

Handbook of Research on E-Transformation and Human Resources Management Technologies: Organizational Outcomes and Challenges

Tanya Bondarouk
University of Twente, The Netherlands

Huub Ruël
*University of Twente, The Netherlands & American University
of Beirut, Lebanon*

Karine Guiderdoni-Jourdain
*The Institute of Labour Economics and Industrial Sociology (LEST),
Université de la Méditerranée, France*

Ewan Oiry
*The Institute of Labour Economics and Industrial Sociology (LEST),
Université de la Méditerranée, France*

Information Science
REFERENCE

INFORMATION SCIENCE REFERENCE

Hershey • New York

Director of Editorial Content: Kristin Klinger
Senior Managing Editor: Jamie Snavelly
Managing Editor: Jeff Ash
Assistant Managing Editor: Carole Coulson
Typesetter: Michael Brehm
Cover Design: Lisa Tosheff
Printed at: Yurchak Printing Inc.

Published in the United States of America by
Information Science Reference (an imprint of IGI Global)
701 E. Chocolate Avenue
Hershey PA 17033
Tel: 717-533-8845
Fax: 717-533-8661
E-mail: cust@igi-global.com
Web site: <http://www.igi-global.com/reference>

and in the United Kingdom by
Information Science Reference (an imprint of IGI Global)
3 Henrietta Street
Covent Garden
London WC2E 8LU
Tel: 44 20 7240 0856
Fax: 44 20 7379 0609
Web site: <http://www.eurospanbookstore.com>

Copyright © 2009 by IGI Global. All rights reserved. No part of this publication may be reproduced, stored or distributed in any form or by any means, electronic or mechanical, including photocopying, without written permission from the publisher.

Product or company names used in this set are for identification purposes only. Inclusion of the names of the products or companies does not indicate a claim of ownership by IGI Global of the trademark or registered trademark.

Library of Congress Cataloging-in-Publication Data

Handbook of research on e-transformation and human resources management technologies : organizational outcomes and challenges / Tanya Bondarouk ... [et al.], editors.
p. cm.

Includes bibliographical references and index.

Summary: "This book provides practical and unique knowledge on innovative e-HRM technologies that add competitive advantage to organizations"--Provided by publisher.

ISBN 978-1-60566-304-3 (hardcover) -- ISBN 978-1-60566-305-0 (ebook) 1. Personnel management--Technological innovations. 2. Management information systems. I. Bondarouk, Tanya, 1967-

HF5549.5.T33H36 2009
658.300285'4678--dc22

2008052438

British Cataloguing in Publication Data

A Cataloguing in Publication record for this book is available from the British Library.

All work contributed to this book is new, previously-unpublished material. The views expressed in this book are those of the authors, but not necessarily of the publisher.

Chapter VII

Adaptive Municipal Electronic Forms

Pieterneel Kuiper

Excellence Group, The Netherlands

Betsy van Dijk

University of Twente, The Netherlands

ABSTRACT

Adaptation of electronic forms (e-forms) seems to be a step forward to reduce the burden for people who fill in forms. Municipalities more and more offer e-forms online that can be used by citizens to request a municipal product or service or by municipal employees to place a request on behalf of a citizen. The impression exists that not all users of municipal e-forms are entirely satisfied about the current e-forms. To improve the customer satisfaction a shift must be made from a supply-led to a demand-led approach, including possibilities for tailored information and services. A municipal e-form can automatically adjust to the background, knowledge, interest, goals and restrictions of the user. The user can also adjust the form to his/her needs. Adaptive municipal e-forms can be used for different purposes, that is to make an appointment, to announce a change of address, or to request a passport or building permit. This chapter describes how municipal e-forms can be improved by the use of adaptation.

INTRODUCTION

To adapt or to be adapted: that is the question. This chapter describes how municipal electronic forms (e-forms) can be improved by the use of adaptation. The impression exists that not all users of municipal e-forms are entirely satisfied about the current e-forms. To improve the cus-

tomers satisfaction a shift must be made from a supply-led to a demand-led approach, including possibilities for tailored information and services. (Advies Overheid.nl, 2006)

Adaptation of e-forms seems to be a step forward to reduce the burden for people who fill in forms. (Dijk, 2005). Municipalities more and more offer e-forms Online (through a website or portal)

that can be used by citizens to request a municipal product or service or by municipal employees to place a request on behalf of a citizen. The form can automatically adjust to the background, knowledge, interest, goals and restrictions of the user. The user can also adjust the form to his/her own needs. Adaptive municipal e-forms can be used for different purposes, e.g. to make an appointment, to announce a change of address, or to request a passport or building permit.

The Dutch program *Overheid heeft Antwoord*, assigned by the Dutch Department of Internal Affairs and Kingdom relations (*Binnenlandse Zaken en Koninkrijksrelaties - BZK*), describes that municipalities must offer at least 65% of their services through the Internet in 2007. For the total government this required percentage is 67%. *Overheid heeft Antwoord* gives out a yearly report called the *Overheid.nl Monitor*. The *Overheid.nl Monitor 2007* describes the most important progressions and bottlenecks in the design of the electronic government and it stimulates governments to perform better. The *Overheid.nl Monitor* is based on an elaborate checklist and consists of both a yearly and continue monitor. The results of the *Overheid.nl Monitor 2007* are inspiring and confirm that we are heading in the right direction. 67% of the public services are offered electronically in 2007. This means that the goal of 65% in 2007 is widely accomplished. The results also indicate that personalized services to citizens and companies, have increased rapidly in 2007 from 19% to 36%. This has been made possible by doubling the implementation of DigiD (see (DigiD, 2008) for more information), personalized front offices and the Internet pay desks. The priority in 2008 will be on projects regarding personal services. The *Overheid.nl Monitor* will also focus on the accessibility and the quality of the government services. The goal is that government services are rewarded with a 7 (out of 10) by citizens. A better and more efficient service will save the citizens but also the government time and money. (Garnier, Flos & Romeijn, 2007).

