is a comparable service available).** ○

A critical question for the evaluation is whether or not the target users were sufficiently able to



work out what to do next when using the demonstrators, and whether or not they were helped enough when things went wrong. This is a major challenge for agent-like systems such as AVANTI.

The qualitative results from the feedback sessions indicate that:-

### *Users were more confident in getting started*

We should qualify this by saying that most cities found that users needed help to get started. Nevertheless it appeared that users with no or little previous Internet experience had little trouble grasping the principles of using the demonstrators, whereas they often found the complexity of web pages intimidating. However it was not possible to rigorously compare the number of serious problems experienced, between demonstrator and current service. This was partly because the time and tasks spent on each were not controllable, and partly because the current web sites were often not directly comparable with the demonstrator.

### *Users were more confident in handling errors*

Leaving aside the nature of the errors and the clarity of the error messages (considered below), the test users appeared less intimidated by the fact that they had encountered an error. We could not attribute this specifically to the avatar character, synthesized voice, or the step-by-step presentation and suspect each of these contributed.

### *More manageable for staff in intermediary roles*

An interesting point we took from the video evidence from Edinburgh was the role the 'Peedy the Parrot' avatar was given by both the test users and the session facilitators, when handling system failures. It was natural to jokingly refer to the parrot being dead, going on strike, being stubborn (and so on) rather than offer a more technical explanation.

System failures are not desirable, and in most cases the precise cause was not something the facilitators could readily diagnose or explain in terms that could easily be understood by someone unfamiliar with Internet software. However such failures are not unusual for even off-the-shelf software, especially when operating against the unpredictable responsiveness of the Internet. Council staff who provide 'citizen-facing' intermediary roles with computers have to manage and 'repair' situations where a service user needs help with their online task. This appeared to be a more manageable task when helping users with the demonstrator than with the current online service.

An improved ability for human agents to provide a mediated service and/or support at Public Internet Access Points (or remotely) may address one of the major criticisms of conversational agents:-

“A critical issue for designers is the clear placement of responsibility for failures. Agent advocates usually avoid discussing responsibility. Their designs rarely allow for monitoring the agent's performance, and feedback to users about the current user model is often given little attention. However, most human operators recognize and accept their responsibility for the operation of the computer, and therefore designers of financial, medical, or military [systems] ensure that detailed feedback is provided.” (Schneiderman, 1997, pp.6)

### *Failure to anticipate the users' expected response*



This echoes the criticism in the quotation above. The qualitative data from Edinburgh and Kista showed that the responses users expected to give were sometimes not those that the demonstrator was set up to handle. This frequently led to errors, although in many cases users could work around them, in a minority the errors prevented the user continuing. The appropriate wording to use in the avatar dialogue was a result of iterative design, and the sessions proved an indispensable final step.

Users also had difficulties when the avatar presented too much information in a single 'turn' of the conversation. There were many requests for easier 'backtracking' of the conversation.

- I-7 A majority of target users say they are satisfied with the ease of use of the demonstrator, or that it is easier to use than the current online service (where there is a comparable service available)** ✓

The test-users mostly rated the demonstrators positively on ease of use.

- I-8 Conversation management and content integration software facilities should not be considered more difficult to use than the current facilities, by their users.** ●

This was a very ambitious criterion considering the lack of comparable products, and that the comparison is with mature versions of market-leading web content management software, which the cities have recently deployed. The Conversation Builder was successfully used to develop the demonstrators, and in some cases by non-IT specialists (with a lot of frustrating effort). However the criterion was not met, as in most cities the software was considered difficult to learn, unpredictable, and only acceptable for use by IT specialists.

### **2.5.1.6 Clarity and enjoyment**

This referred to the target users' enjoyment and ease of understanding the information presented by the avatar (i.e. this criterion is concerned with the content of what the avatar 'says' rather than with the structure or flow of the conversation assessed under manageability). It also encompasses the attractiveness of the avatar and screen layout.

- I-9 Target users have fewer serious problems understanding the words and phrases used by the avatar, or displayed in instructions, than with the current online service (where there is a comparable service available)** ○

The cities' reports indicate that a great deal of attention was given to the avatar's words and phrases when developing the conversations. This appeared to 'pay off' since the qualitative data indicated more frequent comprehension problems with the wording of website links than with the demonstrator. There were exceptions:-

*Serious problems for non-native language speakers*





This was most evident in Lewisham, who tested with many minority ethnic groups. People who were not confident in reading or writing English were not confident in their use of the demonstrator. The aim of reducing language barriers was only addressed in so far as some non-native speakers found it helpful to see the text and hear it at the same time.

### *Poor support for non-English text-to-speech*

Lack of acceptable text-to-speech capabilities in Swedish was a problem in Kista for phase 1 tests, and lack of Latvian or Russian was a problem for Ventspils. In Edinburgh, non-English speaking groups were not a target group.

Other comprehension issues were more to do with consistency, and therefore could also be discussed under 'manageability' or 'relevance in context'. They were:-

### *Risks of incoherent responses*

Edinburgh's results illustrated a risk that would increase along with the complexity of the conversation. This was that information provided by the user was not recalled in later conversation sequences, resulting in the later sequences confusing the user.

### *Inconsistent application of Natural Language Processing*

The NLP allowed the user to use a variety of synonyms for words when responding to the avatar. The utility of this depended heavily on the 'conversation builders' having correctly anticipated which words the user expected to have to enter, whenever a text response was required. The user's expectations also depended on the cues given by the avatar when asking for the user's response. Getting this right was a result of trial and error for both conversation builders and users. The decision to present discrete options more explicitly as buttons was a response to this, but in effect limits the NLP role in the demonstrator to handling any discrete range of keywords or phrase responses that is too long to display as a list of buttons.

A potentially more significant area of inconsistency was with the use of integrated data sources, which the NLP did not operate on. For example database searches did not retrieve synonyms of the search query. Although there was no requirement stated for this, we would expect the inconsistency to confuse users.

- I-10 A majority of target users say they find the language used by the demonstrator easy to understand, or that it is easier to understand than the current online service (where there is a comparable service available)** ✓

The questionnaire responses showed that in each city a majority of the target users preferred the demonstrator to the alternatives in terms of ease of understanding, despite the issues discussed above.

- I-11 A majority of target users say they find the avatar and screen layout appropriate for its purpose, or that it is more attractive/appealing than the current online service (where there is a comparable service available).** ○

A majority of the target users said they found the demonstrator more appealing than the current alternatives. Clarity of the layout depended on separation of the dialogue from other information that the avatar was 'talking about'. Interesting points were raised about the appeal of the avatar



characters and voice. However we cannot say this criterion was fully met, because there were some visually impaired users who had difficulties with text size and screen colours, and it was not possible for users to control these.

### *The positioning of the avatar*

Different approaches were taken in each city, as can be seen in more detail when the demonstrators are described in section 3.

- Edinburgh displayed the avatar plus speech bubble and user response box, and a separate 'conversation record' in a scrollable text box. No other information was displayed on screen.
- Lewisham displayed the avatar plus speech bubble and user response box, but with no 'conversation record' or other information. In later versions the user could respond with any combination of click button and typed or (when available) spoken text.
- Kista and Ventspils displayed the avatar with speech bubble and user response box, and in a separate area of the screen text and graphics that the conversation referred to. There was no conversation record.

Experience of these various formats have shown that the most usable and useful combination appears to be the Kista/Ventspils approach, but with a record of the conversation like Edinburgh's, and the flexibility in input format developed by Lewisham. This would make it difficult to include a conversation record without cluttering the screen. Also Edinburgh's conversation record was not easily understood by users. The functionality would probably best be implemented with video like controls to replay the conversation, including the user's previous responses. A separate 'print friendly' option should be available.

### *The appeal of the avatar characters*

Users generally more readily accepted the non-human characters (dogs, parrots etc). Human-like characters provoked more partial responses since users wanted them to have 'desirable' human characteristics, however they defined that.

Non-human characters had the indirect benefit of lowering expectations of accurate lip synchronisation. However there were obvious limitations to the scope of some characters. When council service users make enquiries they may be distressed, angry or confused, and would be unlikely to be impressed by the charms of (e.g.) a talking parrot. Although Kista's avatar seemed to have very general appeal, some users in Edinburgh and Lewisham found the avatars patronising, and a sizeable minority of Ventspils users found their avatar 'disturbing'.

Gestures were associated with particular text sequences when building the conversations. However we have no evidence of any influence on the users' responses.

### *The vocal characteristics*

- In Edinburgh and Lewisham the voice was often considered robotic. However this can be fairly easily changed by the cities, by integrating different text-to-voice software.
- The gender of the voice affected users responses, and users should be able to change it.
- In most cities some users found the vocal pace too fast while others found it too slow. Control of the speed would therefore be an advantage. However when Lewisham experimented with this the results severely affected the quality of the voice.

### *Difficulties for the visually impaired*



The demonstrators were in some respects less accessible to the visually impaired than the current web sites, since there was less user control of text size and colour than would be afforded by a WAI compliant web site used with an industry-standard browser. Most cities reported complaints from visually impaired users about text size and colour. These were addressed, although users could not change them themselves.

It would be highly desirable for the AVANTI avatar-based services to follow the WAI Web Content Accessibility Guidelines principle of ‘graceful transformation’, i.e. that content remains accessible despite “physical, sensory and cognitive disabilities, work constraints and technological barriers”. AVANTI already goes some way towards that principle, following Lewisham’s phase 2 tests that allowed users to respond as they wanted, between typed or spoken text, and buttons that could be clicked with mouse (or touchscreen if implemented).

### **2.5.1.7 Relevance**

This refers to the credibility (accuracy, completeness and reliability) of the information provided to citizens. Additionally where the demonstrators provide an information retrieval service, i.e. where users are provided with a range of ‘hits’ to information related to a question they have asked, the relevance of these results should be assessed.

**I-12 Target users have no problems with the relevance or credibility of information presented by the demonstrator. ✓**

We did not expect this criterion to be fully met, but were interested in the issues that affected relevance and credibility. However all of these are considered under other criteria,

- Lewisham’s cultural barriers have been stated under the headings of social, time and place barriers.
- As mentioned under technology barriers, Edinburgh’s screen layout made it impossible to display the results of searches, to enable the user to judge whether they were relevant;
- Ventspils users had trust issues mentioned below.

**I-13 A majority of target users say they are satisfied that information presented by the demonstrator is relevant to their query ○**

This criterion was mostly met, however:-

- Most Ventspils users found the demonstrator content ‘interesting’, but a majority of users did not trust the information presented by it. There is no evidence the avatar was a cause of this.
- In Edinburgh, young people with learning disabilities did not find the library content relevant, and most people would have appreciated wider content.

### **2.5.2 European Added Value: Common Themes**

We did not expect to find any direct synergy between the demonstrator applications. Rather we consider the European Added Value is represented by the common themes to emerge from each city’s reflections on added value. These resonate strongly with the Interactive Public Services proposals of the e-Europe Action Plan 2005.



The Action Plan (pp. 11) calls on Member states to have ensured by the end of 2004 that “basic public services are interactive where relevant, accessible for all, and exploit both the potential of broadband networks and of multi-platform access”. This also “implies addressing access for people with special needs, such as persons with disabilities or the elderly”. AVANTI has addressed these needs, and though it has not successfully met all of our criteria, the cities service providers and users were generally very much in favour of further development. Avatar-based approaches have the potential to stimulate broadband e-government. The demonstrators were not dependent on broadband availability, but this would be highly desirable to address issues of response time.

In each city AVANTI was considered to enhance the authority’s ability to meet its e-government objectives, by supporting digital inclusion. Also in each city there were service providers in areas not directly involved in the project who could identify services that an avatar-based approach could add value to. Indeed there were more of these than could realistically be addressed in the short term.

Within the AVANTI teams there has been discussion around how an avatar-based service should be positioned in relation to conventional web sites. There has never been an assumption that all e-government services could be delivered using avatars. But should AVANTI be seen as a ‘bridge’ for those new to the Internet, or as an ‘alternative platform’ for those who preferred it? Our answer takes into consideration the novelty of the approach, the effort needed to build ‘conversations’, and the feedback from demonstrator users. The greatest potential for added value lies in:-

*Avatars as a user-selectable alternative method of performing complicated tasks.*

It would be more appropriate to focus on readily identifiable transactions than on large-scale applications for browsing information. Help with form-filling is the clearest example. It was well received by Kista and Ventspils users. Although the Edinburgh demonstrator did not include form-filling this was often cited by new/infrequent Internet users as something they found intimidating, and by service providers as a ‘high payoff’ application.

*Service areas that are not well served by existing channels.*

Edinburgh and Lewisham faced some criticism from a minority of users and stakeholders in partner organisations, that selected service areas were already well served by the off-line channels. Ventspils positive response was in contrast to a poor perception of the off-line channels among the test users. Kista’s e-parliament and Lewisham’s e-survey application were well received as new channels for the public’s voice in decision making.

The users’ preferences for the AVANTI demonstrators over current alternatives are an indication that cost benefits from wider take-up of e-government services would be realisable. These could be substantial, even allowing for the fact that responses from demonstration sessions might not accurately reflect actual take-up. However the estimates are speculative, as it is not possible to statistically generalise from the samples used. Lewisham did not think it realistic to quantify any estimates, but would justify costs on the basis of higher quality of service and the increased possibility of meeting e-government strategy aims.



## **2.6 Conclusions: AVANTI and Digital Inclusion**

Here we draw on the previous section's assessment of the demonstrators against the criteria and indicators, to state the user requirements in D01 Addendum that would need to be met for full deployment. We also draw conclusions on the added value AVANTI represents, and make further recommendations on the organisational needs for a 'conversational approach' to e-government development.

### **2.6.1 Conclusions on the Users' Requirements**

The D01 Addendum pointed out that users have a major difficulty when expressing requirements about new developments that they have no experience of. Thus many of the user requirements stated in D01 Addendum do not state unambiguously what a deployable avatar-based system must do to be acceptable to its target users. Clarification of what users need and want is also an outcome of the project and, to that end, many of the stated user requirements can be read as general comments based on ongoing user feedback. Nevertheless we are now in a position to draw conclusions about what would be required for a fully-deployed system to be acceptable.

Below we give each city's conclusions about requirements that would be essential to deployment.

#### **Edinburgh**

##### ***Toolkit / User requirements***

In terms of the look and feel of the demonstrator improved *avatar voice quality and clarity* and the ability for users to *choose the character* were identified as requirements. In addition, the ability to change text size, screen colours and contrasts to improve viewing for users with visual impairments would be a necessary feature of AVANTI in the future.

A rolled out AVANTI service would have to be capable of more intelligent handling of user responses to recognise a wider range of inputs as well as *mis-spellings and different ways of phrasing responses* to avoid the user having to re-enter information when it is not recognised. This would include the ability to handle open-ended user input at any point in the conversation. The system would be required to have the ability to facilitate user navigation through the system by presenting the user with information relevant to them, based either on specific or general characteristics of theirs, rather than the full range of available information. This could be based on either the user's *personal profile* accessed through an authentication process or by navigation to the correct part of the system as a result of the user's input at the beginning of their session with the service.

Within the Libraries service the system would be required to allow the user to undertake transactions available to Library users such as renewing books, searching the library catalogue and completing applications as appropriate. In addition to the Libraries service an AVANTI service would be required to support a wider range of information and transactions from other key service areas of the Council.

From the service provider perspective there is a requirement for a *more intuitive, manageable conversation builder* to allow business users to easily create information flows and test run them without significant time input or technical knowledge.



For a roll out of AVANTI certain access issues would have to be addressed. The ability to fully integrate alternative input methods such as voice and handwriting recognition to obviate the need for users to use standard keyboard and mouse if desired/required would be essential in a rolled out service. Furthermore the service would be required to be available to users in convenient locations with easy initial access requiring not more IT skills than are assumed for a user of the service itself.

### ***Skills / Resource requirement in Edinburgh***

Within The City of Edinburgh Council a number of skills and resources would have to be in place to support and manage the rollout of AVANTI. In particular skills would be required among staff to undertake work with citizens to develop scenarios to be used in the AVANTI conversations and test their use in practice to ensure that information is appropriately presented and follows a logical flow. This work would require to be co-ordinated across all relevant Council service areas to ensure *consistency and coherence of approach and design*. Appropriate management support and direction would need to be in place to oversee this work.

Council staff would need to have relevant skills to undertake development and maintenance of conversations and to provide support to citizens using the service. This would include basic technical help and sufficient knowledge of the system to be able to advise on use and navigation.

Input would be required by Council staff into the promotion of the AVANTI service in general and in particular as an alternative channel open to all in order not to create a new divide or perpetuate the exclusion of anyone not using standard web based services.

## **Kista**

### ***User perspective***

The overall response from the user tests and also from other people that have seen the application in Kista during the open test sessions are very positive to the use of Avatars and a dialog based interface on the web. Most people would like the city to have web pages like the one we have demonstrated, especially when it comes to complex matters and areas where the citizens feel need of extra support.

The voice recognition part of the test showed us that this is a specific area that we feel needs quite a lot of experiments and training before it can be developed into a usable tool for the target group when it comes to Avatar based applications like the one we developed in the project. The test persons liked the voice recognition functionality when it understood what they said, but the risk of failure was too high with the existing demonstrator. You also need to think about the restrictions of the voice recognition functionalities when you design the dialog, which we did not take into account when we designed the dialog in Kista. (We just added the voice recognition software to the existing developed dialog).

The text to speech function was accepted right away without any specific comments other than it felt like a very natural function when interacting with the Avatar.

The users did express some concern about how the Avatar based interface would be experienced when it was "loaded" with a higher number of available services. Will the dialog be experienced as tedious and complicated with a higher number of available services? Further tests needs



certainly to be done in this area to find the “best practice” of designing the dialog in an environment with many available services.

From the perspective of the initial user requirements from the SOR we can say that these requirements from the user perspective are met by the application.

### *Service provider's perspective*

Perhaps the most important factor that needs to be obtained before rolling out Avanti in Stockholm/Kista is to get top management support for the Avanti approach to e-government services.

The management have understood that the experiences from the user tests is very positive but before important decisions can be made additional consequence analyses certainly needs to be done. These include:-

- What is the consequence on business processes/information processes?
- What is the consequence on the organisation of responsibilities?
- Which technology platform is relevant for Stockholm – how does the platform fit into the existing IT-infrastructure?
- What further education do we need and which staff would require it?
- Extended cost/benefit analysis!

The experience from the implementation of the application further indicates that the development environment around the “conversation builder” does need some important redesign. We can say that some parts of the initial user requirements (from the SoR) about the back end user interface have not been met. The requirements says that; “The back end user interface for conversation development and programming will: be easy and user friendly to update and alter content, not be more time consuming than current services”. These two requirements have not been met by the toolkit because you need an IT professional to handle the conversation builder. Further comments are given in section 5 of the report.

## **Lewisham**

### *User preferences*

From the user's perspective, it was often found that people wanted to press the screen to activate the click button, this may be due to the realistic look of the buttons, therefore, introducing touch-screen technology would be beneficial to the users. It was suggested that a language translator would be very useful for people who did not have English as a first language. Lewisham residents would be inclined to use the demonstrator if it was located in a place that would be easy to get to. It would also need to carry a variety of services in order to encourage a wide use by residents.

The aspect of the demonstrator that people liked least was the rolling text and the lack of the ability to backtrack through the conversation on the occasions when the user had been distracted and missed the next question. Addressing these aspects of the demonstrator would further encourage its use.

The people who suffer from disabilities need further help such as, careful choice of colour use on screens and the addition of a signing capability such as a human avatar for deaf or hard of



hearing users. The deaf users stated that it was necessary to use a video clip of a human signing because current avatar software does not provide the degree of movement required to make the necessary signing gestures.

#### ***Service providers and Front-line staff***

We specifically asked the front-line service providers for their views on how the AVANTI service could be deployed through the council and they identified that they liked the key functions and facilities the system could provide. These members of staff gave the following ideas of ways to enhance the users experience of an AVANTI enabled service:-

- Use touch screen technology
- Provide a sound-proof booth
- Use simple language
- Make the microphone less sensitive as old people tend to shout
- Give a reply option

They also felt that they needed to carefully monitor implications of implementing an Avanti service in parallel with a fully functional operational service, which is dealing directly with the public.

#### ***Services users would like to use on AVANTI – Target users***

The users were asked what services they would use on the demonstrator if it were available. Below is the long list of what they would like to use the demonstrator for.

- Housing benefit
- Council tax information
- Community services – dustbins; abandoned vehicles; etc.
- Employment services
- Library information
- Sports and recreation
- Browsing the council web site
- Health information
- Community Safety
- What's on in and around the borough
- Sessions for the elderly to learn to use the PC and its services
- Council minutes
- To talk to individuals
- Schools
- Recycle, removal of dumped cars, drainage i.e. sewers, road closure, traffic in the borough
- Refuse service and reporting problems such as abandoned vehicles and tracking the progress made on such reports.
- Council housing repairs





- Lighting not working
- Regeneration grant
- Waste disposal
- Clearing dustbins, cutting trees, removing unwanted, untaxed cars blocking the road, broken steps and holes in the pavement

### *Services users would like to use on AVANTI – Service providers*

- Schools and education
- Business rates
- Housing benefit
- Council tax information
- Community services – dustbins; abandoned vehicles; etc.
- Employment services
- Library information
- Sports and recreation
- Browsing the Council web site
- Health information
- Community Safety
- What's on in and around the borough

### *Skills or resource requirements for Lewisham*

The majority of users found the demonstrator very easy to use, however, there was a lack of confidence among the elderly when using the application. Even among this group, the returned questionnaires indicated that once they had used the demonstrator, they also found it easy to use. In order to boost confidence among this group, it may be necessary to provide fully trained staff to coach the new and first time users.

