TESTING COMMUNICABILITY IN MUNICIPALITY E-SERVICES

Marie-Therese Christiansson, marie-therese.christiansson@kau.se
Malin Wik, malin.wik@kau.se

Information systems, Karlstad Business School, Faculty of Arts and Social Sciences, Karlstad University, Sweden

Presented at the 11th Scandinavian Workshop on E-Government (SWEG 2014), Linköping, Sweden. Used in:


Abstract
This paper focuses on the ability to communicate public e-Services, as one part of e-Service evaluation. The purpose is to use and further develop the emerging concept of “communicability” to be used as a base in an evaluation tool in the context of public e-Services. The ability of citizens’ to find, understand and use the e-Services provided is return on investment for public sectors, governments and agencies. The point of departure in this paper is to elaborate on a test process design for data collection and analysis from an empirical driven approach. Empirical grounding is based on a Swedish municipality case with a pilot usability test with eye tracking in 2012 and a second further improved test sessions 2013 on e-Services with citizens partaking in a university course. The research contributions include a further defined concept together with a generic test process for data collection and analysis to be useful as an evaluation tool, in research as in practice. Our research design and experiences from test sessions might also work as an inspiration to other university courses. Further more, findings from our test sessions can be used as a point of departure in formulating guidelines in a handbook to improve communicability in public e-Services.

Keywords: e-Service evaluation, communicability in e-Services, test process design, eye tracking

1 Introduction
The public sector, governments and agencies increase their use of e-Service solutions to offer flexible, valuable and collaborative services to their customers (private and companies). ‘Customers’ (e.g. citizens, companies, visitors and associations) might for example initiate and follow cases (requests, applications and reports) together with functions for registering, calculating, booking or download information through the municipality website. The main focus for public services has been on front-end services to citizens. By aligning front-end services with the back-end business processes and systems in administrations, changes in serving citizens occur. Well-designed and well-managed
business processes are a prerequisite for providing, delivering and performing valuable e-Services (Becker et al. 2002; Boyer et al. 2002; Christiansson 2011) as the overall service. To be a professional e-Service provider, the task is not only developing new e-Services, it also concerns with keeping track of services on the website and provide an information content to support customers to find, understand and use it (Christiansson 2014). In order to understand how customers’ experiences e-Services, user tests with the eyetracking technology (eye-movements and fixations) is one way to proceed. Eye-movement analysis in the field of Human-Computer Interaction (HCI) is promising, but the progress forward is slow compared to other research fields incorporating the technique, such as e.g. reading (Jacob & Karn 2003). One drawback using the technique is that eyetracking studies result in large amount of data to handle. Extracting results and interpreting the eye tracking data is both labour intensive and difficult. (Nielsen & Pernice 2009; Jacob & Karn 2003) Furthermore, a quick scan of the reported studies on the supplier Tobii Technology (Tobii 2013b) website, shows a lot of examples of incorporating eyetracking, but no explicit method for efficient elicitation of results. However, as the technique is promising and does enhance research with valuable data\(^1\), such as e.g. how efficiently a user can search for an element, indications on a user’s difficulty to extract information from an element and importance of the element (Jacob & Karn 2003), we are using the technique in our research on how to incorporate the concept of communicability in a test process for e-Services. To communicate e-Services is to support the citizens’ ability to find, understand and use the service provided. A recent study stress the importance to consolidate the information about and in the e-Service with a social interaction dimension, e.g. to highlight the e-Service purpose, roles for actors involved, action modes and intentional message exchange in the social relation (Christiansson 2014). Focusing on the ability to communicate IT solutions, usability means supporting the user to perform, in the way that he/she wants and expects to, without hindrance, hesitation or questions (Rubin & Chisnell 2008) and providing the user with a system that is efficient, easy to learn and remember, secure to use and difficult to do wrong (Benyon 2010). However, usability in websites services is not longer only an interaction designs issue; it’s also an issue to provide a “communication service” to the citizens (Goldkuhl 2007).

The point of departure in our study is to further elaborate on the concept communicability in e-Services by using the concept in a user test process design. To understand the meaning of communicability, we need to study what the user do and react on when using an e-Service in case in an errand, solving a task. This paper is driven by the research question:

*What are the key elements in a test process for an evaluation on communicability in e-Services?*

The research is conducted during a university course by defining the concept of communicability to be implemented in a test protocol focusing the observations in eyetracking user tests during a university course. By reconstructing two test process designs and performance during a university course, we will identify challenges (to support) in using the concept and analysing results from the eyetracker. We thereby hope to contribute both to the work practice on communicating e-Services and the work practice on testing the same, as our findings will be interrelated. Our students are young citizens between 19 and 23 years using the municipality e-Service portal in the supplier’s test-environment (see Sävenfalk, 2013). However, in this study the focus is on in-depth analysis and thus a less amount of the e-Services provided (28) are tested. Seven different e-Services where tested 2012 and six different e-Services are to be tested 2013.