One of the most prominent cases in the area of e-government is the implementation of a digital front office, e.g. a digital service counter. Due to this, services can optimally be adapted to users/citizens, the interaction between citizens and the government can be improved, and various internal front offices can be supported. A digital request of a municipal product and/or service can for example lead to a higher efficiency because of a higher quality of the request and the possibility for semi-automatized testing. A disadvantage is that if the municipality can not digitally process the request in their back office systems there is a big change that the digital request will only lead to a shift of the administrative burdens and to an increase of the costs. (Hoogwout & Vries, 2005) In this case the request will be sent through email to a municipal employee. The employee has to process the request in the back office system manually. With, e.g., the implementation of a Mid Office, the municipalities can process the requests digitally in the back office systems. In this case intervention of a municipal employee is not necessary anymore. For more information about a Mid Office, see (Expertisegroep Usability, 2006).

When implementing e-government one of the main points of interest is that everyone gets access to public services to avoid the risk of digital diversion. One way to handle this risk is to adjust the municipal e-forms (adaptation). This can be done by adjusting the form to the user (personalization) or the user can adjust the form him/herself (customization). There are numerous potential advantages. Time can be saved when the content matches with the choices of the user. The field of attention can be increased by pointing out which choices similar users made. The forms can also adapt to the expectations of the user by showing adapted content after the system has recognized the user. But are users actually interested in adaptation implemented in municipal e-forms? A user might get the feeling that he/she has no control since the system decides which

offer the user gets. Moreover, a user might get the feeling that his/her privacy is violated since the system monitors the (Online) behaviour of the user. (Kroon, 1998)

This chapter answers the question if and in which way citizens, municipal employees, and municipalities appreciate the implementation of adaptation in simple and complex municipal e-forms and if adaptation can improve the quality of municipal e-forms. To get an answer to this question a research has been performed by the University of Twente in cooperation with the Excellence Group (Kuiper, 2006). This research consisted of two parts. In the first part a theoretical research was performed regarding the implementation of adaptation in general and in municipal e-forms in particular. As a result of this theoretical research, three questionnaires were created to discover the need of adaptive municipal e-forms under citizens, municipal employees and municipalities. The second part of the research consisted of the design and evaluation of prototypes to demonstrate how adaptivity can be implemented in municipal e-forms.

The next sections give an overview of the different types of adaptation and adaptation techniques, the difference between paper forms and e-forms, and the way adaptation can be

applied in e-forms in general and in municipal e-forms in particular. In the following sections the questionnaires performed under citizens, municipal employees and municipalities, including their results, are discussed. The last sections of this chapter describes the prototypes that are designed based on the theoretical research and the results of the questionnaires. They also describe the evaluation of these prototypes including their results. The prototypes are evaluated under citizens and municipal employees in an end-user evaluation and under municipalities in a focus group evaluation.

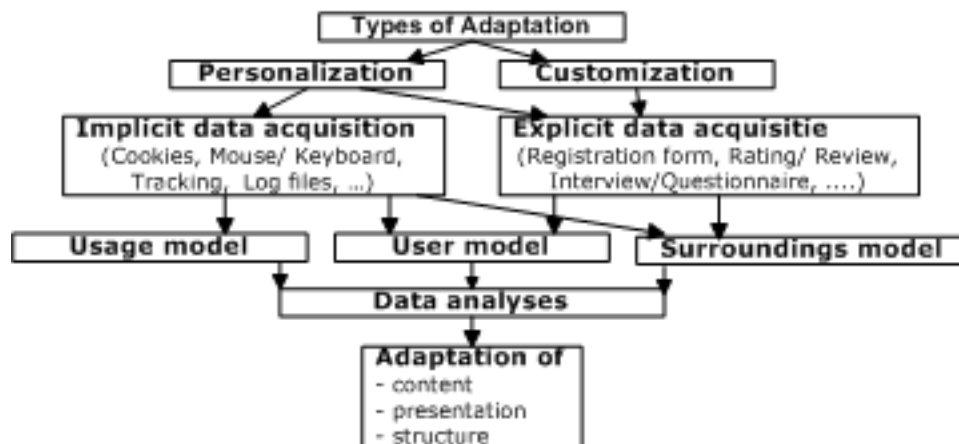
OVERVIEW OF ADAPTATION

Adaptation deals with the ability of an application to collect user information, to analyze this information, and to adapt the application to the needs of the user based on the analysis (Kobsa, Koeneman & Pohl, 2001). Figure 1 shows an overview of adaptation.

Types of Adaptation

There are two types of adaptation; personalization and customization, which can occur simultane-

Figure 1. Overview of adaptation



ously. Customization is based on explicit data, i.e. a user can adapt the applications' data or layout. Personalization is handled by the system and is based on implicit data, e.g. user behavior, and/or explicit data, e.g. information entered in a form. Hereby an application can adapt to an individual or a group. For personalization three types of models are used: user models, surroundings models, and usage models. For customization two of these models are used: user models and surroundings models. User models describe personal information or presumptions about the user. Surroundings models describe the users' software, hardware and location. Usage models describe the users' behavior by looking at user actions. User models and surrounding models contain explicit and implicit data. Usage models only contain implicit data. To create a more elaborated model, the data in these models must be analyzed using various data analysis methods, e.g. content-based filtering, collaborative filtering, rule-based filtering and usage mining. Content-based filtering is a method that is based on individual user interest and preferences. Information comparable to these interests and preferences is offered. Collaborative filtering compares the current user with comparable users to predict unknown attributes of the current user. With rule-based filtering decision rules, that are based on static or dynamic profiles and that can be used for content adaptation, can be specified in advance. In this way association rules can determine that a user who has seen two pages will also be interested in the third related page. Usage mining applies statistic and data mining methods to log data which results in user patterns that describe the user behavior of the user. (Kobsa, Koeneman & Pohl, 2001), (Germanakos, 2005), (Bearman & Trant, 2004), (Eirinaki & Vazirgiannis, 2003).