### **Ventspils**

Actions required to successfully roll out AVANTI based on user responses:

1. To make the use of it more efficient, because only 34 % of target users rate AVANTI in Ventspils City portal as 'efficient'
2. To make the use of it easier, because elderly people find it difficult to interact with computers in general
3. It should provide an interface for customisation of data interpretation
4. It should be capable of answering specific questions about given amount of data



5. It could be very reasonable to create Latvian NLP to integrate in AVANTI, as well as Russian
6. To create many different skins for assistants to meet the users needs
7. Creation of user accounts for users so as not to repeat the same information every time he/she logs in
8. Ability to create dialogs with minimum effort from content provider

The skills that would need to be in place are:-

1. Knowledge to work with the content management system of the assistant
2. A basic understanding of components and the flow of conversation
3. Knowledge to work with the conversation builder

## **2.6.2 AVANTI as a conversational approach to e-government**

Finally, the development of the ‘conversations’ relied on extensive knowledge of how people currently converse with front-line service providers, and how they should do so with an avatar. The cities added to their skills in doing this, and this had the benefit of drawing attention to areas where existing web site content accessibility needed improved.

To view interaction between systems and users as a ‘conversation’ is not new, but the AVANTI approach forces developers to take it more literally than before. Recent developments in user participation in systems design that would support a conversational approach include:-

- Ethnographic studies of how users converse across current channels. This involves detailed description of how language is used to accomplish tasks and establish their context. Our analysis of Edinburgh’s sessions was influenced by this approach (for an overview see Anderson, 1997).
- Scenario-based approaches to understand how the intended users (citizens and front-line staff) think conversations *should* flow. The term ‘scenario’ has various uses in systems design but usually means some variety of narrative or model of how designers intend the interaction with a system to work in practice (see Rosson and Carroll, 2002).
- ‘Wizard of Oz’ approaches to early prototype testing. Here the prototype user interacts with an avatar, which is controlled remotely by a member of the design team responding to user requests according to a script (see Maulsby et al 1993).

Kista made the most use of scenarios in developing their conversations, as described in section 5, so it is appropriate to end this section with their comment:

*Going from a traditional design of web interfaces to an Avanti approach is like going from an inside out perspective to a strictly customer or citizen oriented perspective. This shift in perspective is a small revolution and it has a lot of consequences for the development of e-government services compared to the current traditions.*

In a separate research report on the project Olov Forsgren will consider an alternative design methodology to address the avatar-based approach.



# Demonstration Analysis and Assessment Report

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### **3 Digital Divisions in Four Cities**

This section profiles the extent of digital exclusion in each of the local authority areas, defines the characteristics of the target groups, and describes how the relevant services are currently used. Then each city’s demonstrator(s) are described to illustrate how they meet service needs, how they appear to the user, and how the ‘conversation’ is structured.

The section is organised by city, to show why particular groups have been selected and the size of the target audience for AVANTI, by giving a profile of the % of the local population who fall into the categories associated with digital exclusion. Statistics are the most recent available and are given for the local authority area, or the closest available geographic area (e.g. city, region), for comparison with national figures.

#### **3.1 Edinburgh**

##### **3.1.1 Digital exclusion in Edinburgh**

###### **3.1.1.1 Social-demographic profile**

	<b>Local</b>	<b>National</b>
<b>No computer or Internet access</b>	Edinburgh	UK
This heading covers several related figures ( <i>from source 2</i> ):-		
Adults who have <i>never</i> used the Internet:		<b>38%</b>
Percentage of the above who say they have not used it because they:	Not available	
- have no computer or Internet access:		30%
- lack confidence or skills		26%
- lack interest		42%
		<b>62%</b>
Adults who <i>have</i> used the Internet, who:-		13%
- Do so less often than once a month ( male )		19%
- Do so less often than once a month ( female )		83%
- Have never used or accessed government/ official services		



<b>Aged 55 or over</b>		Scotland
Scottish Census figures are given for the percentage of people in age bands 60-64 and <b>65+</b> . The figures shown in bold are for the latter ( <i>Source 1</i> )	4.43%	5.17%
In the UK generally, the percentage of people who have never used the internet rises to 55% for the 55-64 age group and 85% for those aged 65+ ( <i>Source 2</i> )	<b>15.4%</b>	<b>15.9%</b>
<b>No formal education after age 15 (or equivalent qualification)</b>		
Scottish Census figures show the percentage of people aged 16-74 with no qualifications, or without a qualification requiring post-15 education. (source 1)	<b>42.83</b>	<b>57.92</b>
<b>Resident in area of high unemployment or deprivation</b>		
Population of areas designated as Social Inclusion Partnerships (source 3)	<b>22.53%</b>	
<b>Ethnic minority group, or does not use the majority language as first language</b>		
Scottish Census figures show the percentage of people who describe themselves as belonging to white and non-white ethnic groups. The figures shown are for the latter. The largest non-white populations in Edinburgh are Pakistani (0.88%) and Chinese (0.79%). ( <i>Source 1</i> )	<b>4.07%</b>	2.01%
<b>Long-term illness</b>		
Scottish Census figures show the percentage of people with 'any long-term illness, health problem or disability which limits daily activities or work'.	<b>17.2%</b>	20.31%
Also relevant is the percentage of people who provide unpaid care to family members, neighbours or others because of long-term physical or mental ill-health, disability, or problems relating to old age.	<b>8.66%</b>	9.51%
Physical impairment	N/a	N/a
Visual impairment	N/a	N/a
Hearing loss	N/a	N/a
Learning difficulty (including short-term memory loss, dyslexia)	N/a	N/a
Limited literacy	N/a	23%
An "International Adult Literacy Survey" ( <i>source 4</i> ) carried out in 1996, concluded that 23% of adults in Scotland may have low skills and another 30% may find their skills inadequate to meet the demands of the "knowledge society" and the "information age".		



#### Sources

1. General Register Office for Scotland (2003) *Scotland's Census 2001: Key Statistics for Council Areas and Health Boards*
2. Office of National Statistics (2003) *Internet Access Households and Individuals 29 April 2003* available at: [http://www.statistics.gov.uk/press\\_Release/CurrentReleases.asp](http://www.statistics.gov.uk/press_Release/CurrentReleases.asp)
3. Capital City Partnership (2001) *Annual report 2001 Technical Annex Part A: A Statistical Picture*
4. Consortium of Govt Depts and The Basic Skills Agency. (1997) *Adult Literacy in Britain*

### **3.1.2 Service delivery and current usage**

#### **3.1.2.1 Services selected for AVANTI**

##### *Libraries and Information Service*

After initial investigations into an application area of information on recreation services in the city, the Libraries and Information Service was chosen as the most ideal area for development of the Edinburgh AVANTI demonstrator. This service would provide information on key library services and also a search function for information on all Council Services.

The Central Library, 25 Community Libraries and 4 mobile Libraries are key community information points in the city with a large volume of phone and face-to-face enquiries received every day. In 2001-2002 Edinburgh Libraries had over 115,000 borrowers and recorded almost 2.2 million visits by people looking for a diverse range of services far wider than simply borrowing books. It was felt that, given the current focus within the Council on the role of libraries as information providers, community support and education centres and locations for enabling electronic service delivery, that this would be an ideal application area for AVANTI in Edinburgh. The combination in the Libraries service of management support for actions addressing the digital divide, the availability of technology facilities and the many citizen groups who could be involved through the Library created the perfect environment for AVANTI development.

#### **3.1.2.2 How citizens contact the council**

The figures for 'offline' channels shown here are for enquiries to *the Central library only*. A standardised procedure for collecting data on enquiries to Edinburgh's Community Libraries is currently being implemented, but unfortunately no historical data is available.

	<b>Enquiries</b>
In-person	133722
Phone	44578
Letters/ Fax	283
E-mail	2038

A direct comparison with the number of web visitors, or visits, would be misleading since the web is a 'self-service' medium and there is no data available on how many visits correspond to an enquiry.



### 3.1.2.3 Web statistics

Figures for the same period show a steady increase in traffic to the library web pages on the 'CapInfo' site. As expected there are seasonal trends in the volume of site visits, with decline in the main holiday months of August and December.

2002	Visitor sessions	Unique visitors	Total hits
Apr.	13670	7599	37980
May	13433	7034	29381
Jun.	11036	5852	39082
July	11788	6089	42222
Aug.	9035	6619	31012
Sep.	13513	9531	43187
Oct.	18431	12506	63825
Nov.	19733	13203	68162
Dec.	14201	11422	42609
<b>2003</b>			
Jan	22087	16667	64516
Feb	22554	16719	64866
Mar.	13102	10022	49722
<b>Total</b>	<b>182583</b>	<b>123263</b>	<b>576564</b>

Table 3.1.2.3 Library site traffic

Notes:

1. Stats for unique visitors include figures for "Whats New" page from April 2002 - March 2003, figures for the Capinfo search page from June 2002 - March 2003. Visitor sessions and Total hits figures are for library pages only.
2. Mar 03 figures are to 18 March.

### 3.1.2.4 Target groups' use of the service

An online survey was linked to the library website between March and June 2003 to gain feedback and knowledge of the effectiveness of the library website and demographics of its users. Also a survey of adult library users is carried out periodically, the most recent one in November 2001. However the methodology differs – for the library user survey, questionnaires are handed out at library locations.

From the responses to these:-

- 67% were aged 25-44, while only 6% were over 55. By contrast the library users survey results state "The largest user group by age is 25 to 44 year olds, who make up 33% of library users, with slightly more older people (45+) using the service than expected from Edinburgh's population".
- 4% had a disability making computer use difficult. This compares well with the library users survey results, which stated that "1.2% of you said that you had a visual difficulty, 0.6% a hearing difficulty, 1.2% a physical disability and 0.9% a learning difficulty.
- 75% had university-level education, while only 13% had no formal education after age 15. Comparative figures are not available from the library users survey.
- 94% had been using the internet for one year or more



- 91% use the Internet more than once per week

This suggests that the AVANTI target groups are heavily under-represented as users of the library pages. It should be noted that since this was an online survey the sample was self-selected and so generalisation from these figures or comparison with the library users survey would not be statistically valid.

### **3.1.2.5 User satisfaction levels**

Response statistics show that 44.9% of users 'agree' that the library website looks appealing enough to use regularly and in terms of text size and colour a further 61.9% of users 'agree' that the library pages are easier to read. In total 49.5% of users felt that the Library pages were a reliable source of information. As noted above, however, the AVANTI target groups were not well represented in the online survey.

In terms of Council online service delivery as whole a citizen consultation on access and accessibility to Council services in 2000 rated the Council slightly worse than other service providers in the following service attributes: convenient opening hours, providing help and services from a single point, convenient location and speedy service. It was recorded that there is a growing desire amongst consumers for online access to Council Services with 42% stating they would like to use the website in the future compared with 8% who use it now. Seventy-five per cent of respondents expressed support for the Council's proposed Integrated Customer Services Arrangement where customers will be able access to the Council through Internet-based services as well as call centres and one-stop-shops. 64% of these respondents stated their preferred location of kiosks with online Council services to be the library.

### **3.1.3 The selected target groups**

Edinburgh's city portal covers information on a wide range of services and has changed significantly during the period of the project. Although the demonstrator focuses on the library service it extends beyond it. Thus to define the target group in terms of previous use of the library web pages would be misleading, and we have instead based the overall target group on patterns of internet use and social exclusion as follows:-

*Citizens who have never used the Internet, OR use it less than once per month, OR have been using it for less than a year AND at least one of the following:-*

- *Age 55+*
- *No further or higher education*
- *Unemployed or resident in 'low income' postcode sectors*
- *Visual, hearing or physical disability making computer use very or quite difficult*
- *Learning disability*



## 3.1.4 Edinburgh's demonstrators

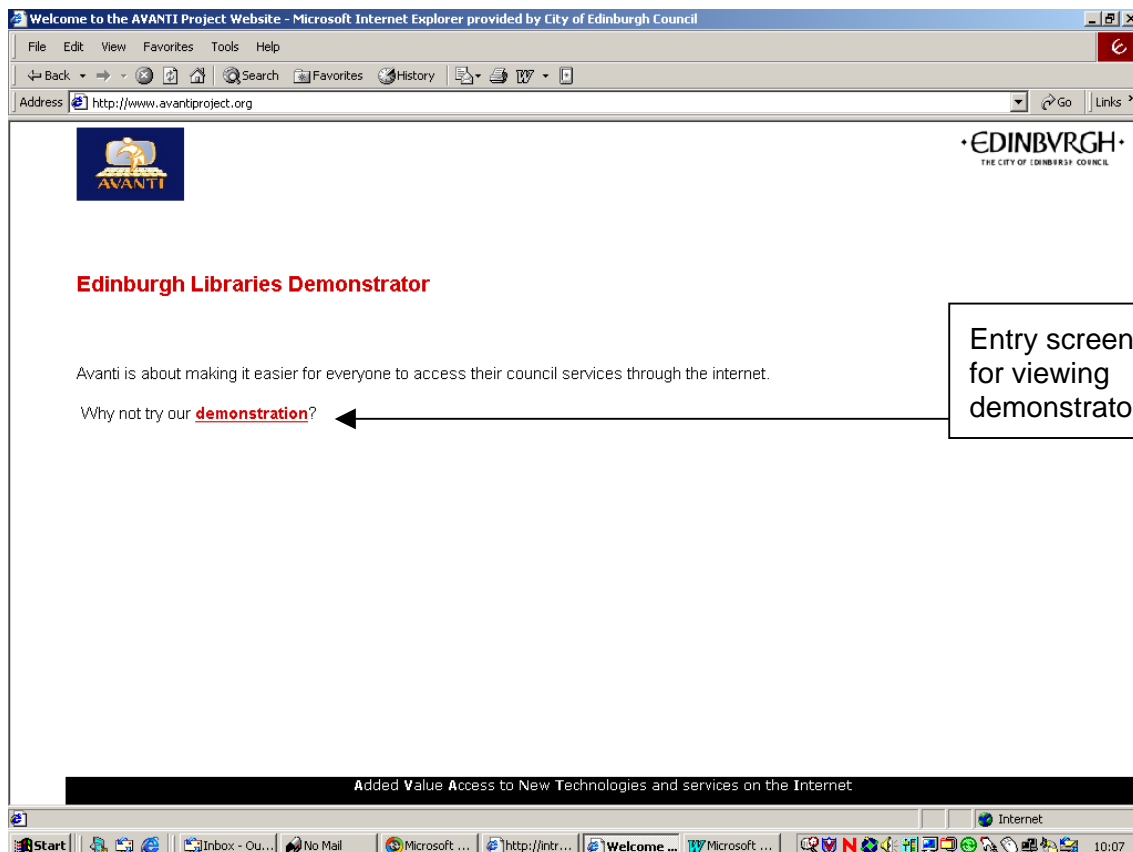
### 3.1.4.1 The application area

The Edinburgh demonstrator is focussed on the area of Libraries and Information Services which is contained within the Culture and Leisure department of the City Council. The AVANTI service supports the following information and transactions: -

- Information on procedure and requirements for joining the library depending on status (i.e. age and residency in Edinburgh)
  - Database search for nearest library by postcode or address
  - Information on services provided by Libraries for elderly or disabled
  - Travel cards for elderly, blind or disabled people
  - Home book delivery and lifts to the library
  - Resource centre facilities and equipment for disabled users
- Search the Council's A to Z of services database for all services the Council offers
- Access to the Council's Frequently Asked Questions (FAQ's) database relating to all aspects of Council service provision

### 3.1.4.2 Presentation of the agent interface

Figure 3.1: Demonstrator Entry Screen



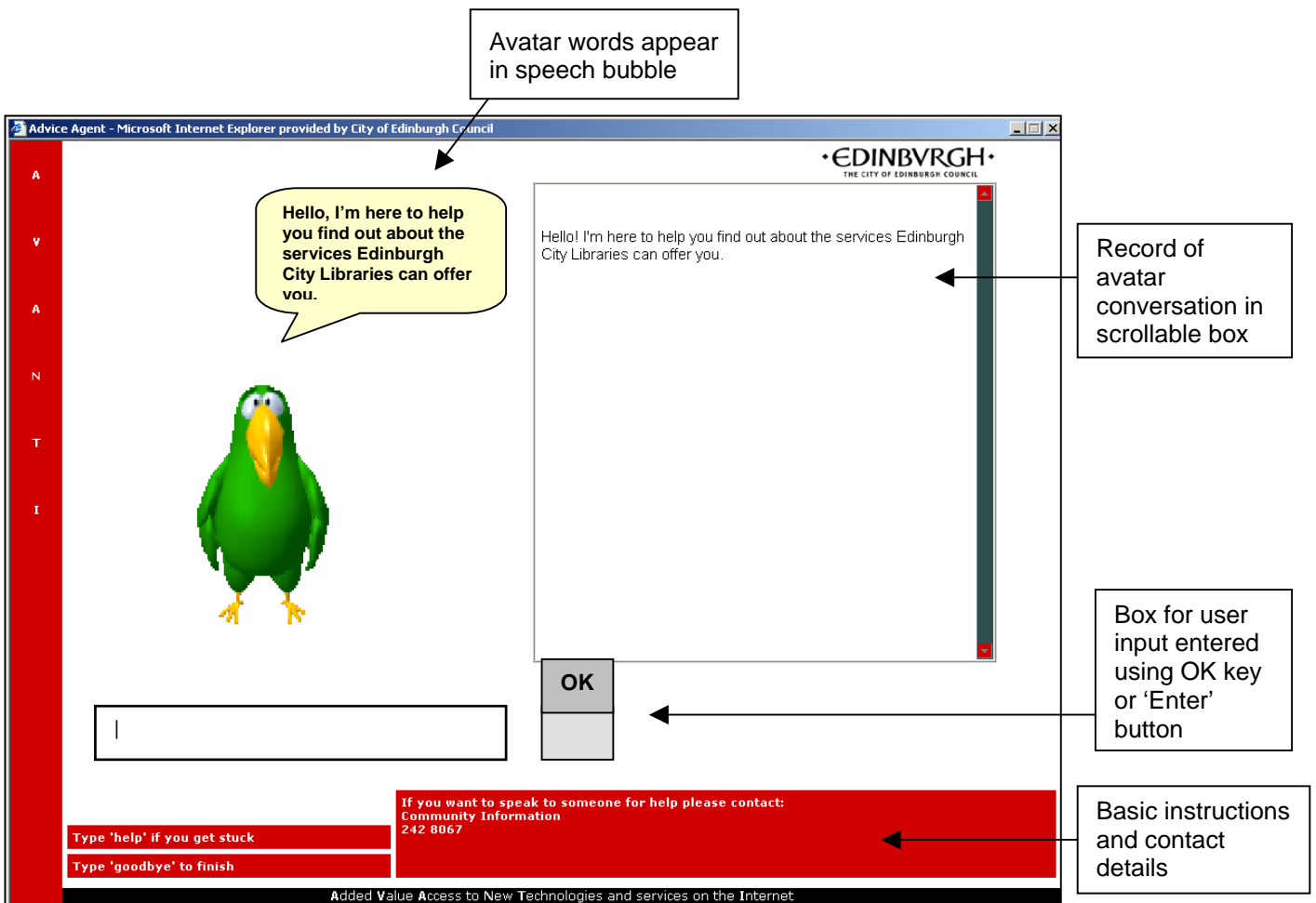
The avatar character, the Microsoft Agent Peedy the Parrot, flies onto the screen at the start of the user interaction and is located in the left half of the screen for the duration of the user's conversation. If the user types goodbye or comes to the end of the conversation and requires no further information the parrot flies away off screen and the user clicks on the close button to exit.

The words spoken by the avatar appear as they are said in a speech bubble above the parrot's head. The bubble disappears once each section of text has been said and displayed for a few seconds. Words are heard by the user as they appear on the screen.

Beneath the avatar character is the input box for users to type their replies. Beside this input box is an OK button to click and enter the response (users can also press the enter button instead). The bordering and design is in red, white and black to reflect City of Edinburgh Council corporate colours.