Limitations in this study are that our user tests on e-Services are conducted on one municipality case and on standard solutions in terms of e-Services provided on a common portal from one supplier (Abou, 2014). The municipality case uses the e-Service portal as one part of the overall e-Service offerings, totalling 70 e-Services. The supplier describes the portal as a standard system that is configurable with the ability to turn severe form handling into user-friendly e-Services integrated with the E-ID and My Account. Solutions can be integrated with back-end systems, enabling faster and easier processes with functions such as transparency and duplicate signatures in the same case (Abou, 2014). Our paper does not elaborate on other evaluation tools and instruments for analysing e-Service initiatives as it is beyond the scope of the paper. Moreover, this paper has excluded the discussion on

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\(^1\) Which wouldn’t be available by using other methods.

\(^2\) Five users are required for qualitative think-out-loud results.
preferable placement of e-Services, search patterns and the citizens’ ability to navigate in the e-Service. The focus is on the task of communicating e-Services, i.e. to inform e-Service users. In many digital services, there is no direct and real-time communication between the service provider and the service user. Thus, the communication is skewed in that the supplier (internal or external) tries to imagine their customer (service provider) communication with their customer (user) and provide e-Service solutions with such functions and interactions. There is no possibility for a municipality to correct the built-in communication on the fly and this is of course a serious challenge and limitation on implications from this study. However, the e-Service portal supplier will partake in the test sessions of 2013 as observers. Thus, the potential for impacts from our test results to be applied in the further development of e-Services has thereby increased.

The paper is structured as follows: Section 2 presents the research design; Section 3 reports on the user tests on the municipality e-Services conducted 2012 and implications for test sessions conducted 2013; Section 4 analyses findings on the test process design; Section 5 concludes the paper with reflections on limitations and suggestions on further research.

## 2 Research Design

The use of e-Services is shifting from not only improving the efficiency of routines in the organisation, but also using services occasionally (Lee-Klenz et al. 2010) in the daily mobile life. Additionally, open data provide third parties and citizens with opportunities to develop new government e-Services as co-creators (Prahalad & Ramaswamy 2004). Initiatives such as open government data require transparency and a high-level of support for openness, prerequisites for increased innovation capacity (Chesbrough 2006) and relationships with citizens to turn government data into information (Francoli 2011). E-service development is thus a complex and multiple work practice including business process improvements (Chourabi et al. 2009; Corradini et al. 2010), communication on websites (Cronholm 2010), open innovation possibilities (Feller et al. 2010), collaboration with citizens (Goldkuhl 2007; Millard 2011) and service design focused on public value and trust (Grimsley & Meehan 2007). Additionally, citizens’ e-maturity for usage in a digital divide context (Sipior et al. 2011) and the increasing significance of social media in daily business and wider citizen participation in service delivery and uses of Web 2.0 platforms (Chun et al. 2010) highlight the need to adopt more flexible and experimental approaches to e-Government management.

E-Services are usually communicated and supported by employees at the municipal Contact Centre (Grundén & Bernhard 2012). The implementation of Contact Centres in the public sector is influenced by increased access to municipal services, coherent case handling together with internal efficiency (Bernhard 2009; Grundén & Bernhard 2012). As the first line contact with the citizens, the municipal advisors together with statistics from systems in use, will become an important “knowledge source” to value realisation. In practice, work on e-Service solutions in a municipality setting is today an issue for administrations together with departments such as e.g. IT, communication and Contact Centre. Thus, to communicate e-Services is an inter-organisational process and findings from our studies need to be implemented cross administrations in municipalities to make an impact.

Our study uses a qualitative research approach. The research process consists of four steps in two iterations: (1) data collection (2) analysis (3) reliability and validity check with practitioners and (4) conclusions in lessons learned and implications for further research.

A reconstruction of our test design of 2012 and 2013 in the university course will work as the empirical base in development of a test process design using Tobii technology 1750 eye tracker. Citizens are testing the municipality e-Service portal in the supplier’s test-environment. The municipality case is described below.
2.1 The Municipality case

The evolving e-Service landscape, i.e. e-Service offerings in the end-to-end service delivery, means that business processes are linked to or performed by inter-organisational digitised structures, supported by several internal and external systems and channel choices. Multiple channels for citizens contact with municipalities are provided by e.g. visits, telephone, email, mobile apps, social media and website forms and services to initiate case handling processes. However, the website is the main resource for information and e-Services in the municipality case, one challenge is to increase citizens’ use of e-Services. The virtual organisation, called the e-Office (Karlstad 2008) coordinate and support the development of e-Services in the municipality since 2008 and for all 16 municipalities in the county since 2010 in the co-operation CeSam Värmland. The population range from around 3 700 inhabitants is the smallest municipality to the county with around 85 000 inhabitants. Municipalities with a lower number of inhabitants are offered to choose as many of the e-Services provided. Common solutions, test, implementations, training and maintenance are handled by the e-Office. Assigned roles are intended to ensure a combination of business-, IT- and communication perspectives in development. Unfortunately, the role of communicator is lacking but is represented by staff in each administration, together with their internal business developers and IT-coordinators.