Adaptation based on usage, user and surroundings models can be presented in three ways: adaptation of content (methods to adjust the content to users), adaptation of presentation (methods to adjust the presentation, media formats, and

interaction elements to the user), and adaptation of navigation (methods to adjust the navigation to the user), which can appear in combination. (Kobsa, Koeneman & Pohl, 2001), (Serengul Guven Smith, 2000).

Adaptation of Content

Adaptation of content can be described according to different personalization functions and techniques. The following personalization functions can be distinguished (Kobsa, Koeneman & Pohl, 2001):

- **Optional explanation of detailed information.** Explanations can help users to better understand items when they miss certain background information. However, such explanations can also be unnecessary or even distracting for users who do have the necessary knowledge. Optional explanations of detailed information of items can improve the relevancy of a page for users who are interested in the item. It can also help to keep a page interesting for users who are already familiar with the item.
- **Personalized recommendations.** They inform the user about available options in which they might be interested by presenting or highlighting the items or emphasizing the parts the user is possibly interested in.
- **Optional opportunistic hints,** which are based on possible user interest and current circumstances.

The following personalization techniques can be distinguished (Kobsa, Koeneman & Pohl, 2001), (Serengul Guven Smith, 2000):

- **Conditional text:** Conditional text means that text has been divided in different parts, each part associated with a condition regarding the user knowledge of a user model (e.g. an expert or novice user). Only these parts

are presented in which case the condition is true.

- **Page variants:** A page can exist of two or more variants, in which each variant presents information on a different level or in a different way. Adaptation simply means selecting a page variant. This technique can easily be implemented by selecting a page variant. A disadvantage of this method is that for each variant a new page must be created. It could also be inflexible since all relevant pages should be adapted when something changes and it can easily become inconsistent since items should be adapted on multiple places.
- **Fragment variants:** This is a more refined implementation of the page variant technique. Each page is subdivided in a number of fragments. Two or more variants of one fragment can exist in which each variant is created for a certain user group. Fragment variants can be used in combination with page variants. A suitable page variant can be selected according to the background of the users, after which other adaptation techniques can be used by selecting a suitable fragment variant according to the knowledge of the user.
Fragment coloring: Fragment coloring can only be applied in areas where content is presented in the same formulation to all users and where the variability of adaptation across all users is relatively low. Using colors, for individual users some elements can be marked as being important, irrelevant or demanding. The advantage of fragment coloring is that users can see all available information. In this case mistakes that are self-assessed have less critical effects than with page/fragment variants.
- **Adaptive strechtext:** Adaptive strechtext is text that gives explanations about a term or word and which can be “unfolded” by the users, which can automatically be folded and

unfolded by the system, or which a pop-up screen can show when a user clicks on it or moves over it with the mouse. The advantage is that the user can adapt the content manually when the automatic adjustment is not suitable or wanted.

- **Adaptive natural-language generation:** Adaptive natural-language generation can be used to formulate alternative descriptions for different users. It can also be used as an addition on strechtext.

Adaptation of Presentation

With adaptation of presentation the information content of the object ideally stays the same while the format and the layout of the object change, e.g. images are replaced by text and/or text is replaced by audio, and/or video is replaced by still images. This can be relevant for users with a physical disability, e.g. blind people. Adaptation of presentation can be used in combination with adaptation of content and adaptation of navigation (Kobsa, Koeneman & Pohl, 2001).

Adaptation of Navigation

The goal of adaptation of navigation is to support users in decision making by manipulating navigation recourses, e.g. links, labels or hot words. It should also prevent problems like disorientation and information overload. Adaptation of navigation can be described according to a number of personalization techniques and functions. The following personalization techniques can be distinguished (Kobsa, Koeneman & Pohl, 2001), (Serengul Guven Smith, 2000):

- **Collateral structure adaptation:** Content adaptation can create implicit adaptation of links (“wanted” side-effects) when fragment variants contain links that are not shown to the user in one of the variants.

- **Adaptive link sorting:** This can be used for non-contextual links. Links can be arranged according to user interests, goals, and availability (e.g. presenting recommended items) or based on frequent use (e.g. creating personalized views).
- **Adaptive link annotation:** This can be used for contextual and non-contextual links. Adaptive link annotation annotates links in a personalized way using different colors, font types, sizes or pictograms. In a lot of systems annotations are adjustable.
- **Adaptive link hiding or disabling:** Hiding links removes the visual indicator of a link (the link looks like a normal text or icon). Disabling links removes the functionality of a link but not the visual representation. The goal of adaptive link hiding is to simplify the link in a visual way to support the navigation behavior of the user and to guide him/her to those parts of which the system thinks that they are relevant or understandable based on the supposed knowledge level of the user.
- **Adaptive link removal/addition:** This adds or removes the link of non-contextual links as a whole. The idea behind this is also to simplify the link in a visual way by removing links that point to non-relevant information. By adding links a complete new link, such as a link that points to a page that contains information that corresponds to information on the current page of the user.
- **Navigation recommendations:** Links are filtered or arranged according to usage, user and surroundings data. Filtering can also mean that inferior links are removed and therefore recommendations are enforced.
- **Adaptive guidance and orientation.**
- **Personalized maps:** Maps help users to understand the content and structure of an application. Hiding/disabling, annotation and direct guidance techniques can also be used to improve a map.
- **Personalize direct guidance:** This points the user to the most suitable route. Users only have to click on the 'next' button to get to the next page, which the system determines according to the user/usage model. Normally the user does not get the freedom to ignore the suggestions of the system. The destination of the 'next' button is not directly connected to the current node but can be determined dynamically.
- **Personal views and spaces:** The possibility to create ordered bookmarks gives users personalized access to websites (views). Personalization techniques can support users creating personal views and more elaborate information spaces. Personal spaces can namely be used for looking up browser history, creating shortcuts, and saving documents.

The following personalization functions can be distinguished (Kobsa, Koeneman & Pohl, 2001), (Serengul Guven Smith, 2000):

- **Adaptive recommendations.**
- **Recommendations regarding products and information:** Lists with links to products/services and information are filtered or arranged according to usage and user data and presented to the user.