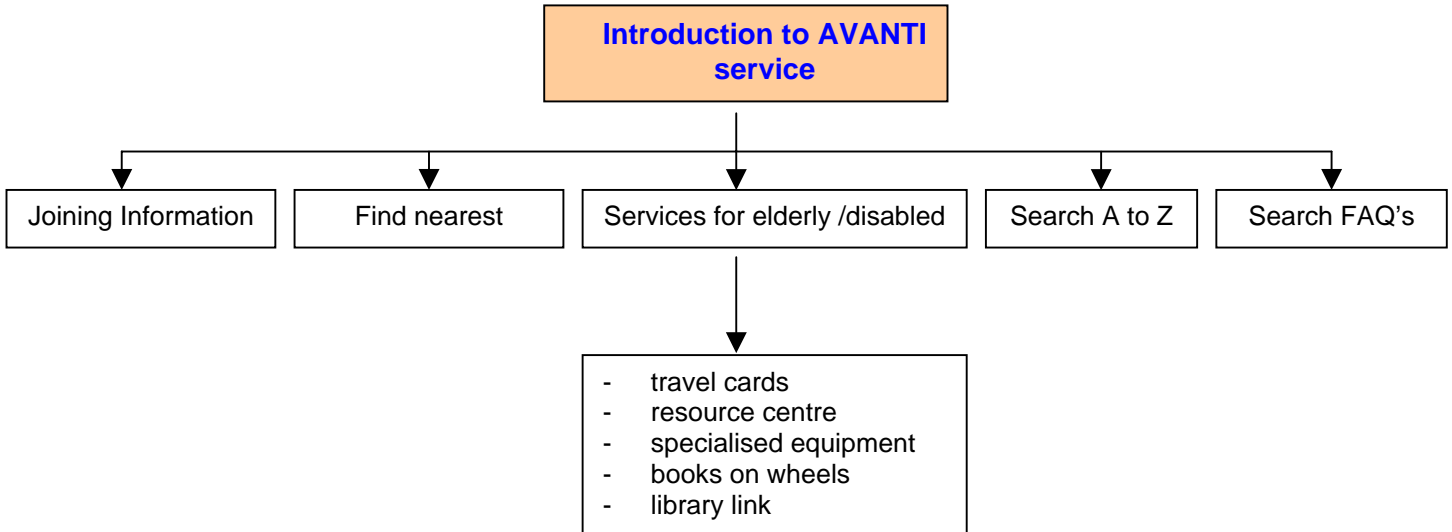
To the right of the screen is a scroll box containing a record of the avatar's responses and questions. At the foot of the screen are some contact details and some basic commands to assist the user.

Figure 3.2: Main Demonstrator Screen





### 3.1.4.3 Conversation structure



#### Example user conversation

**AVATAR:** So what would you like me to help you with? JOINING the library, FINDING your nearest library, SERVICES for our elderly or disabled users, search the A TO Z of Council services, or search the Council's frequently asked questions?

**USER:** *services*

**AVATAR:** The library offers many services for its elderly or disabled users that you may not have heard about. To get more information on the services listed below, please type A, B, C, or D.

- A) Getting books delivered to your home or getting a lift to the library
- B) The Resource Centre and its facilities for visually impaired users
- C) Borrowing equipment such as magnifiers and large buttoned cassette players to help cope with disabilities
- D) Travel cards for senior citizens and disabled people

**USER:** *D*

**AVATAR:** Travel cards let you travel free or at reduced rate on local buses and trains. There are three kinds of travel card: One for senior citizens, one for people with a disability, and the Scottish Blind Person's Travel card. They can be obtained at any public library in Edinburgh. Which type of card are you interested in, SENIOR, DISABLED, or BLIND?

**USER:** *senior*

**AVATAR:** Concessionary travel cards (bus passes) are available to people of pensionable age. Now can you tell me if you want to:

- A) See the BENEFITS of having a travel card
- B) APPLY for a card
- C) RENEW your card



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D) REPLACE a lost or damaged card

USER: B

AVATAR: etc...

### **Other Avatar Conversation Elements**

#### **Joining Information**

- Before I can tell you about joining the library I need to ask you a few questions
- Do you live in Edinburgh?
- Are you sixteen or over?
- You can join the Library by...

#### **Find nearest Library**

- I can help you find your nearest library by using your postcode or address
- Do you know your postcode?
- What is your postcode?
- Your nearest library is Morningside Library. The address is 184 Morningside Road, Edinburgh EH10 4PU

#### **Search A to Z**

- You can search the Council's A to Z of services by using a key word or phrase. Would you like to do this now?
- What is your keyword or phrase?
- I found a match for your search. Pest control. If you are experiencing problems with rodents, insects or birds, contact Pest Control, Environmental and Consumer Services. Telephone: 0131 529 3030 or E-mail [env.con.svs@edinburgh.gov.uk](mailto:env.con.svs@edinburgh.gov.uk)

#### **FAQ's**

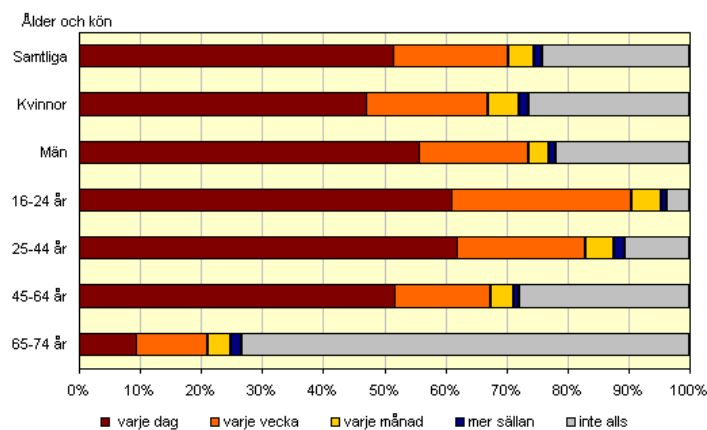
- Please enter a keyword or phrase which relates to your enquiry
- I found more than one match for your search. Would you like to search within these results?
- What is your keyword or phrase?

## 3.2 Kista

### 3.2.1 Digital exclusion in Kista

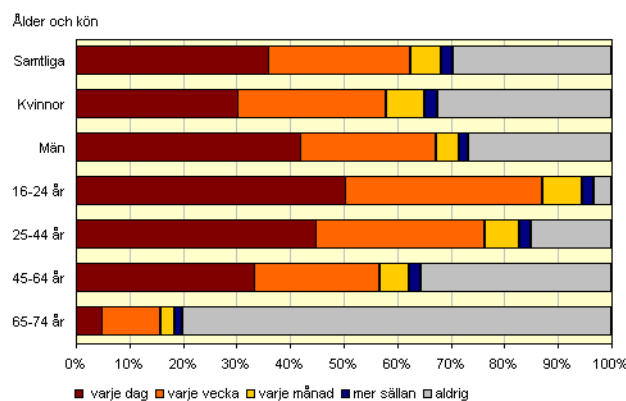
#### 3.2.1.1 Social-demographic profile

The Statistics Sweden's recent report<sup>2</sup> shows that approximately 75% of Sweden's inhabitants use computers, which could be divided into different categories based on how frequent their use of computers is (as shown below). According to this report the use of computers by inhabitants between the ages of 16 to 24 are 95% while just 26% of those who are 65 years old or older use computers.



Private person's use of computers in Sweden (2002)

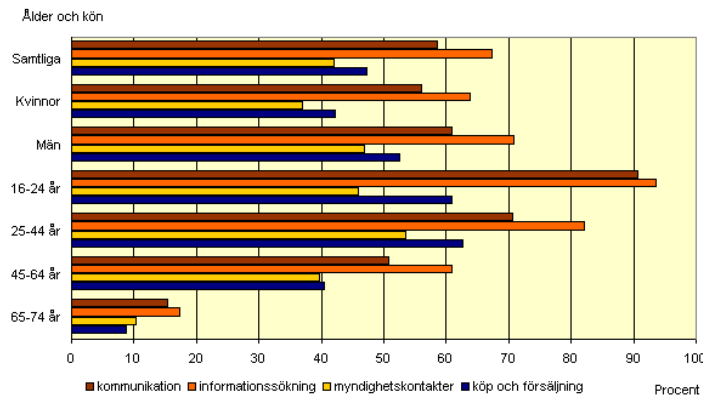
By looking at private person's use of Internet we would find almost the same difference between the younger generation and the older people. In other words, 96% of those who are between the ages of 16 to 24 use the internet, while the figure for the older people (65 or older) is just 28%. The Internet is used by approximately 70% of the inhabitants of Sweden.



Private person's use of Internet

<sup>2</sup> SCB, Private person's use of Computers and Internet, 2002

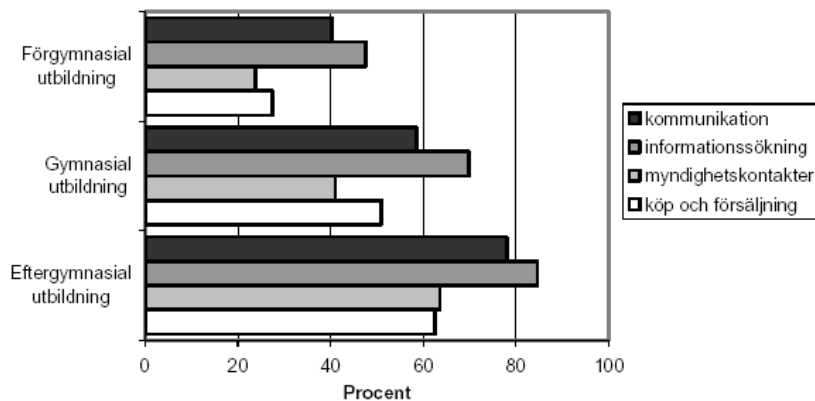
The study also shows that the Internet is mostly used for fact-finding and communication, which is common between both the younger generation and the older people in Sweden. Accordingly, the Internet is used by almost 43% of people in Sweden to access and use services and information provided by governmental authorities. Among the older people this figure is 11%, which is more than half of those who use the Internet.



## What private person's use the Internet for

If we look at the effect of education on people's use of the Internet we find that it is used more frequently by people with higher education. However, fact finding and communication is still common between all groups.

Diagram 15  
Andel personer efter vad man använde Internet till.  
Befolkningen i åldern 16–74 år fördelad efter utbildningsnivå



## Education and the use of Internet

These figures show that the majority of the older people do not use the Internet and computers, which results in their exclusion from the information society.

Unfortunately, there are no official statistics about the immigrants' use of computers and the Internet in Sweden, but what is obvious (from earlier interviews and the study<sup>3</sup> which have been carried out in the beginning of this project) is that the immigrant population reported language problems in the use of the Internet and especially when they visit websites.

<sup>3</sup> ID03.8-1, Internal report, Avanti



## **3.2.2 Service delivery and current usage**

### **3.2.2.1 Services selected for AVANTI**

In the Kista Borough, one of eighteen Boroughs in the City of Stockholm, there is a public service called "Meeting Point Kista". This is a public meeting point and a communication centre for everyone who lives, works or visits Kista. At "Meeting Point Kista" there is cooperation between:

- Kista Borough Council (citizen's office)
- The regional Social Insurance Office
- The Swedish Debt Collection Service
- Unemployment Agency
- Central Study Allowances Board.

At this time, all the authorities mentioned above have their own websites, which are large with a great deal of information and services available. The problem, however, is that relevant information and services are hard to find, and in some cases hard to use. This problem is more noticeable when the users are inexperienced and immigrants with language difficulties. Two other groups that find it difficult to find and use services and information on these websites are many of the borough's older population, and some disabled people.

Therefore, the idea behind the application developed in Kista is to work as a digital assistant in the Kista's future "one stop shop" on the Internet, by using which, users would be able to receive the same kind of help they would get from the physical location that today exists at "Meeting point Kista".

Through a dialog with the user groups in Kista and the staff at "Meeting Point Kista", we have determined that the following services are relevant for the users and possible to develop during development of the prototype.

- General information, about events and other relevant information to borough's inhabitants.
- Problem/fault registration, which actually is a central unit in Stockholm City.
- Call-back function.
- Kista e-Parliament integration, citizens' viewpoints for mandatory consideration.

### **3.2.2.2 How citizens contact the council**

- General information: It has not been possible to get any figures on this task.
- Problem/fault registration: The unit responsible for this service receives approximately 120,000 reports from citizens every year, 90% of which are received via telephone and the rest by e-mail.
- Call-back function: Persons responsible for this service receive approximately 500 requests a year.
- Kista e-Parliament integration, citizens' viewpoints for mandatory consideration: Today, through this digital service, the board of the borough receives about 3 viewpoints. The hope



is that by using Avatars more people and specially the target group of Avanti use this advantage.

### **3.2.2.3 Target groups' use of the service**

Estimates of these figures have been made by the staff at Meeting point Kista. At Meeting point Kista all different groups of citizens are asking for public service so they are well prepared for making these type of estimates.

In general one of ten visitors to the centre belong to the Avanti target group. There are some special services, for example invitation form for those who want to invite their relatives and friends from countries outside Europe, that are more frequently used by the Avanti target group. The use of the services developed in the Avanti demonstrator follows the general use pattern estimated by the staff at Meeting point Kista.

### **3.2.2.4 User satisfaction levels**

The analysis of interviews, which have been carried out in the beginning of the project, showed that we can cluster people into two groups:

*Those who do not use Internet today.*

This group mostly consists of the older people because

- They are not interested in using Internet.
- They experience language difficulties.
- They have no experience of solving problems using the Internet.
- They do not know that those services they would need are available digitally.
- They are not able to use computers and Internet because of the high cost for getting hold of them and the required equipments.
- They are unaware of advantages that the use of Internet and computers could offer them (like freedom from time constraints).

*Those who use Internet but experience difficulties.*

Besides the language difficulty and the lack of knowledge regarding the existence of their desired services and information, the members of this group often find it difficult to find specific services and information on the Internet. Further, as the use of some services, requires some expertise and experience, the other difficulty that some members of this group face regards the use of these services.

## **3.2.3 The selected target groups**

Based on interviews, statistical reports and the study of peoples use of Internet and the local government websites, which has been presented in ID03.8-1, the project team in Kista decided to set its primary focus on the elderly with both Swedish and immigrant background. These are a large and important group in Kista.

The Target group was subdivided into those living in the Councils Service Houses, who have access to computers in the lobby, and users living in apartments, who would access computers in the libraries, "the Husby World House" and "Meetingpoint Kista". "Husby Worldhouse" is a public meeting point, hosted by the council, with an Internet café, performance stage, meeting rooms etc for the citizens. During the test of the Avatar, we also found that it would be of interest to people with disabilities.



## 3.2.4 Kista's demonstrators

The idea of the application developed in Kista is that it will become a virtual "one stop shop", where the citizen is able to receive the same kind of help he would get from the physical location that today exists at "Meeting point Kista". Through different dialogues with the application, she will hopefully get all the relevant help and answers needed.

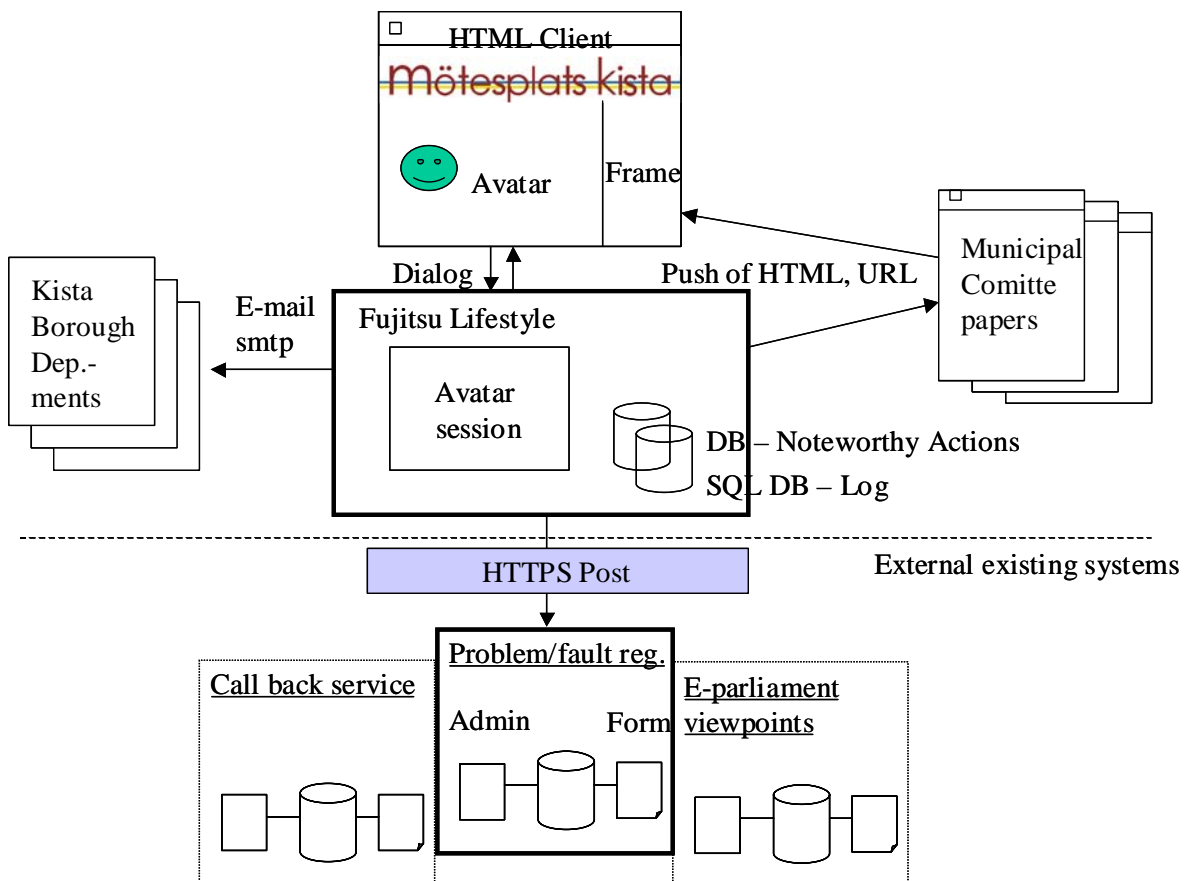
### Services

Through a dialog with the user groups in Kista and the staff at "Meeting Point Kista", we have



determined that the following services are relevant for the users and possible to develop during the project:-

- *General information:* General information about Meeting point Kista. - which authorities that are represented, opening ours, location etc.
- *Problem/fault registration:* The City of Stockholm has a central service centre for all problem and fault matters. This service collects and distributes about 120 000 issues a year. The volume is highest during winter when snow removal and icy pavements are the most frequently issues registered. The issues are distributed to different public and private service providers. About 10% of the issues come via the existing e-mail form on [www.stockholm.se](http://www.stockholm.se).
- *Call-back function;* On the existing homepage of Kista there is a call back function where citizens can submit a phone number and someone from the front office staff at Meeting point Kista will call You within some minutes. The service is a new kind of service made possible by use of the web.
- *Kista e-Parliament integration, citizens' viewpoints for mandatory consideration;* from the homepage of Kista there is a link to a separate e-Parliament application where citizens can have a dialog with politicians, organizing bulletin boards etc. The service we connect to from the AVANTI application is citizens' viewpoints for mandatory consideration which is one of several services at the e-Parliament application.

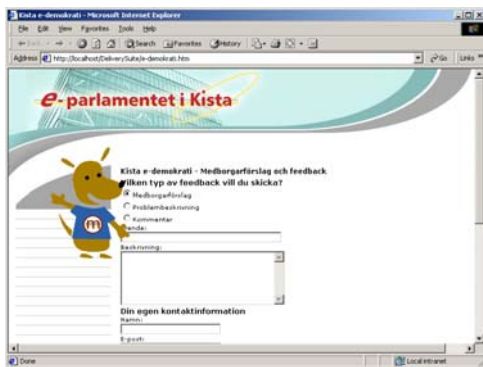


### 3.2.4.1 Presentation of the agent interface

Based on meetings with artists, illustrator and graphical designer, that is people trained in creating images of people, we found that the use of a non-human cartoon character would be more appropriate. It was found that a humanoid character could be both a bit scary and could also create an expectation of the avatar to be really human. Other reason for our choice was based on the difficulty of designing a humanoid character that would be liked by different people. For example just a variation in the avatars skin colour, sex and age would affect users' acceptance of the character.

Therefore, to study the acceptance of characters among our target group, we initially tried two avatar characters: a humanoid – the Suza character provided in the toolkit; and a dog - a cartoon character developed in Kista. This study resulted in the selection of the dog. However, as the study showed that the dog was more popular among the user group, the project group in Kista decided to use the dog character in its future development of the interface.

The dog, used in the developed interface in Kista, is able to "play" a mixture of gestures. The interface is divided into two frames. The left frame of the interface is used for appearance of dialog (in form of text) between the user and the avatar, while the right frame is reserved for visualizing additional and related information, links and/or images which would help users to accomplish their desired tasks.