The e-Service portal is further developed in collaboration with 20 other municipalities in the Sambruk community, which means that a significant development within the framework occurs in cooperation where experiences in need of improvement are identified and shared. There was a complete list from the e-Service portal supplier (Abou 2014) with more than 50 existing e-Services that could be presented to administrations to choose from and adapted to administrations in the community. There is no guarantee that an administration would see less need for as many services, but if the organisation saw a service developed and ready to use, the organisation could adopt it even though a need was not directly stated.

Similarities and differences between service offerings of different municipalities are analysed and results are presented in both enhanced services locally and overall benefits on a national scale. A collaborative approach throughout the analysis, requirement and procurement phases will ensure a better result from both economical and functional aspects with a common technical platform (Sambruk, 2013). When it comes to improvements, other municipalities in the Sambruk community may have resolved some functions and features that the municipality has put on hold, i.e. member municipalities can benefit from development initiatives driven by others. (Christiansson 2014) Now, the same co-operation idea is implemented on a regional basis, in terms of CeSam Värmland.

2.2 Data collection

In this study, we used the Tobii technology 1750 eye tracker (Tobii 2013a) as a data collection tool to capture and record eye movements as well as the real time dialogue between the user, observers and test administrator. Gaze data is collected at a 50 Hz sampling frequency. Recording and analysis software used in the study is Tobii Studio 2.8, running on Windows XP. Additionally, audio and video of the test participant is recorded with a Logitech webcam.

During the sessions the users are encouraged to “think aloud”, meaning the users verbalizes their thoughts, actions, confusions and frustrations (Rubin & Chisnell 2008). There are some disadvantages of the technique: the user can interpret it as unnatural and obtrusive (Rubin & Chisnell 2008); or it may can affect the interaction and scan paths of the user (Nielsen & Pernice 2009). Nonetheless, the users’ comments were found highly valuable during our analysis. Seeing exactly what the user sees, acts and tells helps in understanding why users have problems finding e-Services, performing and completing their task. When the users are asked to “think aloud” during the test sessions, Pernice and Nielsen (2009) indicate that people tend to look at what they’re talking about, why some objects may appear to be very focused on simply because the user fix his/her eyes on the area which is talking about. The eye tracking data from our test sessions can be visualised in: heat maps (see Figure 1), still images that show user attention, i.e. where users fix their eyes in terms of length and time; gaze plots (see Figure 2), still images that shows where users fix their eyes in terms of order; and gaze replay, which is a recording of the screen and the user's eye movements. However, the software does not
visualize register changes of dynamic elements on websites in heat maps and gaze plots (Pernice & Nielsen 2009). This means that if the user opened a popup window, the static visualization will be displayed as if the user has studied the website behind the popup box. Such circumstances can be detected by studying the gaze replay, allowing affected recordings and/or heat maps and gaze plots to be excluded.

Figure 1.  A heat map - shows the start page for the e-Services platform in the test environment. Note that this example is an overview of all citizens in the 2012 study having different tasks.

Figure 2.  A Gaze plot - shows one user searching for the e-Service "Apply for Direct Debit." After 1 min 10 sec, the user sees the e-Service under "Popular Services" and clicks.

Elements in communicability in e-Service solutions (Christiansson 2014) and guidelines based on findings from our user test in the course case 2012 has been used in developing a test protocol for observations in the course case 2013. Complementary techniques for data collections by researchers and students are illustrated with following abbreviations, R: Recorded voice – the user talk out loud, I: Interview by the researcher and TR: Template for students test reports.
### Elements to focus on in communicability and questions to guide observations

<table>
<thead>
<tr>
<th>Elements</th>
<th>Questions to use in data collection during observations by researcher</th>
</tr>
</thead>
</table>
| **Purpose** | • Explicit intention and value in using the e-Service? (TR) (R)  
• Explicit target group? (TR) |
| **Context** | • Right placement according to business context/case handling/problem to solve? (TR) (R) |
| **Interaction** | • Explicit roles in the e-Service performance? (TR) (R) |
| **Actor** | • Explicit service provider? (TR)  
• Explicit user and role (customer/citizens/co-producer)? (TR) |
| **Action** | • Are relevant actions provided? (R)  
• How are actions working? (R)  
• Is the information about the actions in the service supportive? (R)  
• Are the instructions in the service performance supportive? (R) |
| **Information** | • Comprehensive overview of the e-Service? (R)  
• Relevant and sufficient information/instructions? (R)  
• Understandable intentions of the message exchange? (R) |
| **Result** | • Handling time (I) (R)  
• Expected results and when and how this is going to be delivered? (I) (R) (TR) |

**Figure 3.** Elements to focus on in communicability and questions to guide observations

### 2.3 Analysis

Heat maps and gaze plots are not used to draw conclusions from in this study, only to visualize results. For best analytical results, Nielsen and Pernice (2009) recommend a gaze replay analysis with approximately six users to be able to draw correct conclusions on usability. In this study we had nine different citizens in 2012 and six different citizens in 2013 as users of the Application for Direct Debit, used as one example in this paper. No conclusions can be drawn whether and what users understand by what they have seen or not seen. However, comments from users and insights in viewed gaze and search patterns, failed actions, action modes (status in errands) and problems occurred in finding, understanding and using the e-Service use can be noticed. No diagnoses have been made on problem causes; instead user expressions and ability to perform, hindrance, hesitation, questions and mistakes in handling are handled. To be able to draw conclusions on communicability we should have asked a wide range of users, however the test sessions in 2012 found a pattern of practical meaning in the concept based on gaze replays from 31 test sessions. Log notes with empirical data from the visualisations and recorded voices from the user where captured and structured by each researcher based on our two background references, i.e. a human-computer-interaction lens and a communicability lens. In a second run we merged our observations in an analysis protocol presented in Table 1. The protocol was then used when we structured our findings into characteristics on communicability. Some of our comments are a direct consequence from the course case, marked in italics.