Possible Disadvantages of Adaptation

Next to the mentioned advantages, adaptive systems can also lead to usability problems. The usability principles 'predictability', 'transparency', 'controllability' and 'unobtrusiveness' are principles that can easily be violated by adaptive systems, as well as the principles 'privacy' and 'breadth of experience'. People may become concerned about the possibility that their data will be used inappropriately. When the user completely delegates a task to the system or the

system relies excessively on an incomplete user model the consequence might be that the adaptive system does not work as it should. To reduce these problems the user should have the possibility to choose between complete control over a task and complete delegation of it. (Anthony, 2003), (Kroon, 1998)

Conclusion

Adaptation can be divided in personalisation and customization, uses explicit and implicit data, and is based on user, usage and surroundings models. Adaptation can be presented in three ways: adaptation of content, adaptation of presentation and adaptation of navigation. These adaptation methods can be used in combination. The use of adaptation has a lot of advantages, but also some disadvantages e.g. the problem that users can have the feeling that they have no control and problems regarding privacy issues.

PAPER FORMS VS. E-FORMS

A lot of governments replace their paper forms with Online e-forms. The main reason for this replacement is to enhance the efficiency. Next to this, the assumption was made that filling in e-forms is easier than paper forms and that the amount of forms filled-in incompletely would decrease. There are a number of standard problems that can occur when filling in paper forms and that can be solved by the use of e-forms (Dijk, 2005):

- **Routing problems:** Routing problems can be eliminated by the use of a branching program that only asks relevant questions depending on the answer of the previous questions.
- **Verification of calculations:** Verification of calculations will be less important since the computer performs all the calculations. Next to this, computers can contain built-in checks

that detect implausible or contradicted answers to question. Such features can inform the user about possible mistakes.

- **Terminology problems:** Terminology problems can be solved with the use of pop-up definitions and explanations.
- **Explanations:** Explanations can be offered through Online help. Some explanations can even be replaced by wizards that do not explain how the answer to a question can be found but that guide the user to the correct answer.

It has been said that there is no significant difference in accuracy, mental load, or motivation when filling in paper or e-forms. However, the use of adaptation in e-forms seems to be a step forward in reducing the administrative burden for persons who fill in forms. With adaptation answers can be prefilled in the forms and questions can be skipped if the answer is already known or irrelevant. (Dijk, 2005).

ADAPTATION IN E-FORMS

This section describes the different adaptation techniques that can be used in e-forms according to the theory described so far (overview of adaptation) and theory about dynamic forms (Frank & Szekely, 1998), (Girgensohn, 1995), (Serengul Guven Smith, 2000). It also describes the different possible advantages and disadvantages of the implementation of adaptation in e-forms.

Adaptation Techniques

As a result of the theory about adaptation in general, as described in the previous sections, and the theory about dynamic forms the following adaptation techniques can be used with e-forms to enhance the usability and flexibility of the form: dynamic visibility of fields, active fields, nested forms, adaptive link hiding and disabling,

sorting, built-in checklists, personalized direct guidance, personalized maps, page variants, fragment variants, and frame-based techniques. The adaptation techniques that are already discussed in the previous sections are only mentioned shortly. The new adaptation techniques are described in a more elaborate way:

- **Dynamic visibility of fields:** Dynamic visibility of fields adds and/or removes fields or links (see also adaptive link removal/addition, as discussed in the section Adaptation of navigation). When fields are added or removed they are repositioned automatically in the form to prevent empty spaces. This technique can be used to prevent the user from being exposed to unnecessary items and helps the user to focus on relevant information.
- **Active fields:** Active fields corresponds to formulas linked to a cell used in spreadsheet programs. If the content of one field changes this can lead to other automatic changes in the form. This can especially be useful for the calculation of certain data in a form.
- **Nested forms:** Nested forms is a form of adaptive stretchtext (see the section Adaptation of content). The content of a window is organized in sections and subsections that the user or system can open and close.
- **Adaptive link hiding/disabling:** Adaptive link hiding or disabling is discussed in the section Adaptation of navigation. It hides the visual indicator of a link or disables the functionality of a link.
- **Sorting:** Sorting corresponds to adaptive link sorting, as discussed in the section Adaptation of navigation, but also aims at text, fields, and sections.
- **Built-in checklists:** Built-in checklists is a form of adaptive link annotation, as discussed in the section Adaptation of content, and of fragment coloring, as discussed in Adaptation of navigation. It uses colors

to make sure no obligatory fields are forgotten and guides users to perform tasks. Checklists can adapt themselves according to previous choices and it can determine if a step is unnecessary, finished or still has to be performed.

- **Personalized direct guidance:** Personalized direct guidance, as discussed in the section Adaptation of navigation, dynamically determined destination of 'next'-button.
- **Personalized maps:** Personalized maps, as discussed in the section Adaptation of navigation, helps users to understand the content and structure of the form.
- **Page variants:** With page variants, as discussed in the section Adaptation of content, one page consist of two or more variants representing information on a different level or style.
- **Fragment variants:** Fragment variants, as discussed in the section Adaptation of content, is the refinement of page variants. One page is divided in different fragments consisting of two or more variants representing different user groups.
- **Frame-based technique:** The frame-based technique uses adaptive natural-language generation (see the section Adaptation of content) to create alternative descriptions for different users, e.g. offering different explanations or different details of information, e.g. depending on the knowledge of the user.
(Dijk, 2005), (Frank & Szekely, 1998), (Girgensohn, 1995), (Kobsa, Koeneman & Pohl, 2001), (Serengul Guven Smith, 2000).

Advantages and Disadvantages

Implementing adaptation in e-forms has a number of possible advantages and disadvantages in comparison with e-forms without adaptation. The following advantages can be distinguished:

- The run time of filling in the form can be reduced since unnecessary fields and remarks/explanations are omitted and adapted help functions and interface can be offered. The user will not be distracted by irrelevant items.
- The user can fill in the form uninterrupted without consulting a separate guidebook; the user does not have to switch between the form and the Online guidebook. In this way the form can be filled in faster and obscurities can be solved faster.
- The help function will be ignored less by the user, it will take less effort to find relevant information and there is more chance that the help function will be used. For example, when a user consults a help function more than 50% of the time the following help functions will automatically be showed by the system.
- An adaptive application, like adaptive municipal e-forms, will reduce the costs of extra support on problem solving. For example, when a user has problems filling in a non-adaptive municipal e-form to request a service he/she might decide to call or visit the municipality to do the request or to ask for help. Implementing adaptation in municipal e-forms can reduce these costs.