## Gesture examples



Greet



Read



Show



Think



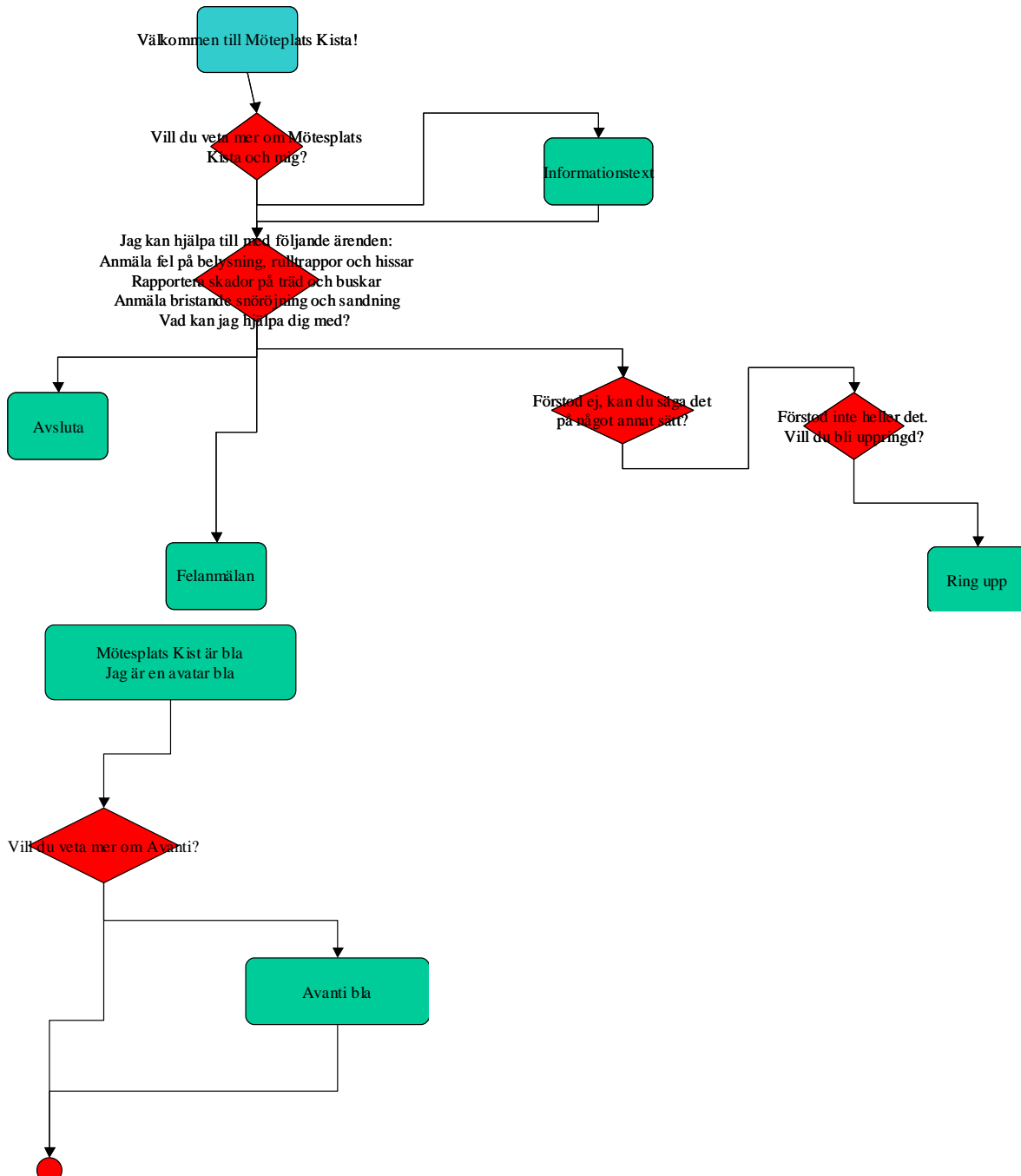
Uncertain

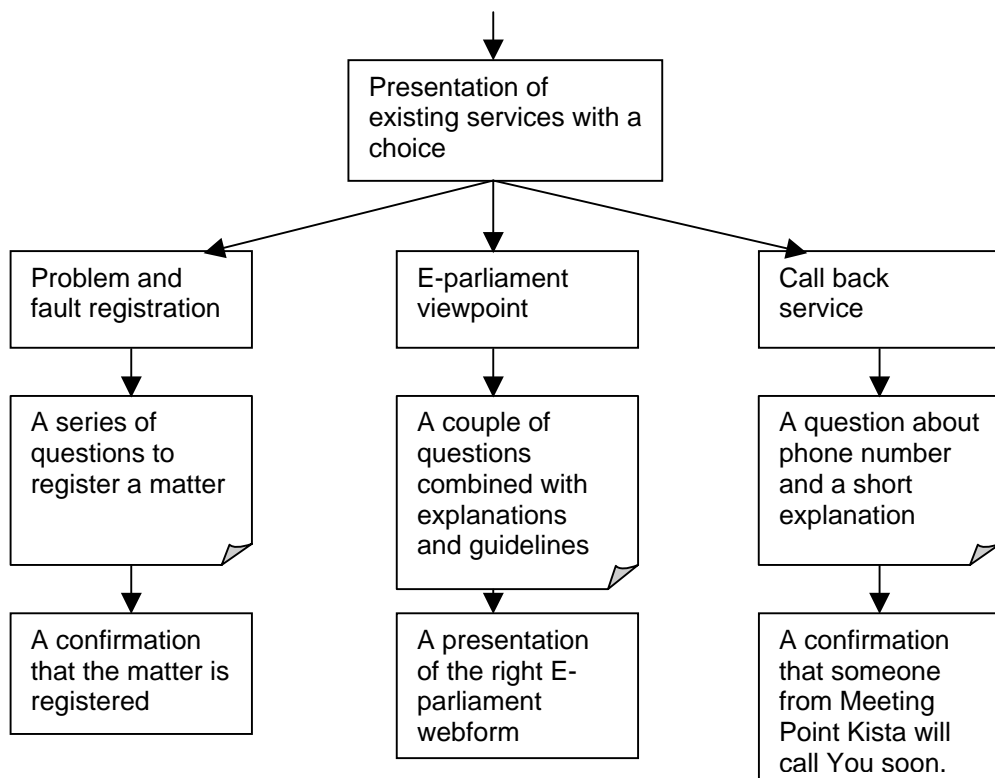
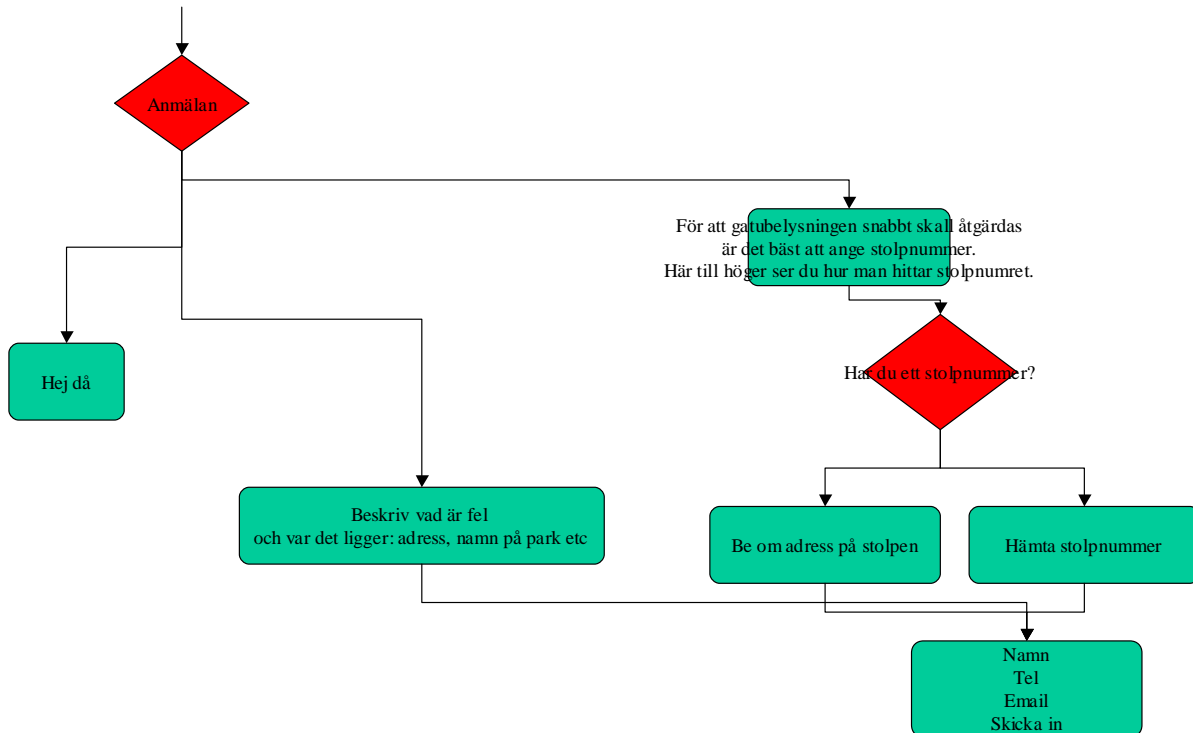
As the result of the first test of the system showed that for persons with very low or no computer experience, the use of keyboard and mouse was a barrier to interact with the system, the interface has been equipped with speech input as an alternative input mechanism.

By using a text-to-speech system, which takes the text “spoken” by the Avatar and transform it into real speech, which in turn puts out through the computer speakers, we succeeded to deliver the output of the system in form of both text and sound.

## 3.2.4.2 Conversation structure

Below are some of the conversation flows taken from the Kista demonstrator using the Avanti Toolkit.







### **3.3 Lewisham**

#### **3.3.1 Digital exclusion in Lewisham**

##### **3.3.1.1 Social-demographic profile**

The list below gives the headings of the main categories associated with digital exclusion. Figures are for Lewisham where available. Where no figures were available, they have been identified by an asterix.

	<b>Local</b>	<b>National</b>
Total Population London Borough of Lewisham	248,922	58,789,194 +
No computer or internet access at home	29%	53% +
Aged 60 or over	36,170	21% +
No formal education after age 15 (or equivalent qualification)	183,136	*
Resident in area of high unemployment or deprivation	3150++	
Ethnic minority group, or does not use the majority language as first language	107,108	*
Long-term illness	59,149	*
Physical impairment	*6215	*
Visual impairment	1128	*
Hearing loss	1706	*
Learning difficulty (including short-term memory loss, dyslexia)	866	*

+ National statistics office

++ Information from the local census

#### **3.3.2 Service delivery and current usage**

##### **3.3.2.1 Services selected for AVANTI**

In Lewisham we selected two application areas for AVANTI.

Firstly, in Lewisham we are one of the lead partners in the UK Government funded LEAP project (Life Events Access Project), which is seeking to provide automation of council processes either for internal council use or for citizen self-service use. LEAP is based around a conventional Internet interface, and is therefore well suited to traditional web users. However, in AVANTI we were keen to build on their learning to develop an alternative style of citizen interaction, which was better suited to our target users.



Secondly, in Lewisham we have an award winning consultation programme with our local citizens. We have a standing panel of one thousand citizens whom we survey four times per year, and also have other local consultations including youth forums, local forums and other activities. Increasingly councils and other organisations are seeking to consult with citizens or customers electronically, as this can be more responsive and less expensive. The fear with this, however, is that electronic panels are more appealing to citizens who are comfortable with technology, and that citizens who are unable to or reluctant to use technology will be less inclined to use electronic polls, and will therefore become excluded.

As a result, for the second Lewisham application, we have focused on providing a citizen-friendly avatar-based demonstrator to enable us to conduct electronic opinion polls and surveys.

**3.3.2.2 How citizens contact the council**

The following table relates to the period June 2002 to June 2003.

<p>These figures below relate to volumes of enquiries or transactions for each contact method/channel.</p> <p><b>In Person:</b> 18,720</p> <p><b>Letter/Fax:</b> 26,000</p> <p><b>Telephone:</b> 72,000</p> <p><b>e-Mail:</b> 3,000</p> <p>For the same period, these figures given below relate to web statistics for the area of the council site that concerns the service that the demonstrator is concerned with.</p> <p><b>Housing benefit:</b> 43,897 hits</p> <p><b>Feedback and opinion Poll:</b> 2,325 hits</p>
---

At the time of writing, there is no comparable web application to either of the Lewisham demonstrators. Whilst the LEAP project has mapped some of the council processes as they pertain to the LEAP Life Events for Lewisham, they are only now beginning to implement these electronically. Similarly, whilst there is an intention to start running electronic consultation, this has not to date been implemented.

Public interactions & main e-access channel take-up	Actual '000s	Forecast '000s			
	01/02	02/03	03/04	04/05	05/06
<b>Local Service Website - <a href="http://www.lewisham.gov.uk">www.lewisham.gov.uk</a></b>					
Page views	4137*	4760	5474	6568	7553
Percentage increase on previous year		+15%	+15%	+20%	+15%
On-line forms submitted	3*	3	4	5	6
Percentage increase on previous year		+15%	+15%	+20%	+15%
We brought back hosting of the Council website in house during ½. Volumes prior to that date are not available. We therefore base volumes above on partial year data.					
'On-line forms submitted' includes forms submitted to a service e-mail account, but currently excludes dynamic forms that save results directly to a database. Reports to capture this additional data are currently being written and will be available shortly.					
<b>Telephone</b>					



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Volume of interactions	463	556	667	800	920
Percentage increase on previous year		+20%	+20%	+20%	+15%
<p>These are calls to the corporate call-centre. Currently services delivered through this channel include; housing and council tax benefit, council tax, business rates, housing repairs, trade and domestic refuse, street cleansing, street lighting, highways, abandoned vehicles, blue badges, pest control, switchboard out of hours service, skip and scaffold licenses. We plan to add additional services. It is not possible at this time, however, to identify the numbers of calls still being received on residual customer service numbers where services are not yet absorbed into the call centre.</p>					
<b>Face To Face</b>					
Volume of interactions	123	135	149	164	176
Percentage increase on previous year		+10%	+10%	+10%	+7.5%
<p>These figures represent visits to the corporate contact centre. Currently services delivered through this channel include; housing and council tax benefit, council tax, business rates, housing repairs, trade and domestic refuse, street cleansing, street lighting, highways, abandoned vehicles, blue badges, skip and scaffold licenses, educational awards and benefits, student support, primary and secondary schools admissions and services delivered in partnership with the Inland Revenue and the Department of Work and Pensions. Additional services are still being added.</p> <p>We have recently opened an additional contact centre in Deptford. We now provide centres both in the north and south of the borough. We plan development of the videoconferencing channel [see below] to complement these larger centres by extending face-to-face interviewing at smaller community sites linked to the larger contact centres.</p>					
<b>Videoconferencing ['TellyTalk']</b>					
Volume of interactions	6	6	6	6	6
<p>We plan refresh of this long established remote interviewing technology, relying on local funds for first phase developments, and looking to external funding for final phase. In the meantime we are faced with decommissioning of some sites and services that are dependent on the 'old' technology. The combination of short term decommissioning and medium term development result in volume forecasts levelling off as constant over the next 3 years. We expect substantial increases beyond 2005 once we have developed the full 'hybrid channel' described above.</p>					
<b>Email</b>					
Volume of interactions	8	13	15	16	17
Percentage increase on previous year		+62%	+10%	+10%	+7.5%
<p>This currently includes volumes for housing and council tax benefit, council tax and business rates. The introduction of a directory of services and a new e-mail platform in 2003/04, will enable us to define more clearly discrete email addresses used for customer service. This will enable us to monitor e-mail transactions across all service areas more thoroughly.</p>					
<b>Smartcards</b>					
Volume of interactions	0	0	20	50	150
<p>These figures are based on the presumption of emergence of a London Connects supported Smartcard combined with the TFL card, and are based on a consensus with neighbouring S.E. London boroughs as to likely volumes.</p>					

\* Extracted from "Implementing Electronic Government Statement 2002" London Borough of Lewisham.

### 3.3.2.3 Target groups' use of the service

Of the 96 people who answered this question 51% of the target audience would use the AVANTI demonstrator leaving 49% saying they would not use the demonstrator.

### 3.3.2.4 User satisfaction levels

User satisfaction levels are covered in greater detail in part 2, section 5.4.3 of this report. When asked if users would use an AVANTI enabled service, 51% said they would, 49% say they would not. However, it should be noted that a majority of users, who said they would not use this type of service, gave a technical failure as the cause. In most cases, it was because of the failure of the voice recognition software that disappointed people most. Lewisham is aware that work needs to be done in this area before the service is released to the public, so therefore feels





that a number of those people who said they would not use the demonstrator would in fact use the system once these problems are fixed.

### 3.3.3 The selected target groups

The initial task was to identify community groups that could be identified as the AVANTI target audience. Groups were chosen that could be identified from the following socio-groupings.

- Age
- Ethnicity
- Disability
- Community Groups

The Core User Group is made up from a list of people who were asked to be part of the AVANTI User Group. The people in this group were selected from a previous European project (Gala) and from a list of people supplied by Community Education Lewisham. All members of both lists were written to and asked if they would be prepared to become participants of the AVANTI Core User Group. It was explained to them that from time to time, they would be asked to test the AVANTI product and give their opinion of it. Lewisham have 32 local residents who make up the total of the User Group.

The details of the other groups were obtained from a local publication called Voluntary and Community Organisations in Lewisham. This publication is put together by a local group, Voluntary Action Lewisham (VAL). It was simply a matter of working through the 600+ entries looking for groups that fitted the criteria listed above. Once a group was located, they were telephoned and asked if they would be interested in participating in the demonstrator trials.

#### 3.3.3.1 Target Group Categories – Phase 1

Service Providers	Citizens	Age	Ethnicity	Disability
Front line staff (3)	Core User Group (8)	Age concern (2)	Indo-Chinese (2)	Horizons (11)
Head of unit (1)	170 Project (2)	Age Exchange (6)	Federation of Vietnamese (20)	DeafPlus (12)
Project board member (1)		Darby And Joan Club (1)	Lewisham Asian Elders (7)	
		L.I.P.A. (6)		
<b>Total 5</b>	<b>Total 10</b>	<b>Total 15</b>	<b>Total 29</b>	<b>Total 23</b>

Phase one 77 users (target group) + 5 (Service Providers) Total for phase one 82

#### 3.3.3.2 Target Groups – Phase 2

Service provider	Citizen	Age	Ethnicity	Disability
e-Government (5)	Here for Good (4)	Age Concern (3)	Fed of Vietnamese Refugees (2)	Horizons (12)
	Evelyn 190 Project (3)	D.E.H.P. (7)	Irish Community Centre (2)	



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		Age Exchange (8)	Indo-Chinese (2)	
		Grove Centre (3)		
		L.E.R.C. (3)		
<b>Total 5</b>	<b>Total 7</b>	<b>Total 24</b>	<b>Total 6</b>	<b>Total 12</b>

Phase two: 49 users (target group) + 5 Service providers Total for phase two 54

Total over both phases 126 Target users and 10 service providers

Out of the 400 council processes, which have been mapped by the LEAP project, we specifically selected a series of processes that would be appropriate to the AVANTI target citizens. The chosen set of processes related to Housing Benefit claims. One of the key determining factors for Housing Benefit eligibility is that the citizens must be on a low income, and there is therefore a higher proportion of elderly citizens, disabled citizens and citizens from poorer social backgrounds interested in this benefit.

The electronic consultation application was less targeted, effectively being available to any citizen. However, it has been specifically designed to be accessible to AVANTI target groups rather than designing it with regular computer users in mind.

The approach we have taken to the user feedback sessions has been focused on the groups identified in the AVANTI proposal, aiming for comprehensive feedback from targeted groups rather than quantitative feedback from large numbers of users. Whilst it would have been possible to make one or both of the demonstrators available to the general public for live testing, we believe that the majority of users would have been those comfortable with technology and this would have skewed the overall results.

### 3.3.4 Lewisham's demonstrators

#### 3.3.4.1 The application area

The first Lewisham demonstrator is focused on Housing Benefit information and advice. It contains two types of conversation.

Firstly there are short answers to frequently asked questions, such as "What is Housing Benefit?" and "Who can claim benefit?"

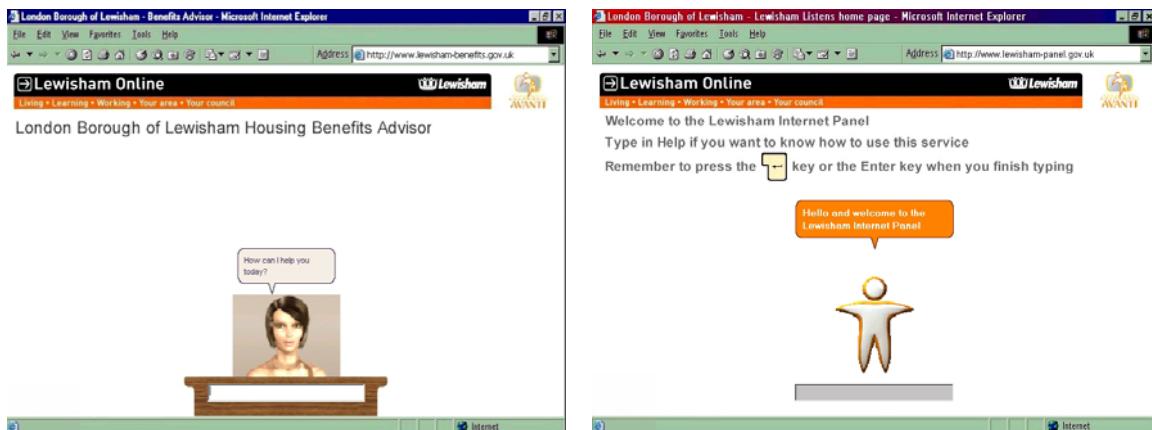
Secondly, there are deep conversations based around two key areas, "How do I start a claim?" and "How do I appeal?" In the former, a series of questions is asked to determine whether there is any reason for the citizen being ineligible for benefit, such as them owning rather than renting, not paying rent, having too much in savings, or being a student. In the latter, questions are asked to determine where the citizen is in the appeals process – just starting, made an initial request for a review or made a full appeal. Based on this, different advice is given on how they can proceed.