#### Table 1. The analysis protocol 2012 – one example from ID1 - Session 1

<table>
<thead>
<tr>
<th>Information Explicit (E)/Implicit (I)</th>
<th>User action</th>
<th>User comment</th>
<th>Time of execution</th>
<th>Researcher comments</th>
</tr>
</thead>
</table>
| 1) E-services and self-service  
2) Popular services | To find the service:  
- But I was logged in, weren’t I? | 00:00:30 | Horizontal menu |
| E: "Click on login to continue" | Gaze moves across the interface, perhaps to find | 00:00:49 |

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2 Five users are required for qualitative think-out-loud results.
3 Without previous experiences using the municipality e-Service.
<table>
<thead>
<tr>
<th>Step 5 of 7</th>
<th>Clicking on the &quot;Learn more about Direct Debit&quot;</th>
<th>00:03:44</th>
<th>Gazeplot/heatmap will not be reliable as a popup window opens.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clicking &quot;I sign with my test ID&quot;...</td>
<td>00:04:13</td>
<td>Gaze moves across the interface to a &quot;progress bar&quot; - one at the bottom of the browser, before the next page appears, perhaps for a confirmation that the system really answered the click.</td>
<td></td>
</tr>
<tr>
<td>To find the expected turnaround time: 1) My cases 2) Link to a .Pdf &quot;Application for Direct Debit&quot;</td>
<td>- Fine, then I only click on &quot;My errands&quot; then? - It ought to be some information about the case right there.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

One challenge in 2012 was to know what to call levels and objects in the e-Service in our analysis, comments on the website, the e-Services startpage, the focal e-Service start page and steps in performance, placement on the user interface etc. In 2013 we used wireframes which are a commonly used framework when outlining the structure of the content on a website, without focusing on details of the design (Benyon 2014). The municipality’s e-Service platform is enhanced with a global navigation system. The global navigation is site-wide, meaning that the user from all the pages of the site can access it. Depending on the context, some navigation alternatives i.e. contextual navigation is presented to the user in the middle of the interface. (Morville & Rosenfeld 2007) See the wireframes we used in Figure 4, developed to be able to visualize our comments on where the user problem occurred, information was missing, user neglected areas etc.
The first wireframe shows the structure on the e-Services start page and the below shows the structure on the focal e-Service page (e.g. Application for Direct Debit). Areas in the frame representing the municipality website link (1), the municipality logo (2), the search area (3), the global navigation bar (4), the left menu/main categories (5), the contextual content (6), drop-down menus: e-Service categories (7), e-Service name (7.1), information sign/icon (7.2), link to e-Service (7.3), link to form (7.4), the right menu/shortcuts (8) and information in text (9).

Another challenge in 2013 was to design a more effective handling of the extensive results from the eyetracker and our log notes from observing the gaze replays. We developed a web based survey to help us to structure log notes and at the same time be able to analyse the material faster by support of the tool Survey & Report used by the university. We had to reconstruct our analysis (which steps and in what order according to the gaze replay) to develop a useful observation template as a basis for the survey.

2.4 Verifying practical use

In order to verify the practical use of the communicability concept an interview was conducted in April 2012 with the e-Office system developer and business developer (confer Christiansson, 2014). The interview was recorded, transcribed and generated statements in approval. Reflections from the interview with the e-Office are that the municipality leans towards developing guidelines for communicating e-Services, rather than making design changes due to time-consuming tests. Based on our test results from 2012 we invited the e-Office system developer and test administrator to our laboratory in February 2013. We gave a short presentation and example view of some of our gaze replays to verify that our results were useful for the e-Office. In 2013 the e-Office was partaking the test sessions as observers and in the workshops on the university course to discuss the students findings and receive test reports.

3 User Tests

The university course is an undergraduate level course in the fall of 2012 and 2013 with focus on the connection between organisation and the acquisition of information systems. For example, critical factors in purchase and acquisition are discussed, along with different types of requirements such as functional, design and usability requirements, specified in various contexts and phases of the process of acquisition. One course assignment is to create test cases; another is to conduct a user test. The latter is held in a laboratory specifically designed for conducting user and usability tests. The lab consists of three rooms: the reception room where users are greeted and might be interviewed; the test room where the eye tracker is situated and the users perform their task and the control room where various stakeholders can observe the test sessions through a mirror wall and listens to the audio output. Students in different roles, two users (citizens), a test administrator and two observers conducted two test sessions in a time frame of 30 minutes. Findings from citizen’s use 2012 have been used in the study on e-Service communicability reported in Christiansson (2013).
3.1 Pre-conditions, test process and findings – 2012

In usability testing, an end user evaluates the usefulness of a particular IT solution, most often on systems, which interacts with the user. Focus is if the system meets specific usability criteria (Rubin & Chisnell 2008) or identifies problems, which arise when using it (Benyon 2010). Overall, 31 test sessions where conducted with two different tasks (test 1 and test 2) described below. See Figure 5 for an overview of the test process design.