Next to these advantages the following disadvantages can be distinguished []:

- Designing e-forms and replacing the current forms will result in extra “costs”
- When adaptation is not applied correctly by the system this could lead to irritation of the user when he/she must restore the “mistake”.

Conclusion

As a result of the theory about adaptation in general and theory about dynamic forms different adapta-

tion techniques can be distinguished that can be implemented in e-forms. If all of these adaptation techniques are also suitable for municipal e-forms is discussed in the next sections. Implementing adaptation in e-forms has a number of possible advantages: the run time of filling in forms can be reduced, the user can fill in the form uninterrupted without consulting a separate guidebook, the help function will be ignored less by the user, and an adaptive application, like adaptive municipal e-forms, will reduce the costs of extra support on problem solving. The possible disadvantages is that it will result in extra costs and that when adaptation is not implemented correctly it could lead to irritations by the user.

ADAPTATION IN MUNICIPAL E-FORMS

Adaptation has mostly advantages for public (but also private) organizations that use a lot of administrative and on forms based communication, like municipalities and the *Belastingdienst*. Improving the efficiency of (electronic) forms is not only an advantage of adaptation for the organization but also for the users: the administrative load of filling in forms by the user (citizen or municipal employee) shifts to controlling, adding and updating information, that is offered by the application. Additionally, adaptive e-forms can help organizations to reduce operational costs by elimination time-consuming, error-sensitive (paper) document processing, and to improve the user satisfaction by offering certain services in a faster and easier way. At municipalities adaptive e-forms can be used for different issues/tasks, e.g. making an appointment, request for an official document or a permit, asking a question. (Dijk, 2005).

User Groups

According to the Dutch government, government websites and municipal websites have to conform

to a number of standard requirements. One of these requirements is that a municipal website should be accessible. Here accessibility means that a website should be usable for all Internet users, e.g. citizens (regardless their physical or technical disabilities) or companies. A real accessible website does not exclude any visitors. (Advies Overheid.nl, 2005)

When researching the implementation of adaptation in municipal e-forms it is sensible to make a distinction between users and to take into account different backgrounds, knowledge, interest, wishes, goals and restrictions of the user. Looking at the accessibility and the different users the following standard user groups can be distinguished that are relevant for municipal e-forms:

- citizens
- companies
- municipal employees
- municipalities

For these four user groups possible physical and technological restrictions should be taken into account. They can also be subdivided in sub-groups, e.g. novice and expert users, depending on the experience level of the user.

Experience Level of Municipal E-Forms

As mentioned in the introduction the Dutch program *Overheid heeft Antwoord* presents a yearly report called the *Overheid.nl Monitor*. The *Overheid.nl Monitor 2007*, that describes that municipalities must offer at least 65% of their services through the Internet in 2007, is based on an elaborate checklist and consists of both a yearly and continue monitor. The checklist is renewed every year, since the government organisations improve their services/website throughout the year. (Garnier, Flos & Romeijn, 2007).

To measure to which extent/percentage the services offered by the different government orga-

nizations are offered through the Internet different experience levels are used (Winkel, 2005):

- (0) **no information:** The municipality has no website or does not offer any or insufficient information on the website about a certain service.
- (1) **information:** Essential information about services is present on the website, e.g. a description of a service and information about procedures or rules.
- (2) **download application form:** The website offers an application form for certain services that can be downloaded from the website. The user can print, fill in and send this form to the municipality.
- (3) **upload application form:** The website offers an application form on the website for certain services which the user can fill in Online.
- (4) **electronic transaction:** When a user or company has submitted an electronic request, the municipality offers the possibility to receive the product or service electronically or sends an digital message that the request is being processed.

For example, the service *Announcement of a change of address* can be offered on level 4 (electronic transaction). In the checklist of the *Overheid.nl Monitor 2007* the actual level, e.g. level 3, offered by a municipality is compared with the maximum level (in this case level 4). In this way the percentage is been determined. To read more about the (yearly and continue) monitor the website of *Overheid.nl Monitor* can be consulted, see (Overheid heeft Antwoord, 2008), (Garnier, Flos & Romeijn, 2007).

Conclusion

Adaptation has the biggest advantages for public organizations that use a lot of administrative and on form based communication, like municipali-

ties. However, it is important to take privacy and security rules into account. Three user groups can be distinguished that are relevant for municipal applications: citizens, companies, and municipal employees. According to the *Overheid.nl Monitor* of the Dutch government 65% of the public services should be offered through Internet in 2007. The results of the *Overheid.nl Monitor* 2007 is that 67% of the public services in 2007 are offered digitally, which means that That year's goal of the monitor is accomplished.

ONLINE QUESTIONNAIRE

There are four main choices that are important when governments/municipalities deal with adaptation: the choice between personalization, customization, or a combination, the choice between adaptation to an individual or a group, the choice between implicit acquisition, explicit acquisition, or a combination, and the choice between adaptation of content, adaptation of presentation, adaptation of navigation, or a combination. Next to these choices it also important to make sure the different options correspond to the needs of the user groups of municipal e-forms: citizens, companies, municipal employees and municipalities. To discover the needs of these user groups three Online questionnaires were created as part of a research on Adaptive municipal e-forms conducted by the University of Twente in collaboration with the Exxellence Group (Kuiper, 2006). In this research the group companies has not been taken into account.