The second Lewisham demonstrator provides online opinion polls and surveys through an avatar-based interface. Citizens are invited to "log on" to the demonstrator or register as a new user. An appropriate survey is then selected and they are invited to complete it, being presented with a series of multiple-choice questions. Dependent on their answers, they will take different routes through the survey, such as missing out a section if another answer renders it inappropriate for them. After the survey, they can also optionally answer a quick opinion poll, a

single question survey with some supporting information available. They can also see results from past consultations.

### 3.3.4.2 Presentation of the agent interface

Lewisham's intention with both demonstrators has been to make the screen as simple as possible, with a significant focus on the avatar character. In the initial designs, Lewisham used the Suza character for the Housing Benefits application and the AVANTI logo character for the e-Consultation application, as illustrated below.



These characters were used in the initial road-show events, but during the test sessions adverse feedback was received, in particular that the Suza character was unfriendly, too pale and too small, and that the AVANTI logo character was too impersonal.

As a result, Lewisham created a new human character, Fiona, who was significantly larger and brighter. At one stage, we did render out a version of Fiona at 400 pixels across, which dominated the screen, but felt this was a little too large and therefore reduced her size.

The screenshot below shows the current housing benefits application as it is today.



Following feedback from citizens and service providers, Lewisham also developed a "Click Buttons" interface alongside the original keyboard entry mechanism. This allows the citizen to

interact with the system by clicking buttons for common answers rather than having to type everything. This is also illustrated in the screenshot above.

From user's comments, Lewisham decided to make screen changes for the final tests by adding a speed controller for the automated voice version. This was a quick method adopted to enable us to test different speeds of speech with citizens. Ideally, the speed of speech would be handled through the conversation, e.g. "Speak slower" or "Speak faster" to change the speed, but it was not possible to implement this at the end of the development phase.

We considered the possibility of maintaining an audit trail of the conversation on the screen, but considered that may complicate the screen further and detracts from the character.

Finally, after the first demonstration phase, Lewisham amended the Housing Benefits application to use any of a choice of three characters, Fiona, Carla, a darker skinned version of Fiona, and Max, a cartoon dog. Citizens selected the character they wanted to use by clicking on it to start the demonstrator.



[Start Using Fiona](#)



[Start Using Carla](#)



[Start Using Max](#)

*On the e-Consultation application, we adopted effectively the same screen design, but selected an animated pencil as the character. Lewisham decided on a pencil because it was synonymous with completing surveys and was liked by the users.*



*Woodrow, the animated pencil – e-consultation application*

### 3.3.4.3 Conversation Structure



### *Housing Benefits Demonstrator*

On accessing the web page for the Lewisham AVANTI Housing Benefits demonstrator, the citizen is provided with three characters from which to choose a fair skinned human female, a darker skinned human female or a cartoon dog. Clicking on one of these starts the application using the appropriate character.

The character appears and greets the user, and then asks whether they have visited before. The citizen can respond in any of three ways, by typing their answer, by clicking on a "Yes" or "No" button or by speaking their answer.

New visitors are asked whether they want to know more about how the character can help them. Returning visitors are directed straight to the main menu question.

The main menu question is simply "How can I help you?" (or "How else can I help you?" if the character has already answered a question). In response to this, a set of option buttons is shown on the right hand side of the screen. As before, the citizen can click on a button, type in their response or speak it.

There are two types of question available for the citizen to ask. Some of the questions are "simple", such as "What is Housing Benefit?", and these are simply answered and the main menu question is asked again. Two of the questions are "deep", where they act as a gateway to detailed conversation sections.

The first of these is "How do I start a claim?" and the citizen is advised that they will need to complete a physical claim form and provide various proofs of entitlement, but that the character can carry out a preliminary eligibility check before they do so. If the citizen opts not to conduct a check, they are advised of where to collect a form or can arrange for one to be sent out to them. If they want to do an initial eligibility check, the character then asks them a series of questions following the LEAP process map for Housing Benefit claims. This includes questions about:

- whether they are resident in Lewisham
- the ownership of the property
- their savings
- whether they are a student
- special eligibility conditions if they are a student (e.g. whether they have dependants, whether they are disabled)
- whether they are currently living in the property or moving in shortly

After each answer, the character will either determine that they still appear to be eligible, or that they are ineligible based on the answer given, or that their circumstances are too complex to handle within the demonstrator. If they are ineligible, the character will explain why and, if appropriate, indicate alternative benefits which they may be entitled to. If their circumstances are too complex, eg owning multiple properties or disabled students, the LEAP process requires manual review of the case. For the purposes of the demonstrator, the character simply explains that their circumstances are too complex and provides contact details for the council. In exploiting a similar solution, we would be looking to integrate a better handoff mechanism here, ideally using video or audio conferencing over the Internet to continue the interaction. At the end of the questioning, if there is no reason for the citizen to be ineligible, the character will inform them and encourage them to apply for benefit. The citizen can find out where to collect a claim form or can arrange to have one sent to them.



The second "deep" conversation is based around benefit appeals. There are three main types of appeal, having the decision explained, having the decision reviewed internally by a second Housing Benefit officer or starting a full independent formal appeal. The conversation here is based around helping the citizen to work out which type of appeal they want to start, and determining whether they are allowed to do so (for example, appeals are strictly time limited and will not usually be considered if they are filed late).

The character first asks the citizen whether they just want some information about the appeals process, or whether they actually want to start an appeal. If they want to start an appeal, the character then asks whether they have already started one (eg asking for a decision to be explained or reviewed), and if they have not, whether the decision was made in the past month (and is therefore eligible for appeal).

If they have not started an appeal yet, all of the options will be explained briefly, and they can choose one of them to be explained in more detail. If they have started the appeal process, the remaining steps will be explained. For example, if they have asked for the decision to be explained to them and they are still not satisfied, they can ask for an internal review or start a full appeal. If they have asked for an internal review and are not satisfied, they can only start a full appeal.

After completing either of the deep conversations, the character will ask the "main menu" question again, "How else can I help you?"

From the main menu screen, the final response to the character's question is "Finish for today" and this will end the session. It is also possible simply to close the browser window to close the session.

#### *eConsultation Demonstrator*

On accessing the web page for the Lewisham AVANTI Housing Benefits demonstrator, the animated pencil character appears and greets the citizen.

The first part of the conversation is based around "logging on" the citizen. As the data provided by the citizen is of relatively low sensitivity, we decided that it was not necessary to have a strong security mechanism here. However, we wanted to ensure that citizens were only asked to answer each survey and opinion poll once. This is from both a citizen perspective (as they would not want to be continually asked to answer the same questions) and from a council perspective (as we would not want results skewed by the same answers being given several times by the same citizen).

The character therefore asks the citizen for their name (surname and first name) and, if they are already registered, for one of three pieces of memorable information, their mother's maiden name, their town of birth or their month of birth. If the wrong answer is given three times, the session is terminated.

For new visitors, they are invited to register for the consultation panel. This involves answering some background questions about things like their age, marital status and where they live. The citizen can decline to answer these, but must at least indicate whether they are a resident of the Borough. They are also required to provide one of the three items of memorable information mentioned above to allow them to log in on their next visit.



Once citizens have registered or logged in, the system will check which surveys they have yet to complete, and will choose the most appropriate one to offer to them. This is based on factors such as whether the survey is available to all citizens or targeted to those matching a profile, whether the survey was specifically commissioned by a council department and the end date for responses.

If the citizen chooses to answer the survey, the character will then ask them a series of questions, each with multiple-choice answers. For each of these, the citizen can type their response, click on an answer button on the screen or speak their answer.

After the citizen answers each question, the character can be (and usually is) programmed to provide a suitable response. For example, if the citizen has said that traffic congestion is far worse than a year ago, the character will respond with "Oh dear, I am sorry to hear that." Responses are stored to a database whilst the character plays an animation of writing down the answer on a card.

After each question, the system will determine which question to ask next based on the response. For example, if a citizen states that they cycle in the borough, the next question may ask what would make them likely to cycle more, whereas if they state that they do not cycle, the next question may ask what would make them likely to start.

At the end of the survey, the character thanks the citizen for their participation, and asks whether they would like to complete a quick opinion poll.

Opinion polls are effectively single question surveys, designed to obtain a quick barometer view from the citizens on a topic such as whether they agree with congestion charging, or whether accommodation should be subsidised for key workers. Before answering the question, the citizen can also be offered further background information about.

Finally, the system can disseminate survey and poll results.



## **3.4 Ventspils**

### **3.4.1 Digital exclusion in Ventspils**

#### **3.4.1.1 Social-demographic profile**

The city of Ventspils is located in the north-western part of Latvia, by the estuary of the River Venta on the coast of the Baltic Sea, 189 km from the capital of Latvia Riga.

The territory of Ventspils city is 55.4 km<sup>2</sup>, 38% of which is covered with forests, parks and watercourses. Judging by the population, Ventspils is the sixth largest city in Latvia (44,004 residents in 2002).

During the last ten years, remarkable changes have taken place in the city – the Old Town is being renovated, city forests and parks are being trimmed and the streets resurfaced. The City Council pays special attention to the upkeep of the city environment as well as improvement of the quality of life of Ventspils residents. Each year, substantial funds are allocated for the support of the underprivileged city residents.

The leading branch of economics in the city is transport and communications – the cornerstone of the economic and social development of the city. Every other employee in Ventspils works at companies either directly or indirectly linked to the operation of the port. During the last five years, increasing significance in the city's economy is acquired by services rendered to tourists, as well as by culture, sports and educational services.

Two culture centres, several dozens of amateur art groups, Central Scholarly Library, branches of the Nordic Information Centre and the British Council operate in Ventspils, as well as 9 comprehensive schools, a secondary vocational school and several specialised secondary education establishments. Higher education can be acquired in Ventspils University College, the Ventspils branch of Riga Technical University, the Ventspils branch of Baltic Russian Institute and the Ventspils branch of Riga Teacher Training and Education Management Academy.

In 2001, 51.9% of the total population of Ventspils (43 783 residents) were Latvians, 31.7% were Russians, 5.3% - Ukrainians, 5.1% - Byelorussians and 2.5% - Gypsies.

There is a comparatively large proportion of residents of working age in Ventspils (in comparison –in the state on average it is 60.9%). But there is a bigger per cent of people over the working age in Ventspils ~ 26% (in the state on average it is 22.8%) in Ventspils.

There is mechanical increase of residents that compensates the natural decrease of the number of residents which is caused by the fact that the death rate exceeds the birth rate. Therefore it is possible to forecast that the number of residents in the time period till 2005 will change slightly and will become stable within the borders of 46-48 thousand people. A small increase can be met by the mechanical movement of residents, as well as by the increase of the birth rate among the newcomers for mostly these are relatively young people at the age of capacity for work.





## **3.4.2 Service delivery and current usage**

### **3.4.2.1 Services selected for AVANTI**

Ventspils demonstrator is intended to provide help to the citizens of Ventspils searching for information about local government public services as well as performs them and will be implemented in the Ventspils Local Government portal.

It is designed to provide the following functionality:

- It provides portal visitors with prime information about portal structure and facilities – Tour through the portal;
- It gives the possibility for users to choose AVANTI as a consistent portal assistant, ensuring the performance of the following functions:
  - Tour through the portal – interactive explanation script;
  - Explanations of portal chapters and functions;
  - Explanations of portal user interface elements;
  - Portal navigation assistance system.
- It is able to manage and complete local governments' e-services.

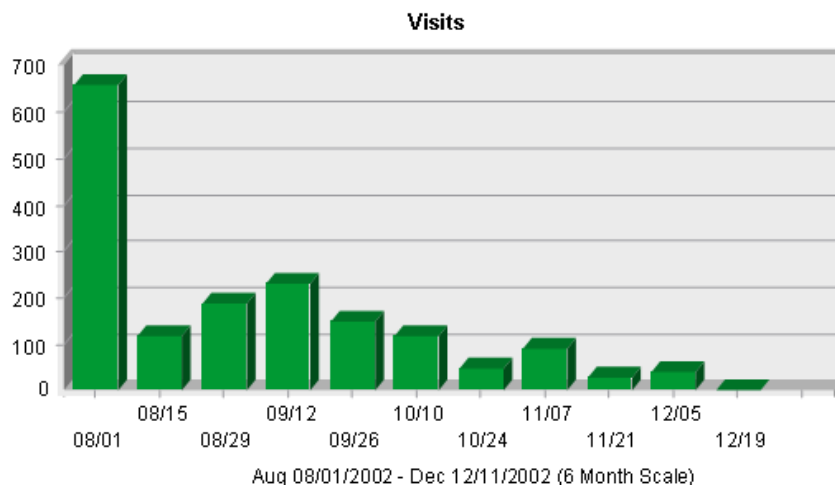
### **3.4.2.2 How citizens contact the council**

The most common way inhabitants contact council are with application forms on paper. As yet in Latvia is not accepted law of digital signature then official application form has to be given on paper. Altogether there were 55 508 inquiries in paper form in 2002. 26 521 of them were received in Social Care Board and 22 044 were received in Municipal Flat Department.

In – person there were 6298 inquiries. By telephone contact with cities council is made 4486 times. Usually they want to know civil servant working hours.

Next choice of contacting the council in through “hot line”. “Hot line” can be contacted via phone, e-mail and special post boxes that are located in many places in the city. Sum of all this kind of inquiries are 623.

Here you also can see trends of visiting AVANTI character in Ventspils portal section: “Take a portal tour” Latvian language version. This diagram we explain that who wanted to know about new Ventspils portal from 1st of august 2003 they visited our site and learned with demonstrators' assistance new structure and available possibilities.



### 3.4.2.3 Target groups' use of the service

The main target group's services are:

- Relief on medicine
- Relief on heating payments
- Extraordinary allowance to prisoners returning from jail
- Issuing of disability card
- Issuing of trip ticket to rest-house
- Etc.

### 3.4.2.4 User satisfaction levels

In recent research on inhabitant satisfaction with local governments provided services revealed that:

- People are mostly (67%) dissatisfied with long queues,
- People wanted that service staff were more polite (54%),
- They showed strong (48%) surprise of complexity of different tasks.

## 3.4.3 The selected target groups

The target audience for AVANTI project are these 26% of cities population retirees, 4 % disabled persons, 4% unemployed persons. We do not count in the target audience all people that do not have a computer or access to it, because there are public computer /internet access in the city and researches has shown that 74% of those people that do not have the computer are willing to have one, but due to low purchasing power they can not allow this. These people that do not have access or does not have a computer are 30% of inhabitants including retirees. Over all this could count up to for about 35% of cities population which in number are ~ 14 000 inhabitants.

In the table below the disabled people were not separated in disability groups because of their small overall number related to pensioners or people with moderate means.



	<b>Local</b>	<b>National</b>
Disabled	3,9	7,8
No formal education after age 15	2,5	4
Pensioner	25,7	22,8
No computer or internet access	16	5*
Limited literacy or language comprehension	Less than 1	Less than 1
Lack of confidence or skills to use Internet	24,1	34
Lack of interest in using Internet	12,4	19,1
People with moderate means	34,2	46,8

\* - in year 2000

This choice is connected with the desire to help the most unprotected spheres by encouraging them to use computers and to become more interested in them. Helping them to acquire new skills in working with a computer or making the work with it more easily would be good possibility how to reduce the necessary number of front-line staff, amount of used paper and the time in which applications are reviewed. As it was mentioned, this group constitutes approximately 35% of all Ventspils inhabitants and in the Social assistance department they submit 26 thousand applications or about 110 applications every day during the whole year.

### **3.4.4 Ventspils demonstrator**

#### **3.4.4.1 The application area**

With the help of AVANTI toolkit it is possible to combine the demonstrator with databases so that it can read from them:

- a. authorisation data
- b. given information

It is also possible that it records information about:

- a. the user's registration
- b. the data entered by the user, as well as sends them to the necessary addressees
- c. any necessary information for statistical or other reasons

There are also technological possibilities to make a conversation with the demonstrator through SMS. It is useful for investigation services because in such a way the user can send a question with the help of short message and receive an answer in the same way.

It is also possible to prepare predefined scripts for the performance of limited actions. And also the script that permits only to retell the content. At the moment such a scrip is available on the Ventspils City website ([www.ventspils.lv](http://www.ventspils.lv)).

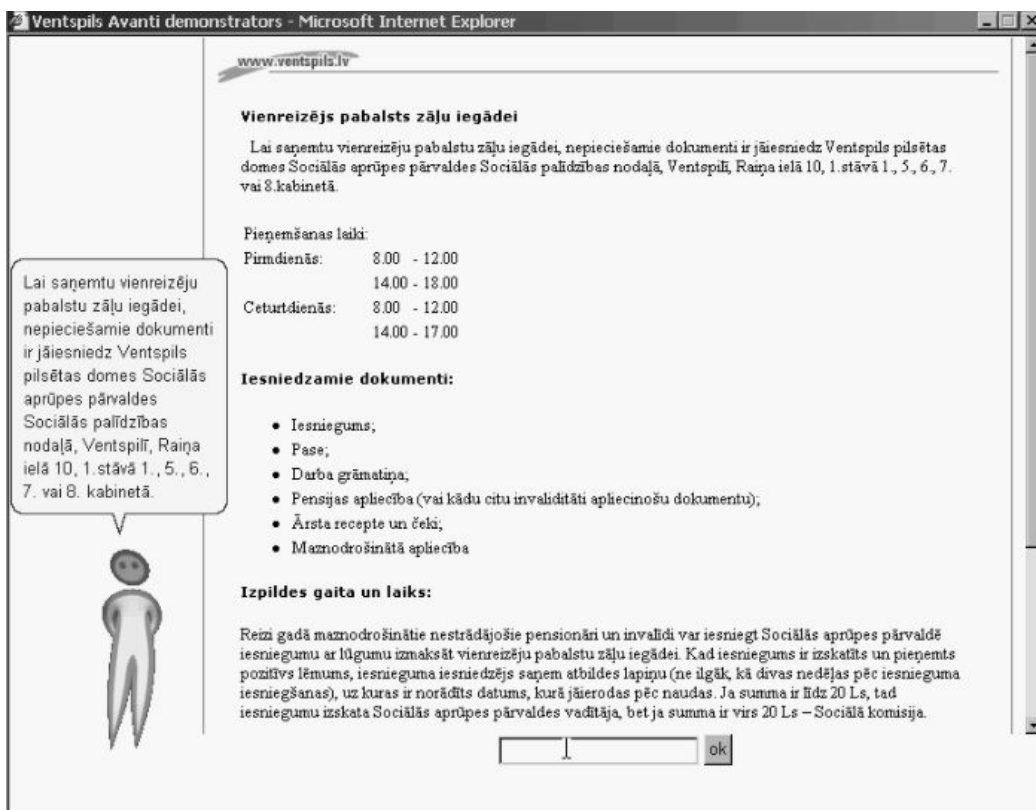
The assistant built on AVANTI demonstrator technology can:

- a. help with navigation in web page;

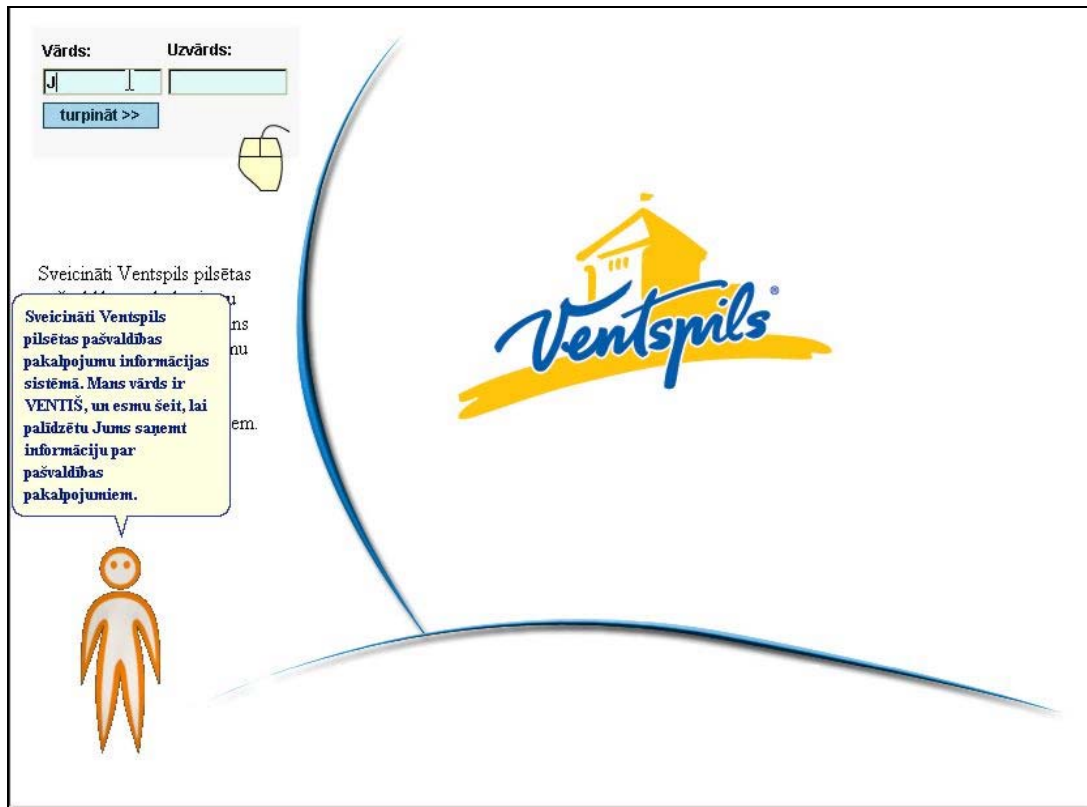
- b. in dialogue regime to clarify user's wishes and adequately answer:
- explaining in the mall where are located specific groups of goods;
  - in one stop agency pointing when the desired person can be met and when it is possible to receive and send the received information;
- c. to offer, implement and help to comprehend electronic services.