Pre-conditions for the test design was an established and well working co-operation and relation between the project manager at the e-Office in the municipality and the course manager at the university. The idea came when the course manager had the opportunity partaking a training sessions based on e-Service offerings in the e-Service portal. From the request to the e-Office, the answer with access to the test environment and instructions with fake-logins for citizens E-ID, was in a couple of weeks. Unfortunately, despite that everything was very quick handled by the e-Office, the idea came late in time for the course and therefore we couldn’t test the course assignment with tasks before hand. Therefore, researchers comments due to vague formulated tasks and test instructions will be analysed to improve the next course assignment as well as the test sessions. Other limitations in our study is the fact that some students had lower degree of commitment and ability to understand their role, some test administrators were more accustomed to lead a test session, while others never done it before. This might affect the outcome as some users had better support than others. The test administrators got the test instructions at the time of testing. Some test administrators read quickly through this information before the test session, some of the persons did not. Moreover, some of the observers didn’t take notes at all or vague notes and their test logs were thereby not usable as input for research.

During test 1 the test environment for the e-services portal was used. From the a start page for the e-Services the user was asked to find a one of the appointed e-Service (see Table 2), use it and determine case status and expected turnaround time (case handling time). The interest was on comments from citizens regarding overall aspects on the service provider’s ability to communicate e-Services, thus no attention was given to website version or type of e-Service.

Table 2. e-Services in test 1

<table>
<thead>
<tr>
<th>E-services tested 2012-12-11</th>
<th>ID - Sessions</th>
<th>Citizens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apply for Direct Debit</td>
<td>ID1, Session 1-4, 17</td>
<td>5</td>
</tr>
<tr>
<td>Parking permission for &quot;green cars&quot;</td>
<td>ID3, Session 5-6</td>
<td>2</td>
</tr>
<tr>
<td>Composting of food waste</td>
<td>ID4, Session 7-8</td>
<td>2</td>
</tr>
<tr>
<td>Drawing archive</td>
<td>ID5, Session 9-10</td>
<td>2</td>
</tr>
<tr>
<td>Sign up for food supply business</td>
<td>ID6, Session 11-12</td>
<td>2</td>
</tr>
<tr>
<td>Food poisoning</td>
<td>ID7, Session 13-14</td>
<td>2</td>
</tr>
<tr>
<td>Civil marriage</td>
<td>ID8, Session 15-16</td>
<td>2</td>
</tr>
</tbody>
</table>

a Using the search function was not allowed.
During test 2 the task was to navigate from the municipality home page to find the requested e-Service, to be able to describe its purpose and expected turnaround time. Test sessions were used to collect user expressions from four different services (see Table 3) on the new website, launched in October 2012 (Karlstad, 2014).

Table 3. e-Services in test 2

<table>
<thead>
<tr>
<th>E-services tested 2012-12-18</th>
<th>ID - Sessions</th>
<th>Citizens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apply for Direct Debit</td>
<td>ID10, Session 1-4</td>
<td>4</td>
</tr>
<tr>
<td>Composting of food waste</td>
<td>ID11, Session 5-8</td>
<td>4</td>
</tr>
<tr>
<td>Drawing archive</td>
<td>ID12, Session 9-12</td>
<td>4</td>
</tr>
<tr>
<td>Sign up for food supply business(^5)</td>
<td>ID13, Session 13-14</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total number of users:</strong></td>
<td></td>
<td><strong>14</strong></td>
</tr>
</tbody>
</table>

Our test sessions showed that it was difficult for some citizens to get adequate information to find, to understand the e-Service purpose, how the service work and what to be expected in the service delivery. According to our analysis of search patterns some citizens found the e-Service as a natural, quickly and easily accomplished case while others experienced the same e-Service as messy and difficult, with frustrations and a feeling of jumping from page to page that was distinguished by a different appearance, language and form. Some users did not find the target service, according to the limited time frame in the session. The exactly time limit when people give up trying differs, but an estimated and required time scope would be helpful in evaluation.

Findings from citizens’ use based on the example of the e-Service Apply for Direct Debit, analysed by researchers are summarized in pros (+) and cons (-) as follows:

**To find the e-Service**

(+ or -) Different search patterns to the e-Service, e.g. from the home page, the e-Service start page, in several categories (e.g. Apply for Direct Debit), in e-Service lists structured from A-Z, in Popular services, besides the search function.

(+ ) All users found the e-Service in “Popular Services” in test 1, one tried My Details and the search field before landing on Popular Services on the top right hand side on the site.