Method

The questionnaire for citizens, municipal employees and municipalities was created to discover the wishes and needs of these user groups regarding adaptation with municipal e-forms. The citizens questionnaire aimed at all citizens in the Netherlands who have access to Internet. Citizens were

approached by a posting (Computable forum) and by email (78 persons) including the request to send it on to others. The municipal employees questionnaire aimed at municipal employees who fill in municipal e-forms on a regular base. About 800 municipal employees were approached in a newsletter of the Exxellence Group. Next to this, an email was send to all 483 municipalities in the Netherlands. Both with the question to send it on to municipal employees who fill in forms. The municipality questionnaire aimed at all municipalities in the Netherlands. Municipalities (mostly clients of the Exxellence Group) were personally approached by email. In total 53 municipality employees were emailed.

Before the questionnaires were designed it was necessary to find out which options (adaptation methods/models) should be used in adaptive municipal e-forms and which products/services could be improved with adaptation. The questionnaires were designed to be understandable for everyone, since they aimed at different people, e.g. men/women, young/old people, people with different educational levels. The main problem was how to ask things of which the user has no knowledge. To do this the questionnaires used examples of announcing a change of address, where the use of adaptation was described by approaching different users in a different way when filling in the form. The questionnaires also used pictures based on this example to explain items, e.g. adaptation of content. The user was explicitly asked to indicate his/her preference, e.g. personalization, customization, or a combination.

Questionnaire Results

54 out of 78 citizens have filled in the citizen questionnaire. The effect of request to send the questionnaire to others and the response on the posting is not known. The response rate of the municipal employees who were approached in a newsletter of the Exxellence Group was less than 1%. The response rate of the municipal

employees that were approached indirectly (who got the request from another person) was also less than 1%. The response rate of the municipal employees who were approached by sending an email to all 483 municipalities in the Netherlands was 11%. In total 51 municipality employees have filled in the questionnaire. The response rate of the municipalities was 26% (14 persons (13 municipalities) out of 53).

Citizens and municipal employees indicated that they had different problems when filling in municipal e-forms. Striking differences between the two user groups are mentioned when relevant.

- **Explanation problems (69%):** it was not clear that an explanation could be consulted; the correct information was difficult to find in the explanations.
- **Knowledge problems (65%):** not all terms and fields that had to be filled in were clear to the user.
- **Selection problems (64%):** it was not clear enough which questions had to be answered.
- **Orientation problems (58%):** the overview was not clear enough when filling in the form.
- **Control problems (53%):** the user was not interested in or had no time to control the filled in form on mistakes.
- **Shift problems (52%):** because other documents needed to be consulted when filling in the form, the user had to shift between the form, the explanation and other Online documents.
- **Calculation problems (27%):** the user had difficulties with the calculation of problems. Notable is that 36% of the municipal employees had calculation problems comparing with only 17% of the citizens.

The problems mentioned above can be prevented with adaptation. Citizens and municipal

employees also indicated that the following adaptation items could be improved in (municipal) e-forms:

- **Relevant fields (72%):** the program should only show the questions or fields that are relevant for the user.
- **Unlikely fields (69%):** the program has to give signals when a very unlikely data or illogical combinations of data are filled in.
- **Combination forms (67%):** the program offers combination forms if this is relevant for the user.
- **Sums (65%):** the program should calculate sums automatically for the user. The user should only fill in the numbers.
- **Suggestions (62%):** the program should make suggestions for other forms that could be relevant for the user.
- **Instructions (58%):** the program should give instruction about “difficult” terms and fields when relevant to the user.
- **Relevant explanations (58%):** the program should only show relevant and understandable explanations and detailed details to the user.
- **Link problems (56%):** the program should prevent link problems by showing information in the same screen, e.g. in the form of an explanation. Notable is that 70% of the municipal employees indicated that link problems should be improved comparing with only 41% of the citizens.
- **Modal data (45%):** data that has to be filled in on a frequent base, as personal data, should be filled in automatically by the program.

Assuming that the approached end-users were representative for the whole end-user group it can be concluded that they all prefer the use of adaptation with municipal e-forms (citizens: 82%, municipal employees: 67%, and municipalities: 62%). Striking is that especially the highly educated persons were more positive than people

with a lower education. The users also had the opinion that most of the municipal products and services could be improved by the use of adaptation. The following products and services could be improved the most: 'Announcement of a change of address' (according to citizens), 'Permit to fell trees' (according to municipal employees), and 'Building permit' (according to municipalities). Citizens, municipal employees and municipalities generally have the preference for:

- Adaptation to an individual AND adaptation to a group
- Combination of personalisation and customisation (e.g. for people with poor eyesight)
- Combination of explicit (e.g. DigiD) and implicit acquisition
- Adaptation of content
- Adaptation of presentation (especially for people with poor eyesight)
- Adaptation of navigation. Notable is that 63% of municipal employees preferred the use of adaptation of navigation comparing with 84% of the citizens and 77% of the municipalities.

Since people with poor eyesight are seen as an important subgroup by the end-users, this should also be taken into account in the design phase (of the prototypes).

Conclusion

An Online questionnaire was conducted to discover the needs of citizens, municipal employees and municipalities regarding the implementation of adaptation in municipal e-forms. Before the questionnaires were designed it was necessary to find out which options (adaptation methods/models) should be used in adaptive municipal e-forms and which products/services could be improved with adaptation. All three user groups preferred the use of adaptation with municipal e-forms and they had the opinion that most of the municipal

products and services could be improved by the use of adaptation. As a result of the results of the Online questionnaire and the theory studied two prototypes were created and evaluated in an end user evaluation.

END USER EVALUATION

The end user evaluation uses a so-called usability test that measures the usability by examining how easy and effective a certain user can use an application and which problems occur. It can also collect information about problems, difficulties and weak point and areas that need improvement. (Lee, 1999) In this case the usability test is used as a comparison test, where the usability of an adaptive municipal e-form has been compared with a municipal e-form without adaptation. In this way the effects of adaptation could be measured.

Method

As a result of the results of the Online questionnaire and theory studied two municipal prototypes were designed and evaluated that would benefit the most from the use of adaptation or that could be improved the most according to the user groups; one relative simple form 'Announcement of a change of address' and one relative complex form 'Building permit'. Both prototypes contained the preferred methods indicated by the end-users. During the evaluation the focus was on fill in mistakes, explanations, mental efforts (quantitative results), and the use of the help function, the function page style, the appreciation, and the choice between adaptive and non adaptive (qualitative results).