### 3.4.4.2 Presentation of the agent interface

Ventspils demonstrator is being implemented using modified/ newly established (Microsoft agent) built-in office assistant models. It possesses different animation facilities, however it cannot move on the screen determinedly itself. It can be freely relocated.

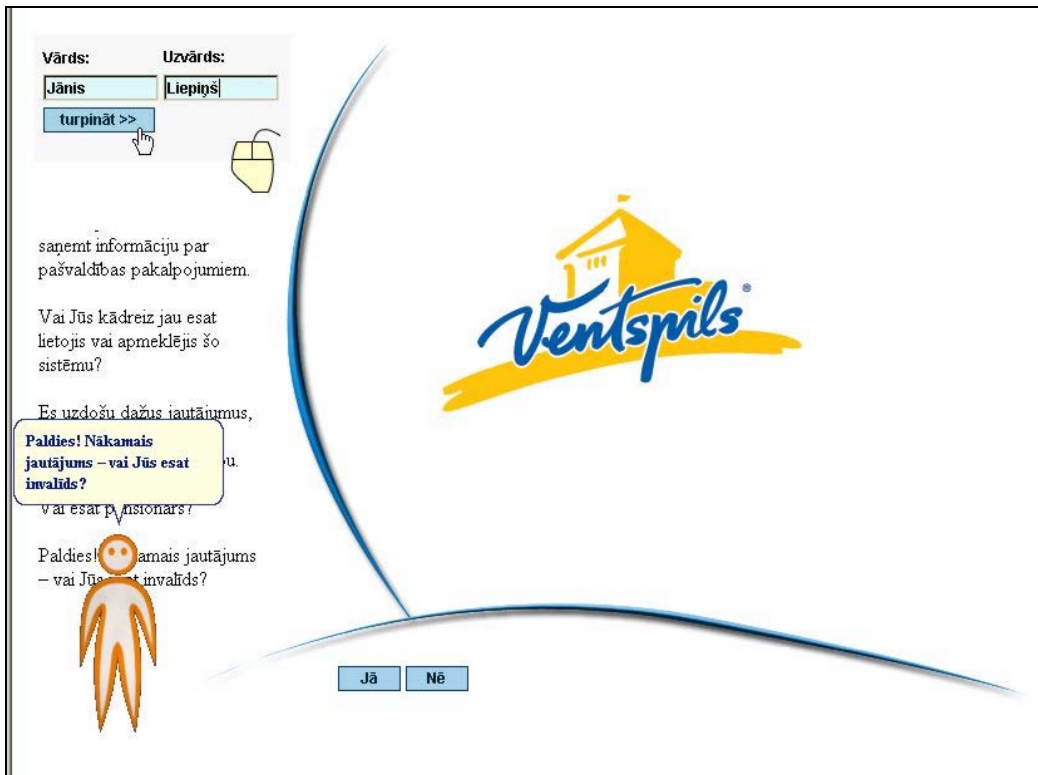


Screen shot of first version of demonstrator

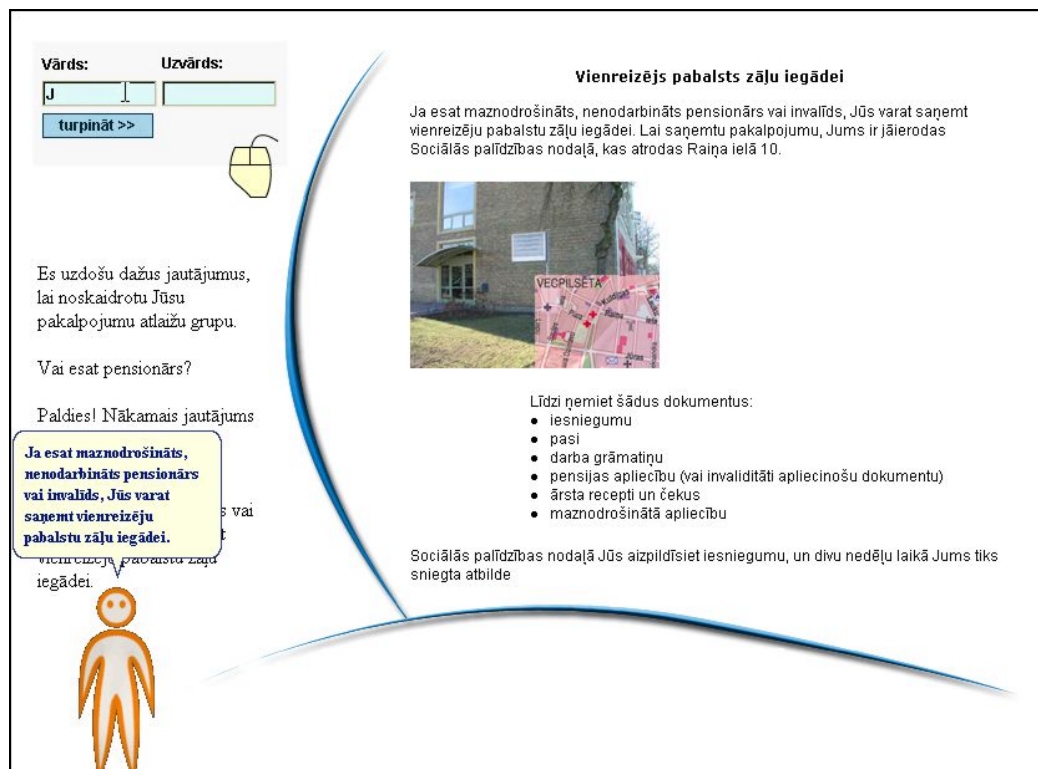


Screen shot of the second demonstrator version.

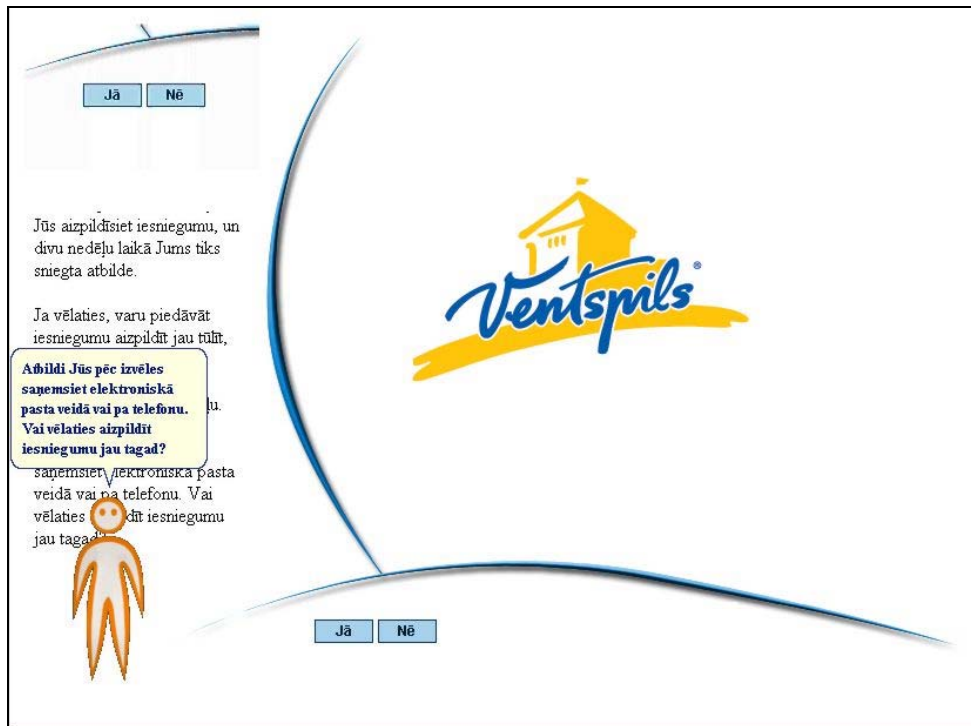
In this picture there is the very beginning of the conversation where AVANTI assistant: "Ventiš", addresses new system user (this is point 0 in the conversation structure shown in section 3.4.4.3 below). Currently one can see in the window: in the left corner a window where in avi format there are showed examples for current action under this window textual information on what Ventiš says, lower Ventiš itself, that can be freely moved as the character built on Microsoft agent base.



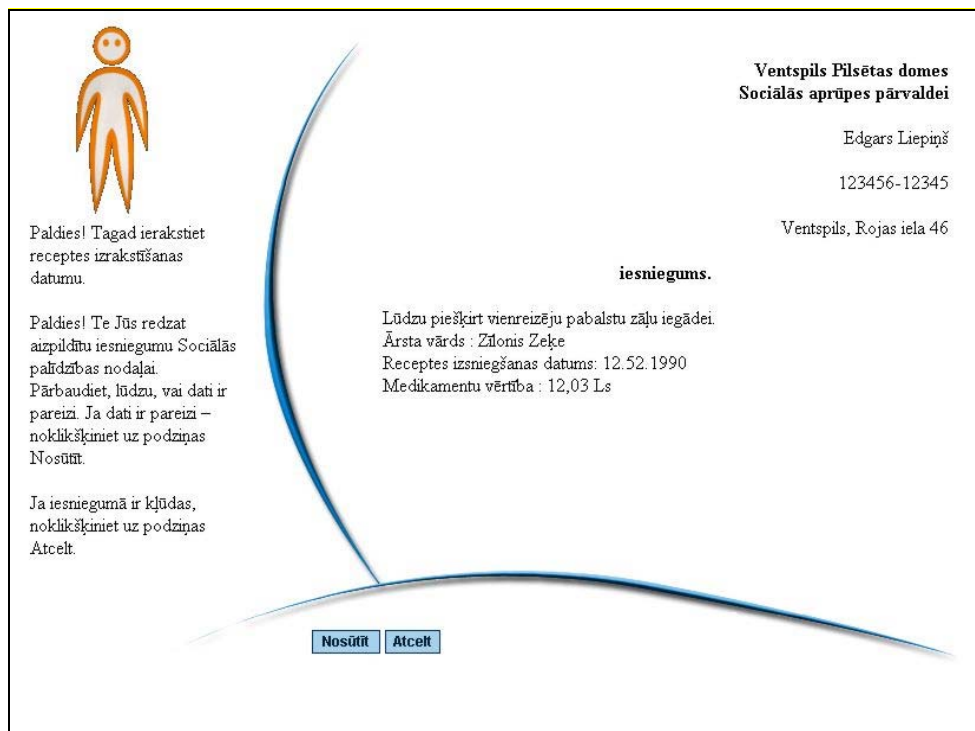
Here Ventiš clarifies to which group the user belongs to and offers the available allowances according to belonging to certain inhabitants' group. That is point number 38 in the conversation structure. At the moment it should be chosen whether user belongs to the disabled allowances group.



At this moment the user is being showed the building where they should go, its location on the map, the necessary documents. This is at point 15 in the conversation structure.

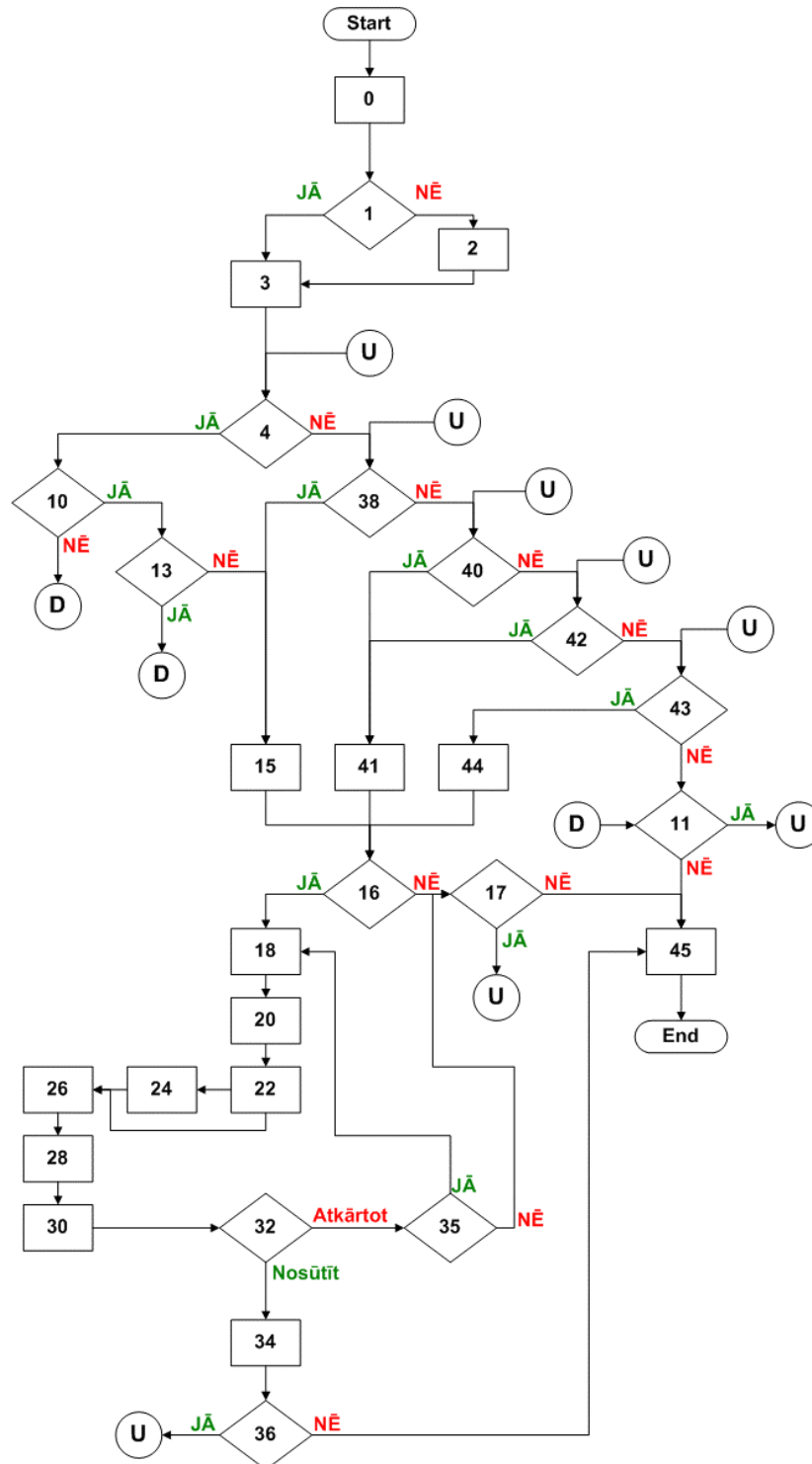


After reflecting this information Ventiš offers to write an application. This is point 16 in the conversation structure.



Here is fully completed application that is addressed to Social Care Board. That is point 32. Currently there is possibility to send or write from the start in case there is a mistake.

### 3.4.4.3 Conversation structure



- Ⓢ - Konektors U ved uz stāvokļiem 4, 38, 40, 42, 43 atkarībā no tā kurā stāvoklī jau ir pabūts
- Ⓣ - Konektors D ved uz stāvokli 11

This algorithm of work is for the second demonstrator. Each square marks static information or information input, each rhomb - necessity of choice. Every exit to "D" gets to the corresponding "D" entry to further conversations. The same with letter "U".





## **4 The Assessment Approach**

### **4.1 Introduction**

In this section each city provides an account of their work in terms of the criteria, indicators, and methods described in section 2. There are 5 sub-sections for each of the 4 cities:-

#### **4.1.1 Evaluation criteria and indicators**

This describes how the core criteria and indicators described in section 2 were localised by each city. As outlined in section 2, each city devised questions that both fitted the local user requirements and gathered data against the core indicators for “accessibility” and “inclusion and appeal”.

Note that *indicator 8* regarding the ease of use of conversation management and content integration software is assessed separately, since this was not used directly by citizens. This is discussed by each city in section 5 under the heading “*Building the conversation: issues and experiences*”

#### **4.1.2 Phase 1 demonstration sessions**

This describes the approach taken for the first phase of the evaluation, the results of which are in section 5 of the report.

The nature of the sessions is described here, covering the recruitment of test users to ‘invited’ sessions, and the approaches made to people in ‘open’ sessions held at public events or in open sessions. This section outlines what test users were asked to do, and what information was provided to them.

#### **4.1.3 Phase 2 demonstration sessions**

This describes which target groups were given more emphasis in phase 2 sessions, which built on the experience of phase 1 by following up the changes to the demonstrators that resulted from the initial feedback. Phase 2 sessions also included tests of non-keyboard input devices and technologies (e.g. speech recognition), and addressed questions that emerged from phase 1.

#### **4.1.4 Interviews on socio-economic added value**

This describes the approach taken to discussion/ interviews with managers of service areas interested in the project, and in some cases with community group workers involved in initiatives to address digital exclusion. The results of these discussions are given in chapter 6.

#### **4.1.5 Cost-benefit analysis**

This describes the approach taken to the cost-benefit analysis by each city. The results of this are given in chapter 6.



4.2 Edinburgh

4.2.1 Evaluation criteria and indicators

As described in section 2.4.3, all of the 'core indicators' can partly be assessed on qualitative analysis of field notes and observations. In Edinburgh all of the indicators were assessed on qualitative data. Some of the core indicators can also be assessed using questionnaire responses. For the Edinburgh sessions questionnaires were developed for them first for phase 1 and then revised for phase 2. Where there were substantial differences between the two they are both shown below. Each core indicator is given first, then the questions used in Edinburgh.

4.2.1.1 Social Barriers

I-1 A majority of target group users should state that they would use the demonstrator if it were deployed.

The target users were identified from responses to these questions :-

Your age

- Under 15 15-24 25-44 45-54 55-64 65-74 75+

Your gender

- Female Male

What is the first part of your postcode (e.g. EH6)?

Or, if you do not know your postcode, which area do you live in?

What do you do?

Please choose whichever option best describes what you do: -

- Work full time Work part time Look after family Unemployed At school, college, or university Retired

What level of formal education do you have?

- Secondary School up to age 15 Secondary School past age 15 Further Education College or apprenticeship University

Do you have any long standing illness, health problem or disability that makes it difficult to use a computer? If so please tell us what is difficult for you.

For this question you can choose more than one option:-

Table with 4 columns: Activity, Very difficult, Quite difficult, No problem. Rows include Using a keyboard, Using a mouse, Seeing text displayed on the screen, Hearing sounds played on the computer.

Something else (please tell us what)



**How often do you use the Internet?**

- More than once a week     About once a week     About once a month     Less often than once a month     Never

**How long have you been using the Internet?**

- About one week     Several weeks     About 1 month     Several months     6-12 months     Over 1 year

The participants fitting the target group criteria were identified from their responses to the above, and then their responses to the following question used to assess their preferences for the demonstrator or the current system.

**If you were using the Internet to find out about library and other council services, what would your overall preference be?**

- Much prefer Avanti     Prefer Avanti a little     No difference between the two     Prefer the Web pages a little     Much prefer the web pages     Not sure/ Don't know

#### **4.2.1.2 Place and Time Barriers**

*I-2 Target users should perceive benefits in using the demonstrator to access the service outside office hours, and from home or other locations with Internet access.*

*I-3 Any practical constraints on using the demonstrator at Public Internet Access Points should be no greater than for the current online service.*

These were mainly assessed using analysis of discussion notes and observations made from the demonstration sessions, rather from questionnaires. The questionnaires did include one related question:-

**Where is it convenient for you to use the Internet?**

*For this question you can choose more than one option:-*

- Home     Friend or family member's home     Library or Community Centre     Internet cafe     Work     Nowhere is convenient

#### **4.2.1.3 Technology Barriers**

The following two indicators were assessed from the analysis of discussion notes and observation rather than questionnaires.

*I-4 Target users should be able to complete typical tasks using non-keyboard input at least as effectively with the demonstrator as with the current online service (or its closest equivalent).*

*I-5 Text to speech capabilities of the demonstrator should be at least as acceptable to visually impaired users as currently deployed screen-reader software used in conjunction with the current online service (or its closest equivalent).*



#### **4.2.1.4 Manageability**

*I-6 Target users have fewer serious problems with navigation, task completion, feedback, and error handling, than with the current online service*

This was assessed from analysis of field notes and video recordings of the feedback sessions.