(-) Some users did not find the service at all in test 2.

(-) There are multiple similar services for e.g. the e-Services Suggestions, Point of views and Complaints, providing the same action for citizens, which might be confusing.

(-) Different naming/meaning on tabs (what is the differences between My Cases and My Profile?), titles of the appointed page and actions provided might cause some confusion as well.

(-) E-Service categorisation is based on administrations in the organisation, instead of results and actions provided to citizens.

**Instructions and information about the e-Service (placement)**

(+ ) An overview of the focal service context

(+ ) Overview description of the service

(-) Only description of actions by the service provider

(-) No intended/established relationship is communicated

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\(^5\) The reason that the service was studied only twice was a schedule mistake.
(-) 75% of the users did not find the information concerning handling time; this indicates that it might be a good idea to place the handling time in relation to its context in use.

**Instructions and information in the e-Service use (placement)**

(-) The intention and value of the e-Service is not explicit.

(-) Customer/user in target group is not mentioned

(-) The process description is without actions and information exchange

(-) Overall findings were that no one looked at important information from the e-Service provider marked with “Attention!” on the right hand side with information for the user and contact information (co-producer/contact person in administration).

(-) User expressions like: “- What am I suppose to do now?” as well as “- Am I suppose to do something?” indicates that the service provider need to communicate some intended actions by the citizens in the social relation.

(+) Instructions were clear in forms to be filled in, i.e. actions required.

(-) When the button with the message “I sign with my identification” was used to approve the application, the user “clicked” additional times due to lack of response to the submitted message. One reflection on the business logic in the case handling is to approve the application in relation to the form to be filled in, instead of the last and only action to be performed.

**Roles in relation and user actions (implicit purpose, questions and mistakes)**

(+ ) Service provider explicit

(+ ) An overview of the case handling sub processes

(-) The process description is without actions and actors

(-) Visitors are not a target group in e-Services but might be users in some.

(-) Overall there is a lack of defined roles in relation to performance in the service process as well as information exchange and intended action mode (e.g. a request, an answer, a decision, an offering, an invoice and so on).

**Hindrance and hesitation, implicit action modes (status in errands)**

(-) Two of the citizens were trying the tab e-ID to look for case handling time.

(-) The concept of direct debit was not familiar to the citizens matching with the categorisations in pictures and menus, i.e. the user didn’t find a context to apply direct debit to.

(-) Statements from citizens: “- If I press my case number, I will expect to find the processing time there” as well as “- There tends to be information relating to the page I'm on instead of having to go elsewhere”. Those statements might indicate that the placement of information should be close-to-business, i.e. in relation to actions.

(-) Some confusion on concepts and a lack of knowledge on what the service was all about, as we used the name of the service in the course assignment. The service provider terms some e-Services as actions (e.g. apply and register), others as the result (parking permission) or place/function (design archive) and still others based on topic (e.g. food poisoning, composting and civil marriage).

(-) “- But, I’m already logged in”, i.e. the user felt an established relation with the service provider system and found it confusing when they had to resubmit their personal details.
Time for finding the e-Service

The time from start to finding the e-Service varied from 30 seconds to 1 minute in test 1. The time from start to finding the e-Service varied from 1 minute and 45 seconds to nearly 5 minutes in test 2.

Results

(-) It is not mentioned what kind of result is to be expected and when

In addition, findings from using and analysing results from other test sessions and e-Services are some missing information in guiding citizens to providing mandatory data to be able to go through to the next mode in the service. On the other hand, some services had a lot for the citizen to register and made some asking if all this information really will be used and should be required. “- I have already done this!” was one of the comments when the form required the same information a second time. Furthermore, the citizens had major problems to determine case status as they did not know what to look for, i.e. they did not comprehend the concept of “status”, status on what? Finally, My Cases was used to find the turnaround time and several users opened a .pdf document to look for the case handling time, not the tab Handling as was the intention of the service provider (we think).

3.2 Pre-conditions, test sessions and findings – the course 2013

In the fall of 2013, the university course included a user test conducted by students in the role of users and citizens in the municipality and municipalities in the county.

Pre-conditions for the test design are the experiences and lessons learned from 2012 and an established long-term cooperation with the e-Office concerning user tests. Benefits in terms of results and possibilities to prioritize and select e-Services to be tested have been presented for the 16 municipalities in CeSam Värmland. Even though, no prioritizing was delivered from the municipalities, why the researchers chose what e-Services to be tested. A majority of the e-Services included in the standard portal environment are addressed to elderly users, or users with specific life experiences such as having children or house ownership. Therefore, the selection of e-Services is based on which services that can be reasonably understood by our sample (i.e. young students between
19-23 years) and by taking use scenarios into account. The scenarios were created by students in another university course in the purpose to find suitable e-Services with a young target group, and thus e-Services relevant to our users. By these scenarios it was possible to include a bigger variety of e-Services in the tests, as the scenario included a fictive task. An example of one scenario (translated from Swedish):

"Your child has finally got a place at a nursery school so now you want to be able to pay your fee as smoothly as possible to the municipality, preferably by automatically deducting the bill from your bank account. You decide to investigate this possibility via the municipal website."