The prototypes are evaluated in a face-to-face evaluation where the users (citizens and municipal employees) could give feedback while interacting with the prototype. The end user evaluation has been performed to examine if the implemented design choices correspond to the demand of these

end-users. The evaluation used different test methods (Expertisegroep Usability, 2006):

- **Scenario-based testing:** gives better insight in the product and shows the items the user actually has problems with.
- **Prototype testing:** gives early insight in design mistakes and gives users an accurate view of the level in which the system corresponds to the wishes and expectations of the user.
- **Work out loud method:** is applied in an easy way, it gives direct feedback over how the application will be welcomed by the user since they get an active roll in the designs process, and it gives a clear overview of bottlenecks.
- **Interview techniques:** makes it possible to get clarifications to prevent misunderstandings.
- **Questionnaire techniques:** makes it possible to get feedback in a fast and effective way from the perspective of the user.

Users interacted with the prototype according to a scenario where he/she had to say out loud what he/she was thinking and doing. After the prototype test the user had to fill in a short questionnaire and an interview was conducted to compare the adaptive and non-adaptive version.

End User Evaluation Results

The end users (citizens and municipal employees) preferred the adaptive forms over the non adaptive forms. This was the case for both the relatively complex form 'Building permit' and the more simple form 'Announcement of a change of address'. Certain features of adaptation were more appreciated in complex forms than in the relative simple variant. The context specific help function in the form 'Building permit' was more

appreciated than in the form 'Announcement of a change of address'. On the other hand, the use of DigiD was more appreciated in the form 'Announcement of a change of address', since the number of fields that had to be filled in was drastically reduced by it. In the simple form the option built-in checklists was most appreciated by the citizens and the page style option the least. With the municipal employees the option dynamic visibility of fields was most appreciated and the personalized recommendations the least. In the complex form the option dynamic visibility of fields was appreciated the most and the page style option the least. With municipal employees the option built-in checklists was appreciated the most and the page style option was also appreciated the least. However, it was also indicated by the municipal employees that the choice of the page style should depend on the interaction behaviour of the user and not of his/her personal data, e.g. age of the user.

Conclusion

As a result of the results of the Online questionnaire and theory studied, two municipal prototypes that would benefit the most from the use of adaptation or that could be improved the most according to the user groups were designed and evaluated in an end user evaluation. In the end user evaluation the citizens and municipal employees could give feedback on the adaptive and non adaptive variants of the e-forms while interacting with the prototypes. Both citizens and municipal employees preferred the adaptive forms over the non adaptive forms. The option dynamic visibility of fields and built-in checklists were most appreciated by the users and the page style option the least. Next to the evaluation under citizens and municipal employees an evaluation under municipalities has been performed: focus group evaluation.

FOCUS GROUP EVALUATION

After the end user evaluation under citizens and municipality employees a focus group evaluation was performed under municipalities to investigate if municipalities are interested in offering adaptive municipal e-forms to citizens and/or municipal employees and in which way these forms should be offered.

Method

The goal of the focus group evaluation was to get reactions on the prototypes, to get insights by group interactions, and to get the opinions, attitudes, and preferences of the group. Both adaptive municipal e-forms 'Announcement of a change of address' and 'Building permit' were presented and discussed during the group evaluation to see if these types of e-forms are appreciated by the municipalities. The focus group evaluation is a qualitative evaluation where the focus was on the use of the help function, the function page style, built-in checklists, DigiID, adaptive 'next button', dynamic visibility of fields, and personalised recommendations. Discussed were appreciation of these functionalities and the preference of an adaptive or a non adaptive version.

The target group of the evaluation consisted of a representative focus group of municipalities that offer municipal e-forms to citizens. Five (of the thirteen) approached municipalities participated in the focus group evaluation. The group consisted of ICT advisers, ICT managers etc. of expert (40%) and middle (60%) municipalities. The novice group was also approached but they indicated that they were not far enough with their digital services to evaluate the use of adaptation with municipal e-forms.

Focus Group Evaluation Results

The municipalities preferred adaptive forms and indicated that the use of adaptation contributed to

municipal e-forms since it enhanced the usability of the form. This was the case for the relative complex form 'Building permit' and the more simple form 'Announcement of a change of address'. According to the municipalities the use of adaptation should be standard in the implementation of all types of forms. Some adaptive functionalities were more appreciated than others, however according to the municipalities all functionalities contributed to the forms and should be used in standard implementations.

Conclusion

A focus group evaluation was performed under municipalities to investigate if they are interested in offering adaptive municipal e-forms to citizens and/or municipal employees and in which way these forms should be offered. The municipalities preferred adaptive e-forms and indicated that the use of adaptation contributed to adaptive municipal e-forms since it enhanced the usability of the form. They also mentioned that it should be used as the standard implementation in all types of (municipal) e-forms.

CONCLUSION

The question was if and how municipal electronic forms (e-forms), used to request municipal products and services, can be improved by the use of adaptation. The impression exists that users are not totally content with the current municipal e-forms. To discover if the use of adaptation contributes to municipal e-forms different researches were performed where the focus was on the user and the client.