*I-7 A majority of target users say they are satisfied with the ease of use of the demonstrator, or that it is easier to use than the current online service (where there is a comparable service available).*

This was assessed according to the target participants' responses to these questions: -

**When you were given a choice of things to get further information about, did you find the choices:-**

- |   |   |   |  |  |   |
|---|---|---|--|--|---|
| <input type="checkbox"/> Much clearer on Avanti | <input type="checkbox"/> A little clearer on Avanti | <input type="checkbox"/> No different between the two | <input type="checkbox"/> A little clearer on the Web pages | <input type="checkbox"/> Much clearer on the Web pages | <input type="checkbox"/> Not sure/ Don't know |
|---|---|---|--|--|---|

**When you were working out what to do next, was it: -**

- |  |  |   |   |   |   |
|--|--|---|---|---|---|
| <input type="checkbox"/> Much more difficult on Avanti | <input type="checkbox"/> A little more difficult on Avanti | <input type="checkbox"/> No different between the two | <input type="checkbox"/> A little more difficult on the Web pages | <input type="checkbox"/> Much more difficult on the Web pages | <input type="checkbox"/> Not sure/ Don't know |
|--|--|---|---|---|---|

#### **4.2.1.5 Clarity and enjoyment**

*I-9 Target users have fewer serious problems understanding the words and phrases used by the avatar, or displayed in instructions, than with the current online service (where there is a comparable service available).*

This was assessed from analysis of field notes and video recordings of the feedback sessions.

*I-10 A majority of target users say they find the language used by the demonstrator easy to understand, or that it is easier to understand than the current online service (where there is a comparable service available).*

**Which did you find easier to read on the screen in terms of the size and colour of the text?**

- |   |   |  |  |  |   |
|---|---|--|--|--|---|
| <input type="checkbox"/> Much clearer on Avanti | <input type="checkbox"/> A little clearer on Avanti | <input type="checkbox"/> No difference between the two | <input type="checkbox"/> A little clearer on the Web pages | <input type="checkbox"/> Much clearer on the Web pages | <input type="checkbox"/> Not sure/ Don't know |
|---|---|--|--|--|---|

**Which did you find easier to understand in terms of the language used?**

- |  |  |  |   |   |   |
|--|--|--|---|---|---|
| <input type="checkbox"/> Much more difficult on Avanti | <input type="checkbox"/> A little more difficult on Avanti | <input type="checkbox"/> No difference between the two | <input type="checkbox"/> A little more difficult on the Web pages | <input type="checkbox"/> Much more difficult on the Web pages | <input type="checkbox"/> Not sure/ Don't know |
|--|--|--|---|---|---|



*I-11 A majority of target users say they find the avatar and screen layout appropriate for its purpose, or that it is more attractive/appealing than the current online service (where there is a comparable service available).*

**Which do you think looks appealing enough to use regularly?**

- Much prefer Avanti     Prefer Avanti a little     No difference between the two     Prefer the Web pages a little     Much prefer the web pages     Not sure/ Don't know

#### **4.2.1.6 Relevance**

*I-12 Target users have no problems with the relevance or credibility of information presented by the demonstrator*

This was assessed from analysis of field notes and video recordings of the feedback sessions.

*I-13 A majority of target users say they are satisfied that information presented by the demonstrator is relevant to their query.*

The Phase 1 questionnaire included the question below (separately for the demonstrator and the library web pages). It was dropped from the phase 2 questionnaire as the responses and comments from the test users indicated they saw no difference between the demonstrator and the library web pages on this criterion.

**The information on AVANTI is reliable and I feel I can trust it**

- Strongly agree     Agree     Neutral     Disagree     Strongly disagree     Don't know

**The library pages are a reliable source of information**

- Strongly agree     Agree     Neutral     Disagree     Strongly disagree     Don't know

#### **4.2.2 Phase 1 Demonstration sessions**

Phase 1 demonstration sessions were invited sessions with community groups in Libraries and a Community Centre in the city. Groups were approached by contacting their team leader identified through Library contacts. All but one group was connected to the Library and most were undertaking beginners' computer classes organised by the Library or the Community Centre. Sessions were undertaken in the group's normal meeting location, which was, in all cases, the computer room (Learning Centre) in the Library or Community Centre. In the Libraries these 'Learning Centres' are provided through the People's Network programme which provides public computers with Internet access in libraries.

Introductory user meetings were undertaken prior to testing with some of the groups in Muirhouse Library. The meetings were aimed at specific groups within the library that were composed of people in some of the project's target groups, such as the elderly, computer beginners and people lacking access to technology. These meetings were led by members of the project team in co-operation with the local library staff and group leaders and the agenda was as follows:

- PowerPoint or flipchart presentations with slides introducing the project in simple terms and examples of some Avatar characters
- Discussion of trans-european project objectives and themes



- Explanation of potential future work with the user group
- Distribution of information sheets / leaflets
- Filling in of general computer use questionnaire (in some cases)
- Opportunity for questions and general discussion

In total 5 invited sessions took place between December 2002 and March 2003 lasting approximately 2 - 2.5 hours each. These sessions included two visits to an elderly computer beginners' class in Muirhouse Library, the Library Link Elderly Group, an adult computer beginners' class in Muirhouse, and a group of blind and visually impaired users at the Central Library Resource Centre.

At these sessions a small group of users (ca 6 people) were given a short introduction to the project and then asked to work through a specific scenario provided by the facilitators to find out information or complete a certain task. The user was observed whilst doing this, most sessions were filmed for analysis later and notes were taken of their problems, comments and any other issues arising. Having completed the scenario on the demonstrator the user was then asked to carry out a similar scenario on the Libraries web pages to find the same information (See Annex in section 9). Following the testing, which lasted around 20 – 30 minutes per person, users were asked to complete a short questionnaire giving their views on the demonstrator and suggestions for improvements (See Annex in section 9). At the end of the testing, where time allowed, an informal discussion was held with the group and the project team members and notes were taken of any user observations, comments or suggestions. After each session the notes were written up to provide a full record of the testing.

### **4.2.3 Phase 2 Demonstration sessions**

Phase 2 of testing undertaken in April to June 2003 was a mixture of open and invited sessions and involved far larger numbers of testers than phase 1. The qualitative information from the in depth invited sessions of phase 1 had identified a number of improvements to the demonstrator which were then made, where feasible, before the start of phase 2. In phase 2 therefore it was deemed necessary to obtain some detailed feedback on the demonstrator as well as to consult a wider range of citizens and seek the views of larger numbers of people in order to build up a clearer picture of the overall user response to the demonstrator and its acceptability.

#### **4.2.3.1 Open Testing**

Open sessions took place over 2 weeks in the Central Library. Visitors to the Library were approached by members of the AVANTI project team and asked to give 15 minutes of their time to test both the demonstrator and Library web pages and fill in a short questionnaire asking their views on both (See Annex 1). A number of personal questions were also included in the questionnaire to find out some information about the user's age, level of education, any disabilities and Internet experience. Around 30 people were tested in this testing. Where possible the project team identified Library visitors with little or no previous Internet experience or confidence. This was achieved by a few initial questions on approaching the individual.

Further open testing took place at Age Concern premises in Edinburgh. The 'Silver Surfers Festival' run by Age Concern was a 2 month programme (May-June 2003) offering Internet taster sessions to older people in Edinburgh. The Edinburgh AVANTI project team set up in the computer room at Age Concern and invited those attending taster sessions to also try out the Edinburgh demonstrator and libraries pages and then fill in a questionnaire. A further 56 questionnaires were completed from these sessions.



#### **4.2.3.2 Invited Sessions**

Invited sessions with different groups in the Community broadly followed the format of invited sessions in phase 1. The following invited sessions were held:

- Holyrood Adult Learning Group 22nd May 2003 (6 users)
- Portobello Computer Beginner Class 29th May 2003 (8 users)
- Kingsinch School for Children with Learning and Physical Disabilities 3rd June 2003 (4 users)
- WillowPark School for Children with Learning and Physical Disabilities 4th June 2003 (24 users)
- New Trinity Centre, 'No's in Everyday Life', Adults with Learning and Physical Disabilities 11th June (7 users)
- Invited Session at Fountainbridge Library, 'Surging Ahead' class, 13th June 2003, (5 users)
- Invited Session at Piershill Library, 'No's in Everyday Life' class, 17th June 2003 (6 users)

From sessions in phase 1 it was clear that elderly computer beginners were a useful group with which to test as the demonstrator seemed to have a good level of appeal and potential use to this group. As such, sessions in phase 2 focussed quite heavily on elderly users through open testing and the meeting in the residential home for older people. In addition to this however, a need for testing with a wider range of target users was identified. For this reason the test sessions with adult learners, children with disabilities and the carers group were organised to seek the views of different users with a wider range of requirements and interests.

The focus of sessions was on a number of aspects of the demonstrator, namely look and feel, usability, clarity of information and ease of navigation. These were assessed on the basis of a comparison with Library web pages.

A separate part of this phase involved the testing of several alternative devices and technologies. Handwriting recognition was tested in the open sessions in Central Library using a Compaq tablet PC. It was felt that removing the need to use a keyboard to type might be of assistance to a number of people since this had arisen as a problem in some of the phase 1 testing.

Some trials of voice recognition were undertaken but the unreliability of the recognition meant that this was only tested in a very limited way with one user group. An alternative keyboard with orbs rather than keys was procured for investigation as an aid for people with limited dexterity. Because of the nature of this device, however, it was felt that it could not be tested openly with user groups since it was not intuitive enough to be used by people with no previous training in its operation.

#### **4.2.4 Interviews on socio-economic added value**

The approach to socio-economic added value included a mixture of one to one interviews, discussion groups and presentations. The following list details these meetings:

- Interview with Councillor, Executive member for Modernising Government, 3<sup>rd</sup> April 2003
- Meeting with Library managers and City Development Manager, 24<sup>th</sup> April 2003



- Interviews with: IT Co-ordinator Willow Park School for disabled children, IT Manager Age Concern, IT Manager Holyrood Community IT Centre, 29<sup>th</sup> May 2003
- Presentation to Partnership Steering Group (strategic programme group for Council BT partnership), 5<sup>th</sup> June 2003

The format of these meetings varied depending on attendees and numbers but the general aim was to seek views on the value of AVANTI to the citizen and community at large. It was anticipated that these views would help to scope the cost benefit analysis. Attendees at the meetings were asked for their comments and opinions on the following issues:

- How widely an avatar-based service should be deployed in order to achieve the benefits that evaluation evidence (so far) indicates can be achieved.
- Whether some of those benefits can be achieved by a change of thinking in how e-services are delivered to make them more 'conversational'
- What resources would be needed to do either

All attendees were given an explanation or presentation of the work of the project and a demonstration of the Edinburgh application. The AVANTI team member then described the work with users and response to date in terms of demonstrator feedback. Attendees were then asked to comment in general on the project and demonstrator and were then asked specific questions relating to the themes noted above but tailored to their particular area of expertise. Comments from these sessions were noted and written up later. The information and views received have informed the content of sections 7.1.1 and 7.2.1 as well as some of the content of the Edinburgh Exploitation Plan.

### 4.2.5 Cost-benefit analysis

In order to undertake a cost benefit analysis of the project a number of information sources were considered. The added value interviews mentioned above in section 5.1.4 gave an insight into the areas where costs and benefits might lie in the implementation of an AVANTI type service in Edinburgh. In order to construct the cost benefit analysis further consideration was given to these areas and conclusions drawn as to the potential financial implications. To do this, existing analyses and business cases for IT projects and the already identified savings and costs for migration of certain Council services to online delivery were taken into account. In addition, potential take-up rates were estimated from the results of user questionnaires relating to future use of channels for interacting with the Council.

## 4.3 Kista

### 4.3.1 Evaluation criteria and indicators

The evaluation criteria and general indicators were adapted to give the following questions. Some of these were changed between sessions in phase 1 and 2, as the demonstrators and evaluation priorities changed (e.g. to test speech recognition).





4.3.1.1 Social Barriers

I-1 A majority of target group users should state that they would use the demonstrator if it were deployed.

The target users were identified from responses to these questions : -

- Age: Under 16, 17-25, 26-35, 36-45, 46-55, 56-65, 66-75, 75+
Sex: Male, Female
Have you access to a computer at home? Yes, No
How would you describe your abilities with computers? Complete beginner, Need a lot of help, Sometimes need help, Quite confident, Very confident
Occupation:
How often do you use Internet? About 5 times a week, About once a week, About once a month, Less often than once a month, Never
Have you visited the website of Kista before? Yes, No
Have you reported a fault/problem before? Yes, No
If yes, how did you access to the service? Telephone, Mail, Internet, Other (please say how), .....

The target users' preferences for the demonstrator relative to the current Kista web site were sought using these three questions:-

- Do you think that the Avatar made it easier to find your desired service/information? Yes, definitely, Yes, Neutral, No, Absolutely not, No comments
If you had access to this Avatar on the Internet, could you imagine to use it to access the supported services instead of using other ways (for example telephone)? Yes, No
Which way do you prefer to report a fault/problem? The Kista's website, The dog

4.3.1.2 Place and Time Barriers

I-2 Target users should perceive benefits in using the demonstrator to access the service outside office hours, and from home or other locations with Internet access.

I-3 Any practical constraints on using the demonstrator at Public Internet Access Points should be no greater than for the current online service.

Qualitative analysis was used for evaluation of these, but the questionnaires did have one related question:-

- Where do you have access to Internet? Home, Friend or family member's home, Library, Internet cafe, Work, Other (please say where)

4.3.1.3 Technology Barriers

I-4 Target users should be able to complete typical tasks using non-keyboard input at least as effectively with the demonstrator as with the current online service (or its closest equivalent).



- Do you think that it became easier to communicate with the Avatar by talking (using voice) to it, instead of using the keyboard and mouse?  
 Yes, definitely,  Yes,  Neutral,  No,  Absolutely not,  No comments
- Did you experience any difficulties to communicate (by using the voice) with the Avatar?  
 No difficulties at all,  No difficulties,  Neutral,  Some difficulties,  Large difficulties,  No comments
- Did you like the possibility to talk to a computer to find/use information or services on the web?  
 Yes, definitively,  Yes,  Neutral,  No,  Absolutely not,  No comments

*I-5 Text to speech capabilities of the demonstrator should be at least as acceptable to visually impaired users as currently deployed screen-reader software used in conjunction with the current online service (or its closest equivalent).*

Since Swedish language text-to-speech capabilities were not previously deployed in Kista, and this was an important new capability of AVANTI, a specific question was asked about the users' requirement for this:-

- Now, when you have tried the Avatar, would you prefer that the text be read to you when you use Internet?  
 Yes, definitely,  Yes,  Neutral,  No,  Definitely not,  No comments

#### **4.3.1.4 Manageability**

*I-6 Target users have fewer serious problems with navigation, task completion, feedback, and error handling, than with the current online service*

This was assessed from analysis of field notes and video recordings of the feedback sessions.

*I-7 A majority of target users say they are satisfied with the ease of use of the demonstrator, or that it is easier to use than the current online service (where there is a comparable service available).*

Note that phase 1 questionnaires were used in Kista before Napier drafted the 'core' criteria and indicators. However the questions are consistent with them.

#### **Phase 1**

- Do you think that the instructions and information in the brochure were enough for using the avatar?

1.....2.....3.....4.....5

Not at all

Yes, absolutely

- Do you think that the use of voice would make the use of the avatar easier?  
 Yes  No
- If you compare the avatars, which of them has been easier to use?  
 Andrea  The dog  
Would you please describe the reason? .....
- Did you experience any difficulties to use the avatar?
- Which way was easier to find the fault/problem reporting service?  
 By using the avatar  Stockholm.se



- Do you think that the use of avatar made it easier to find your desired service or information?
Yes No

Phase 2

- Did you succeed to find the current fault/problem reporting service available at the Kista's website?
How was to find the fault/problem reporting service available at the website of Kista?
How was to find the fault/problem reporting service by using the Avatar?

4.3.1.5 Clarity and enjoyment

I-9 Target users have fewer serious problems understanding the words and phrases used by the avatar, or displayed in instructions, than with the current online service (where there is a comparable service available).

This was assessed from analysis of field notes and video recordings of the feedback sessions.

I-10 A majority of target users say they find the language used by the demonstrator easy to understand, or that it is easier to understand than the current online service (where there is a comparable service available).

Phase 1

- When you listened to the text read by the avatar available at Stockholm.se, did you experience any difficulties to understand what has been said?
Did you experience that the dialogue was too much restricted?

Phase 2

- When you listened to the Avatar, did you experience any difficulties to understand what has been said?

I-11 A majority of target users say they find the avatar and screen layout appropriate for its purpose, or that it is more attractive/appealing than the current online service (where there is a comparable service available).

This was assessed from analysis of field notes and video recordings of the feedback sessions. In Phase 1 this question was also asked about the avatar.



- Which of the tested avatars do you prefer?  
 Andrea                       The dog

#### **4.3.1.6 Relevance**

*I-12 Target users have no problems with the relevance or credibility of information presented by the demonstrator*

##### **Phase 1**

- Did you receive relevant information from the avatar?  
 Yes                       No

##### **Phase 2**

- In order to do report a fault/problem, how relevant/supportive did you find the information presented at the website of the Kista?  
 Very relevant,  Relevant,  Neutral,  Irrelevant,  Very irrelevant,  No comments
- In order to do report a fault/problem, how relevant/supportive did you find the information presented by the Avatar?  
 Very relevant,  Relevant,  Neutral,  Irrelevant,  Very irrelevant,  No comments

*I-13 A majority of target users say they are satisfied that information presented by the demonstrator is relevant to their query.*

The Kista applications were not information retrieval applications so this indicator was not appropriate.

### **4.3.2 Phase 1 demonstration sessions**

In order to evaluate the application, both qualitative and quantitative methods have been used. The principal research method was the observation method, the main means of which was by video recordings of users dialog with the avatar. This method was supplemented by two questionnaires.

The user group was consisted of 14 elderly people between the ages of 60 to 84, and one disabled person who suffered from Downs-syndrome. The selection of the members of the user group was based on the result of a questionnaire, which has been distributed among voluntaries. This questionnaire contained questions about sex, age, as well as previous experiences of using computers and Internet. The previous experience of using computers and Internet varied among the members of the user group, i.e. 64 percent of the users had some experience of using computers, while 36 percent of them had not any previous experiences.

Before the beginning of the evaluation process, a brochure containing some general information about the project and the way the avatar works has been distributed among the users.

During the test process, the users began with the test computer 1, on which they tested both interfaces (the dog and Suzy) to find and use the supported services and information by the avatar. After this test, they went to the test computer 2, where they tested the current services (unsupported with the avatar) available on the web. As the intention of the project group was to replace the English version of the TTS used in this version of the avatar by a Swedish version, the user group has been offered to listen to a Swedish TTS available on the Stockholm's website ([www.stockholm.se](http://www.stockholm.se)) to make them familiar with this facility.

During the test, a video recorder has been used. The reason for choosing the video recording was based on reasons given by Smith (1981), who meant that "the use of mechanical recording device usually gives greater then observations done by hand" and allowed "retrospective analyze" (Edwards and Westgate, 1987). A microphone placed at the front of the computer captured the users' voice and comments during the test. The focus of the camera was on the monitor of the test computer 1. The observation was supplemented by brief handwritten notes.

The observation method was supplemented by another questionnaire, which has distributed among the participants after the test. The purpose of the second questionnaire was to gather data regarding the users' experiences by using the avatar, as well as capture their feedbacks and proposals that would help us in the improvement of the application.

After the accomplishment of the test, the gathered data have been analyzed and categorized. The categorization of data has been developed after viewing the tape and adapting an open mined stance, allowing the data itself to influence the design of a category system driven from analyzing it rather than being imposed on it.

During the analyzing process, the focus has been on the users' interaction with the avatar to find those factors that made such interaction difficult. Also the correlation between the users' previous experiences and the way they used the avatar has been studied.

In short, the objective of this test was to:

- Find out which one of the developed interfaces, including the avatars was preferred by the target group and why.



- Study the users interaction with the avatar in order to find those aspects that make such interaction difficult.
- Study the users' use of the avatar to find their barriers.
- Study the users' experience of using avatars as agents,
- Study the users' experience of using TTS system.
- Study the users' experience of the developed interfaces.

### 4.3.3 Phase 2 Demonstration sessions

In order to evaluate the modified application, in this phase as the previous one, both qualitative and quantitative methods have been used. The principal research method was the observation method, the main means of which was by video recordings of users dialog with the avatar. This method was supplemented by one questionnaire.

The user group in this test was consisted of 23 people, 11 immigrants and 12 elderly people. The age of older population was between 56 to 75 years, while the immigrant group had an age range between 14 to 55 years. As the focus of the evaluation in the first phase has been on the elderly, the project team of Kista decided to let both immigrants and elderly try the modified application from phase 1.

During the test, the users have been asked to:

- Find and use the fault/problem service, available at the website of Kista.
- Try the avatar by using keyboard and mouse.
- Try the avatar by talking to it.

During the test, a video recorder has been used. A microphone placed at the front of the computer captured the users' voice and comments during the test. The focus of the camera was on the monitor of the test computer. The observation was supplemented by brief handwritten notes.

The observation method was supplemented by a questionnaire, which has distributed among the participants after the test. The purpose of the questionnaire was to gather data regarding the users' experiences by using the avatar, as well as capture their feedbacks and proposals that would help us in the improvement of the application.

After the accomplishment of the test, the gathered data have been analysed and categorized. The categorization of data has been developed after viewing the tape and adapting an open mined stance, allowing the data itself to influence the design of a category system driven from analysing it rather than being imposed on it.