All scenarios were formulated without keywords that could give away the name of the e-Service tested. Giving the user a scenario based task to perform will alter the way he or she looks at the website, but as Pernice and Nielsen argue (2009, p.148) "The main reason to base usability tests on tasks is that this best mirrors the way people actually use the Web: there’s a reason you visit a website." The scenarios contained a reason for our users to visit the e-Service platform, even though it was a fictive reason.

Successful completion criteria (SCC) were also to some extent formulated, enabling measurements on how and if a user successfully has completed the task (Rubin & Chisnell 2008). In this case we asked the e-Office to provide some SCC so that we could test their beliefs. However, they had not yet formed any opinion on this, why we formulated our own:

Definition of SCCs for the 2013 study:

1. The user navigates to the correct e-Service through menus and/or links without any help from the test administrator
2. The user conducts all steps of the e-Service without any help from the test administrator

Six different services on the municipality website (Karlstad, 2014) were selected to be evaluated during the course case. See Table 4.

Table 4. e-Services in user test 2013

<table>
<thead>
<tr>
<th>E-services tested 2013-12-16, 2013-12-17, 2014-01-07</th>
<th>ID - Sessions</th>
<th>Citizens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permission for the transport of goods</td>
<td>ID1, Session 1-6, 37-38</td>
<td>8</td>
</tr>
<tr>
<td>Application for tree felling and clearing of forest near housing</td>
<td>ID2, Session 7-12</td>
<td>6</td>
</tr>
<tr>
<td>Application for youth money</td>
<td>ID3, Session 13-18, 40</td>
<td>7</td>
</tr>
<tr>
<td>Application for service line</td>
<td>ID4, Session 19-24, 39</td>
<td>8</td>
</tr>
<tr>
<td>Apply for Direct Debit</td>
<td>ID5, Session 25-30</td>
<td>6</td>
</tr>
<tr>
<td>Booking of civil marriage</td>
<td>ID6, Session 31-36</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total number of users:</strong></td>
<td></td>
<td><strong>40</strong></td>
</tr>
</tbody>
</table>

Since the users are introduced to the test environment for the e-Service portal directly, how users normally would navigate to the portal to perform a task was not evaluated. Though, how and if users find the e-Service portal has already shown to be problematic during usability tests during a different university course. As no changes in how users can navigate to the e-service platform has been made since, the focus in this case instead lays on evaluating the e-Service platform, six specific e-Services and by using eye tracking, the relation between what information and where information is being presented, in relation to where users actually expect (look for) information.

Each student in each student group held a specific role in the test team: test administrator, observer or user. Since the course is not about user testing per se guidelines covering all roles with descriptions, instructions and expectations was put together and provided to the students. The test administrators were instructed to be as objective as possible, by not providing hints or explicit help to the user. Further, the test administrators were informed on how their body language and reactions can affect the user. They were also given four examples of questions which they could use during the test sessions to
get information from the user. The observers were provided with information on what to look for when observing the test sessions, and to keep a low profile during the sessions in order to not affect the user or the result. The user tests were conducted as follows:

First, the test team (minus the two users of each group) was briefly introduced in the test room to what their tasks during the test sessions were by one of the researchers. As the students had been given information material about their roles on beforehand, it was correctly assumed that they knew what was expected of them. The test team got the information on which e-Service each group was to evaluate when in the test room, as providing this earlier could’ve “leaked” to the users and thereby affecting the results. The test administrator was handed a manuscript to follow, where the scenario, steps, pointers was outlined. The observers was handed one protocol each with different aspects of the users’ usage to observe and keep record of.

Meanwhile, researcher in the reception room interviewed one of the users. During which, the scenario was introduced and the user was asked to elaborate their thoughts and expectations on e-Services, how they would proceed at such web page and their concerns about a successful e-Service according to actions provided, results and time. The user also read and signed consent, allowing their gaze, voice as well as their face to be recorded, provided that they would be anonymous in all reported results.

After the interview the user was welcomed into the test room where the calibration of the eye tracker started. The student acting test administrator then read the scenario while a gray screen was shown to the user. The gray screen was used, as we wanted to limit the time when users could see the interface of the e-Services platform before listening to the scenario, as the users possibly would focus their attention on the “wrong” parts of the interface after listening to parts of the scenario. Using the gray screen also simplified the analysis of the gaze replay, as then the gaze replay shows only relevant eye movements searching for a specific e-Service (solving the scenario based task), instead of eye movements examining the interface at “random”. During the first test session the second user began the interview in the adjacent reception room. Each group had 30 minutes to conduct their test sessions (only one group had to abort one of their test sessions due to time limitations).

As noted, the course is not about user tests per se why the students acting test administrators (and observers) were more or less inexperienced in their role. Therefore, one researcher with experience of user tests was situated in the test room during all sessions, acting as a test moderator by providing help, questions and comments to the users (and to the test team between sessions). In groups were persons and therefore test team roles were missing, the researcher acted as test administrator alone, observer or a combination of the two roles.

In another adjacent room to the test room, divided by a mirrored wall, the stakeholders could observe the test sessions. Due to technical limitations the eye tracking screen was not duplicated in the control room. Though, the stakeholders could hear what was being said and see the test room (and therefore get a glimpse of the eye tracker’s screen). The stakeholders were provided with the same information as the students: role descriptions, test administrator manuscripts and observer protocols.

Due to the result 2012, we did not let the user find information concerning handling time, however the pre-interview indicated that this was an expected feedback to the user from the municipality for many of the citizen’s (which also were discussed in the course examination, a workshop together with representatives from the e-Office). Some of the findings are similar to the previous test conducted in 2012, however the possibilities for impact has by the tests in 2013 increased due to the stakeholder observations, especially from the supplier. One project manager and one software developer was part-taking in observations and had also the opportunity to try the role as user in one additional test session. Feedback from the supplier showed that the observation and this exercise had been “an eye-opener” and many lessons learned.
4 Lessons learned

Lessons learned from the test process design 2012:

- Course assignment should include a role description for users, observers as well as the test administrator to give more preparation.
- To get more usable log notes we should include a template for how to collect observations due to the e-Service communicability with questions as guideline. See one example in Table 5 below.
- Test instructions should not include the task to find “status” as this is a confusing concept and not relevant in a further analyse. However, the results showed that citizens were expected this in direct relation to the performed service.
- The test sessions should be prepared in advance in the course, a tutorial for students in different test roles and a need to stress the importance of a real case.
- In the task of finding the e-Services it should be explicit that it’s not “a competition”, some users seems to be nervous by not accomplish the task fast enough.
- It is important to schedule test sessions with a sufficient number of users for each e-Service, i.e. six users testing each e-Service, to have the possibility to draw conclusions from gaze replay and test protocols.
- Using the search function was not allowed but a few of the users were trying before the test administrator disapproved. As the users are part of the “Google generation” we let the user describe intended keywords based on the task to perform in the scenario description. However, our intention is not to analyse search patterns in this paper.

Lessons learned from test design and tests 2013:

- Users in the same target group should be testing the scenarios beforehand.
- Letting stakeholders observe the test sessions is highly appreciated and gives students a further incentive to take the tests seriously.
- Role descriptions are appreciated by students. However, more time to introduce the roles of the test team with the students.
- The students should have more time to read through (and possibly discuss) the observer protocols and test administrator manuscript, before the first test session is started to provide the students with better knowledge of what data to collect (as an observer), and how to perform as a test administrator, which would grant the research with more relevant data.
- Live viewing should be enabled in the control room for observers and stakeholders.
- Providing the test team with a test moderator with user test experience is appreciated and, if using inexperienced test administrators, leads to better results.

5 Conclusions

What are the key elements in the test process design for an evaluation on communicability in e-Services?

Experiences from our test session’s shows elements in the test process design and concepts to be defined to be able to describe the process. See Figure 7 for an overview of input, resources, output and roles to be used in the data collection as well as the analysis of results from the eyetracker.
Further research should focus on a more conceptual approach to relate components and concepts in our test practice to a more comprehensive base to further develop the test process. In our case we have had an inductive approach from our test cases to generate empirical summaries and hypotheses. In order to elaborate on how to conduct analyse of the test data generated by the eyetracker, it was an interesting point of departure to research on our own test practice to be able to understand what we need to learn more about and search for in theories and related methodologies.

5.1 Limitations and further research

There are limitations in this study. Our target group of end users are young students, some of the users were not used to contact municipalities with cases like the scenarios we presented and some of the concepts in the e-Services were not familiar.

Some of our findings are related to the website, others might be related to type of e-Service (or scenario). A limitation in this paper is a lack of conceptualisation. A concept modelling based on both theory and empirical grounding will be our approach in further research. With a deductive approach we will be able to narrow down our findings to some hypotheses on communicability e-Service design. Further on, in the next course case we would like to test a prototype on one version of an e-Service developed according to our hypotheses on communicability versus the ordinary e-Service design provided by the e-Service portal to validate our findings and to further develop the concept. The case study brings no evidence that our recommendations on the test process design is the most effective and efficient, nor that our recommendations on improvements on communicating e-Services will generate more appreciated e-Services. However, our experiences assure that the test process will work.

An in-depth study on the inter-organisational e-Service development process coordinated by the e-Office will be another research challenge. A focus on the process to “Improve e-Services” will identify how to proceed with results from the testing process, which on the other hand will define prerequisites for the test process design to reach the appropriate type of content in results. One opportunity is to evaluate findings in this paper and, together with the e-Office and CeSam Värmland, develop the inter-organisational maintenance process to improve and sharpen the requirement specifications to the e-Service portal supplier. Correcting the built-in communication is a challenge in standard e-Services lacking real-time communication. Furthermore, the ability to communicate e-Services can be tested; the problem is finding users from different target groups in a public setting. One suggestion is to continue the co-operation with the university and expand the tests to also include students on e.g. internship courses. Another suggestion is to involve the Contact Centre, which has the ability to get close to the customers and established reference groups.
References