During the analysis, the focus has been on the users' interaction with the avatar to find those factors that made such interaction difficult. The correlation between the users' previous experiences and the way they used the avatar has been studied.

In general, the objective of this test was to:

- Study the dialogue between the users and the Avatar

- Study the users' experience of the modified interface
- Study the modified Avatar's ability to help the user to find their desired information or services
- Study whether the use of voice could make the users interaction with the Avatar easier
- Let the users evaluate the Avatar by comparing it with the current website of Kista.

### 4.3.4 Interviews on socio-economic added value

Our first ambition was to set up a panel discussion between officers and politicians having an interest and impact on the further development of e-government in the City of Stockholm.

We soon realised that this was not possible due to extensive budget discussions taking place during the period. Instead we have met 3 officers and 2 politicians individually to have their views on future e-government with possibilities and lessons learned from Avanti in mind.

The persons we met where;

- Stefan Svensson – Manager of IT strategy – IT department, City of Sthlm
- Kent Larsson – Internet and security - IT department, City of Sthlm
- Ingvar Åhman Eklund – head of information and culture, Kista borough, City of Sthlm
- Mirja Särkiniemi, Head of responsible politicians Kista borough
- Birgitta Wahlman, Head of opposition politicians, Kista borough

At all the meetings we started with a short presentation of the Avanti project together with an quite extensive demonstration of the Kista FAQ application. Both the politicians also tested the application themselves.

We used questions circulated by Napier as guidance to prepare the questions for the meetings. But the meetings turned out rather to be discussions and it was hard to follow a prepared set of questions. Also the tendency was that it was difficult to get clear answers on concrete questions mostly because the person was not in the position to give straight answers (and as the organisation works in the City of Stockholm it is often difficult to know who are in the position to make clear statements in this area).

### 4.3.5 Cost-benefit analysis

#### 4.3.5.1 Choice of method

There are a number of techniques for evaluating the benefits and costs of IT investments. This includes for example:

- Traditional cost and benefit analysis
- Cash flow over time analysis
- Information economics – Valuation of systemic effects on departmental interchange
- Multi objective and multi-criteria analysis – including valuation by different stakeholders



In the process of selecting evaluation method we have also taken into account that the results from the expert panels in the socio-economic evaluation also can serve as an important input in the valuation process.

**4.3.5.2 The main parts**

The method chosen can be described as a version of Multi objective and multi-criteria analysis.

A competence panel representing important criteria has been working on the evaluation partly using the result of the stakeholder comments resulting from the socio-economic analysis, and partly with their own estimations on the potential of the demonstrated applications.

The competence in the panel represents:

- IT-planning, estimating total cost of technology
- Service provider competence, estimating cost and savings in the organisational level
- Target group competence, estimating rate of acceptance use
- Systemic competence, estimating systemic effects on departmental interchange

The competence panel has met and discussed the presented demonstrators.

**4.4 Lewisham**

**4.4.1 Evaluation criteria and indicators**

The evaluation criteria and general indicators were adapted to give the following questions. Some of these were changed between sessions in phase 1 and 2, as the demonstrators and evaluation priorities changed (e.g. to test speech recognition).

**4.4.1.1 Social Barriers**

*I-1 A majority of target group users should state that they would use the demonstrator if it were deployed.*

The target users were identified from responses to these questions : -

Phase 1	Phase 2
How would you describe your abilities with computers?	How would you describe your abilities with the Internet?
How do you usually talk to the council?	When you apply for services form the council, do you need the help of a council officer? E.g. when applying for housing benefit if you just need to hand in the form and get a receipt, please answer no.
Is it important for Fiona to speak a language other than English?	
What is your mother tongue?	

The target users’ preferences for the demonstrator were sought using these questions:-





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If the AVANTI service were available, how would you prefer to contact the council?	When you apply for services from the council, do you need the help of a council officer? E.g. when applying for housing benefit if you just need to hand in the form and get a receipt, please answer no. If all the following methods of contacting the council were available, which would be your preferred method of contact?
Thinking generally, would you be prepared to use a service like AVANTI?	

### 4.4.1.2 Time and Place Barriers

*I-2 Target users should perceive benefits in using the demonstrator to access the service outside office hours, and from home or other locations with Internet access.*

*I-3 Any practical constraints on using the demonstrator at Public Internet Access Points should be no greater than for the current online service.*

Phase 1	Phase 2
What would you say the drawbacks would be of using the AVANTI software?	In your opinion, where would be the best place to access the AVANTI demonstrator?
Would any of the above reasons stop you using a service like AVANTI?	Have you ever needed to contact the council outside of normal office hours?
In which of the following places would you prefer to use this service?	Would you want to apply for services outside of normal office hours in the future?

### 4.4.1.3 Technology Barriers

*I-4 Target users should be able to complete typical tasks using non-keyboard input at least as effectively with the demonstrator as with the current online service (or its closest equivalent).*

*I-5 Text to speech capabilities of the demonstrator should be at least as acceptable to visually impaired users as currently deployed screen-reader software used in conjunction with the current online service (or its closest equivalent).*

Lewisham addressed these indicators in the phase 1 questionnaire with this question:-

How important is it for you to talk to the PC; the PC to talk to you; or for you to use the mouse?
--



**4.4.1.4 Manageability**

*I-7 A majority of target users say they are satisfied with the ease of use of the demonstrator, or that it is easier to use than the current online service (where there is a comparable service available).*

Phase 1	Phase 2
Was the software easy to use?	If you found the demonstrator hard to use, what made it difficult?
How do you think we could improve the software to make it easier to use?	How do you think we could improve the demonstrator to make it simple to use

**4.4.1.5 Clarity and enjoyment**

*I-9 Target users have fewer serious problems understanding the words and phrases used by the avatar, or displayed in instructions, than with the current online service (where there is a comparable service available).*

*I-10 A majority of target users say they find the language used by the demonstrator easy to understand.*

These were assessed from analysis of notes from feedback sessions.

*I-11 A majority of target users say they find the avatar and screen layout appropriate for its purpose, or that it is more attractive/appealing than the current online service*

Phase 1	Phase 2
Did you like Fiona, the character you saw on screen?	Were you given enough information to support your enquiry?
Did you think that Fiona is essential?	If no, what type of information do you need?
Why do you think that Fiona is essential?	How would you compare the AVANTI demonstrator as a method of receiving services compared to e-mail; fax; telephone; post; in person; web site?

**4.4.1.6 Relevance**

*I-12 Target users have no problems with the relevance or credibility of information presented by the demonstrator*

This was assessed from analysis of notes of the feedback sessions.

*I-13 A majority of target users say they are satisfied that information presented by the demonstrator is relevant to their query.*

This was assessed in phase 1 questionnaires with this question:-

What information and services would you use if they were delivered in this way?
---



## 4.4.2 Phase 1 Demonstration sessions

The sessions for phase one were all invited sessions. Lewisham hosted user group workshops and attending community group meetings. The groups were selected because their profile fitted the AVANTI target audience of

- elderly
- disabled
- black and ethnic minority
- service providers

### Phase 1

e-Gov Staff and front-line staff	26/2	Service Providers
e-Gov Head of unit	4/033	Service Providers
Core User Group 1	5/03	Citizen Group
Core User Group 2	10/3	Citizen Group
Indo-Chinese Community School	11/03	Ethnic
Age Concern	12/03	Age
Federation of Vietnamese Refugees	14/03	Ethnic
Horizons Over 25s computer club	20/03	Disability
Horizons Under 25s computer club	21/03	Disability
Age Exchange	03/04	Age
DeafPlus	03/04	Disability
Darby and Joan Club	09/04	Age
170 Community Project	10/04	Citizen Support Group
Lewisham Asian Elders	11/04	Age
Lewisham Independent Pensioners Advocacy	16/04	Age

### 4.4.2.1 The test sessions

The format of the test sessions and community group meetings took the form of a short presentation, user testing of the demonstrator, a questionnaire, another presentation on the avatar and a final one-page questionnaire.

The first presentation was about AVANTI telling viewers

- **WHY THE PROJECT WAS STARTED**
- where the funding had come from
- what they were being asked to do

The presentation lasted for between 20 and 30 minutes.

The users were then asked to try out the housing benefit advisor. They were provided with three scenarios so that they did not feel they were giving away personal information. Each scenario explored the different methods of accessing the demonstrator, using the click buttons, typing the answers and speaking the answers. Quite often, the scenarios were abandoned in favour of speaking the reply.

Scenario 1: Using the click buttons, find out what is housing benefit

Scenario 2: Using the keyboard, find out how to start an appeal against an housing benefit



decision asking for someone in the housing benefit department to review the decision internally.

Scenario 3: Using voice, find out how to start a new claim for housing benefit. The users were given additional information to check eligibility they were: -

- a Lewisham resident
- renting a property from your brother
- paying rent to him but he was not living with them
- single
- have savings around £3,000
- only renting one property
- not a student
- living in the property they were currently claiming for

After each user had explored the demonstrator for as long as they wanted, they were asked to fill in a questionnaire to record their feelings. The questionnaires gave space for users to give their personal view in the form of free form text. They were advised that they could use the back of the questionnaire to add further thought if they should so wish.

After all the users had used the demonstrator and filled in their questionnaires, which consisted of 23 questions.

- The users were asked to rate their abilities using PCs
- Rate how often they used AccessPoint, TellyTalk, telephone e-mail, the internet to get services from the council
- They were also asked which was their preferred method of contact and how often they contacted the council for certain services
- The users were then asked how easy the software was to use
- What improvements should be made to make it easier to use
- The user was asked about the avatar if they liked it, was it essential and why, was it important to speak other languages
- The user was also asked what their mother tongue was and how important it was to talk to the PC, the PC to talk to them, or for them to be able to use the mouse
- Would they be prepared to use this service
- Would it improve the way they got information, talk to the council or gave their opinion and what services should be delivered in this way
- The users were asked what the drawbacks would be, would those drawbacks stop them using the service and where they would like to use this type of service
- The user was then asked about their demographic background

After the questionnaires had been filled in, the group was reconvened to a group discussion. The users were asked four open questions: -

- **I HOPE YOU ALL ENJOYED USING THIS SOFTWARE, CAN YOU TELL ME HOW YOU FOUND USING THE SOFTWARE?**
- Was there anything that you particularly liked or disliked or that you had a problem with?
- Had it changed since you last saw it? (This question was only asked of the Core User Group who had been involved since the outset of the project)
- Would you be inclined to use this service if it was available to you?

These questions formed the basis of the qualitative data. The final presentation shown to the participants was asking for the users feelings about the character used as the avatar. They were presented with 8 optional characters and asked which they would like to have as the avatar. A short questionnaire was given to record their likes and dislikes.



Finally, a group discussion was convened to ensure we got as much information from the participants as possible. This discussion used 4 standard questions to be asked of every group. Each testing session lasted for between 90 and 120 minutes.

These tests are designed to find out : -

- what people think about the demonstrator
- what they liked or disliked
- what made the demonstrator easy or difficult to use
- if they'd be inclined to use the service if it were available

At all times, staff observed the users, recorded ad lib comments, facial and other types of reactions, and entered all events on a data sheet for later analysis.

### 4.4.2.2 The changes needed to the AVANTI demonstrator

At the end of the phase one tests, a list was drawn up of the changes that the people who tested the demonstrator wanted. The list was based upon the responses that the users listed on their questionnaires and from anecdotal information gathered during the group discussions at the end of each session.

- Work to be carried out to make the voice more acceptable – Possible to record a member of staff reading the answers and play these instead of using the computer generated voice
- The screen takes too long to clear and redisplay new information after voice input
- Change some of the phrasing to clarify ambiguous questions
- To remove colloquial comments such as “OK” or “right”
- Slow down the rate at which the question information disappears from the screen
- Include a “pardon” option into the demonstration to allow the user to replay the current question

As a result of this questionnaire, Lewisham implemented changes to the demonstrator by adding a screen to the front-end of the demonstrator, which allows the user to choose the character of the avatar. The user is offered a choice of Fiona, Andrea or Max, the dog.

The users also can choose to have the avatar speak with the computer's automated voice or they may select a human voice by clicking a radio button. This option is available on the front page and must be selected before selecting the avatar.

Other comments from the users indicated that sometimes they found the voice went too fast for them. Lewisham has also added a speed control that allows the user to select either a slow medium or fast rate of speech. This option is available throughout the demonstration.

### 4.4.3 Phase 2 Demonstration sessions

#### 4.4.3.1 Phase Two Groups

This part of the document describes the findings the demonstration of the Lewisham demonstrator tests, second phase. Like the first tests, these were all invited sessions. Lewisham



hosted user group workshops and attended community group meetings. The groups were selected because their profile fitted the AVANTI target audience of

- elderly
- disabled
- ethnic
- service providers

### Phase 2

Federation of Vietnamese Refugees	02/05	Ethnic
Lewisham Irish Community Centre	7/05	Ethnic
Here for good	14/05	Citizen Support
Indo-Chinese Community School	15/05	Ethnic
Evelyn 190 Project	15/05	Citizen Support
Horizons Under 25s computer club	16/05	Disability
e-Gov	16/05	Service Providers
Age Concern	19/05	Age
e-Gov	19/05	Service Provider
Downham Elderly Health Project	20/05	Age (inclusion)
Age Exchange	21/05	Age
e-Gov	21/05	Service Provider
Grove Centre	22/05	Age
Horizons Over 25s computer club	22/05	Disability
Lewisham Elders Resource Centre	23/05	Age

#### 4.4.3.2 The test sessions

The sessions for the second phase of tests differed a little to the first phase of tests because some of the groups tested were also tested in phase one, therefore, the initial presentation was not given to the group. The facilitator would speak for a short while to remind the users of what was going on. If the group had not tested the demonstrator before, a shortened (from the original) introduction was given to the individuals before they tested the demonstrator. As changes had been made to the front end of the demonstrator, the presentation of different avatars was also not given. At the end of the test session, if the user had attended before, the users were given a black leather like Lewisham bag, otherwise an AVANTI T-shirt was given to the users.

The questionnaire for phase two asked the users to: -

- Describe their abilities with the Internet
- Say how difficult the demonstrator was to use and if it was difficult what made it hard to use and how it could be improved. Space was given for the user to comment upon the e-consultation or the housing benefit demonstrator.
- The users were given a selection of all the current methods of contacting the council as well as the demonstrator and asked which would be their preferred method
- They were asked if they had been given enough information to support their enquiry and if not what would have helped
- The users were asked to compare AVANTI with other methods of service delivery
- And did they know where to access a PC in Lewisham



- The users were asked if they had ever needed to apply for services outside normal working hours and if they would like to in the future and where would be the best place to put the demonstrator. The users were also asked if they needed help when reporting something to the council
- They were also given space to make free form comments upon any aspect of the demonstrator that they might wish too.
- The users were asked about their demographic background

The test groups for phase two were selected upon the same basis as they were for phase one. Any group that was willing to attend a second test session and who had not seen any of the changes that were made to the demonstrator were booked again so that they could view the changes and give their opinion regarding the improvements.

To ensure that adequate numbers were available and in the spirit of reaching out to as many Lewisham citizens as possible, Community support groups and other ethnic and age groups were contacted and a demonstration team sent round to them.

In the second phase of the demonstrations, the users were offered a choice of using the housing benefit demonstrator or the e-consultation demonstrator, however the majority of users preferred to use the e-consultation survey.

#### **4.4.3.3 Further Tests proposed for Lewisham**

Further tests are due to start on 19<sup>th</sup> of July and are planned as a one-day event that will take place on Peoples Day. For further information on Peoples Day, visit the web site <http://www.lewisham.gov.uk/peoplesday/>.

Lewisham Peoples Day takes place every year and attracts up to 35,000 people from all over London. The AVANTI team will be present conducting a demonstrator event for the adults and a colouring session for their children. These tests will be run as an open session catching passing citizens as they roam around the site.

#### **4.4.4 Interviews on socio-economic added value**

The approach taken is described with the results in section 6.2 (part 2 of the report)

#### **4.4.5 Cost-benefit analysis**

The approach taken is described with the results in section 6.2 (part 2 of the report).

### **4.5 Ventspils**

#### **4.5.1 Evaluation criteria and indicators**

The evaluation criteria and indicators suitable for questionnaires were adapted to Ventspils requirements as follows. In each case the possible responses were yes/no/ it is hard to tell.



#### **4.5.1.1 Social Barriers**

*I-1 A majority of target group users should state that they would use the demonstrator if it were deployed.*

There were no specific questions designed to identify the target group. As described in section 4.5.2 below, it was realistic to assume that all users of the demonstrator fitted the target group, because of the way they were recruited. Their preferences for AVANTI or the existing Ventspils portal was indicated by these questions .

In each case the possible responses were yes/no/ it is hard to tell

- Do you feel that you would use in future this kind of avatar?
- Does AVANTI Demonstrator in Ventspils City Portal make it more convenient to use?
- Would you better use AVANTI demonstrator services than the services that have been available until now?
- Are you satisfied with the existing level of services at Ventspils portal?

#### **4.5.1.2 Place and time barriers**

*I-2 Target users should perceive benefits in using the demonstrator to access the service outside office hours, and from home or other locations with Internet access.*

- Will you devote your time for using services provided by Ventspils City portal?

#### **4.5.1.3 Manageability**

*I-7 A majority of target users say they are satisfied with the ease of use of the demonstrator, or that it is easier to use than the current online service (where there is a comparable service available).*

- Does acquiring information at Ventspils portal seem to you faster comparing to the traditional methods?
- Does usage of AVANTI Demonstrator allows spending more efficient time at Portal?
- Does usage of AVANTI Demonstrator allows saving more time comparing to other methods?





#### **4.5.1.4 Clarity and enjoyment**

*I-10 A majority of target users say they find the language used by the demonstrator easy to understand, or that it is easier to understand than the current online service (where there is a comparable service available).*

- Do you perceive information easier at portal than using the traditional methods?
- Do you find AVANTI Demonstrator pleasant rather than disturbing?

#### **4.5.1.5 Relevance**

*I-13 A majority of target users say they are satisfied that information presented by the demonstrator is relevant to their query.*

Note: although the avatar functionality covers the whole portal content it is a guide to the content rather than a search engine for it, so it was more important to look at whether this made the portal more interesting and whether or not people they could trust it.

- Do you find the information provided by the AVANTI Demonstrator interesting?
- Do you trust AVANTI Demonstrator information?

### **4.5.2 Phase 1 Demonstration sessions**

In 6<sup>th</sup> of December 2002 first users' evaluation meeting took place. It took place in the premises of Ventspils University College, to which at the end of working day 54 people arrived. In the target group were included elderly people – not computer users, people with different disabilities and students from evening school where typically problems with education are. There were invited 36 people from evening school, 24 people from rest house. As well there were posters of event in Ventspils City College, in Social care board and in Free Night Lodging Centre. The meeting consisted of introduction to definitions of digital divide, AVANTI principles, were delivered information about work that has been done and nearest future plans, hands on testing of AVANTI demonstrator with consecutive questionnaire on various aspects of demonstrator. The participants worked together at first, then when it came to hands-on testing they were divided into two groups because of lack of capacity in the computer classroom. One group was guided by S. Hilkevich and other by D. Calite. Total time for event was 45 minutes.

The main questions of the first questionnaire were on the convenience of usage and clarity of the provided information, as well as whether the user would advise other users to use it, whether it was easy to work with the assistant, whether the contents correspond to the user's expectations on technology achievements and whether user believes that such assistant would be helpful.

In both meetings people were asked to complete the same task, but with different demonstrators. The task was to write submission to Social care board about relief on heating payments.

### **4.5.3 Phase 2 Demonstration sessions**

In 24<sup>th</sup> of February 2003 second users' evaluation meeting took place. It took place in the premises of Ventspils University College, to which only 37 people arrived. Invited were the



same social groups as in previous meeting – elderly people – not computer users, people with different disabilities and students from evening school where typically problems with education are. As well as in previous time there were posters of event in Ventspils City College, in Social care board and in Free Night Lodging Centre. The meeting consisted of introduction on AVANTI project, display of touch screen and biometrics stand, hands on testing of AVANTI demonstrator with consecutive questionnaire on various aspects of demonstrator.

In the questionnaire were evaluated problems and disadvantages of the AVANTI demonstrator, as well as users' view of the future of such technologies.

In both meetings people were asked to complete the same task, but with different demonstrators. The task was to write submission to Social care board about relief on heating payments.

In the second questionnaire there were questions from previous questionnaire to provide comparison and evaluation from results and were added questions about user evaluation on such kind of technology, about implementation of avatar into distance learning, help in computers in general and usage of touch screen and fingerprint scanner technologies. As direct impact from previous questionnaire we can mention questions on usability of push buttons.

#### **4.5.4 Interviews on socio-economic added value**

There was organised one interview with service providers. Over all there are 13 municipal service providers in Ventspils City of whom to the event only 5 arrived. Interview was organised in form of panel discussion. There was organised meeting with head of Social Care board, because this department in Ventspils municipality has greatest share of applications received during year. Last year the number was 47,7% out of all 55508 applications.

The aim of this discussion was to know the evaluation of AVANTI demonstrator by service provider representatives. The main questions in the discussion were about how avatar-based online delivery can add value to services for the citizen and the community at large and any resource implications from their perspective.