First a theoretical research was performed regarding the implementation of adaptation in general and in municipal e-forms in particular. As a result of this theoretical research a more detailed research has been performed by means of an Online questionnaire and user evaluations

to examine how citizens, municipality employees and municipalities, think about the use of adaptation with municipal e-forms. First a questionnaire was conducted under citizens, municipal employees and municipalities. The questionnaire results were used to develop two prototypes which were tested in an end-user evaluation with citizens and municipal employees and during a focus group evaluation with municipalities. The results of the Online questionnaire indicated that citizens (82%), municipality employees (67%) and municipalities (62%) had a preference for the use of adaptation. They indicated that the major part of the discussed products and services could be improved with the use of adaptation. For citizens this was especially the service 'Announcement of a change of address', for municipality employees it was the product 'Request for a felling permit' and for the municipalities it was the product 'Request for a building permit'. Four prototypes have been created. Two variants of the relatively simple service 'Announcement of a change of address' and two variants of the more complex product 'Request for a building permit'; an adaptive and a non adaptive variant. Citizens, municipality employees and municipalities preferred the adaptive version of the form 'Announcement of a change of address' as well as of the form 'Request for a building permit'. However, they mentioned that improvements should be made with respect to the content of the form 'Request for a building permit'. Remarkable was that at first municipalities were least positive about the implementation of adaptation in municipal e-forms (62%) and that they were most positive after the evaluation of the prototypes (100%). They also mentioned it should be the norm to implement adaptation in municipal e-forms, both simple as complex ones.

It is recommended to municipalities to standard implement adaptation with municipal e-forms, to monitor user behaviour and use known (personal) data and data about corresponding users as an input for adaptation. Municipalities should also examine the municipal e-forms internally and improve

them internally prior to the implementation of adaptation. It is recommended to use DigiD and built-in checklist in municipal e-forms and to offer personalised guidance and links; dynamic and active fields, page variants and context dependent help functions on different levels.

When implementing adaptation in municipal e-forms different items should be taken into account. The implementation of adaptation costs money; a part can be 'earned back' because less counter and call centre employees will be necessary if citizens are able to request municipal products and services Online without the aid of a municipality employee. By monitoring the user behaviour the user can have the feeling that he/she is being watched. The user can also fear the possibility that his/her personal data will be abused; the municipalities should show a disclaimer which clearly mentions why and how the user data will be used. If adaptation is not being correctly applied by the system this could lead to irritations for the end-user, who has to recover the 'mistake' him/herself.

Because of the positive feedback of all three user groups (citizens, municipal employees and municipalities) added value of the use of adaptation in municipal e-forms is evident and municipalities should seriously consider to use it in standard practice.

REFERENCES

Anthony, J. (2003). Adaptive Interfaces and Agents. In J. Jacko & A. Sears (Eds.), *Human-computer Interaction Handbook* (pp. 305-330). Mahwah, NJ: Erlbaum.

Advies Overheid.nl (2005). Webrichtlijnen Overheid.nl 2005, Richtlijnen voor de toegankelijkheid en duurzaamheid van overheidswebsites. Retrieved from <http://webrichtlijnen.overheid.nl/webrichtlijnen-1.1.pdf>

- Advies Overheid.nl (2006). Overheid.nl Monitor, Prestaties van de e-overheid gemeten. Retrieved from http://www.minbzk.nl/contents/pages/54678/overheid.nl_monitor_2005.pdf
- Bearman, D., & Trant, J. (2004). *Museums and the Web 2004, Proceedings*. Toronto: Archives & Museum Informatics. Retrieved from <http://www.archimuse.com/mw2004/papers/bowen/bowen.html>
- DigiD (2008). *Over DigiD*. Retrieved August 2008 from <http://www.digid.nl/burger/>.
- Dijk, van J. A. G. M. et al. (2005). *Alter Ego: State of the art on user profiling. An overview of the most relevant organisational and behavioural aspects regarding User Profiling*, Telematica Instituut. Retrieved from https://doc.telin.nl/dscgi/ds.py/Get/File-47289/UT_D1.10a.pdf
- Eirinaki, A., & Vazirgiannis, M. (2003). *Web Mining for Web Personalization*. Retrieved from http://www.db-net.aueb.gr/magda/papers/TOIT-webmining_survey.pdf. Athens University of Economics and Business.
- Expertisegroep Usability 2006 Regio Randstad-Noord (2006). *Usability Testing, Kenmerken van Methoden, Sogeti Nederland B.V.* Retrieved from http://www.tmap.net/Images/Usability%20Testing%20versie%201.01_tcm8-31182.pdf#search=%22voordelen%20%22usability%20testing%22%22.
- Excellence Group (2008). *Partner van de elektronische overheid*. Retrieved from <http://www.excellence.nl>.
- Frank, M. R., & Szekely, P. (1998). Adaptive forms: an interaction technique for entering structured data. *Knowledge-Based Systems, 11*, 37-45.
- Garnier, M., Flos, B., & Romeijn, H. (2007). Overheid.nl Monitor 2007, Overheid heeft Antwoord©. Retrieved from www.advies.overheid.nl/attachment.db?7698.
- Germanakos, P., et al. (2005). Personalization Systems and Processes Review based on a Predetermined User Interface Categorization, III CONGRÉS INTERNACIONAL COMUNICACIÓ I REALITAT. Retrieved from http://cicr.blanquerna.url.es/2005/Abstracts/PDFsComunicacions/vol1/05/GERMANAKOS_MOURLAS_PANAYIOTOU_SAMARAS.pdf.
- Girgensohn, A. et al. (1995). Dynamic forms: An enhanced interaction abstraction based on forms. In *Proceedings of Interact'95, Fifth IFIP Conference on Human-Computer Interaction*, (pp. 362-367). London: Chapman & Hall.
- Hoogwout, M., Vries, de M., et al. (2005). Onderzoek: Digitale indiening omgevingvergunning Mijlpaal op weg naar de Andere Overheid, Zenc. Retrieved from <http://www.vrom.nl/pagina.html?id=18487>.
- Kobsa, A., Koeneman, J. J., & Pohl, W. (2001). Personalized hypermedia presentation techniques for improving online customer relationships. *The knowledge Engineering Review, 16*(2), 111-115.
- Kroon, J. P. (1998). *Hoofdstuk 10: Het belang van klantinformatie voor E-commerce. Ecommerce Handboek*. Retrieved from <http://www.netmarketing.nl/downloads/files/Voorbeeldhoofdstuk%20E-commerce%20Handboek.pdf>.
- Kuiper, P. M. (2006). *Adaptieve Gemeentelijke eFormulieren*, Formulieren die met u meedenken, Universiteit Twente, Excellence Group, Nederland.
- Lee, S. H. (1999). *Usability Testing for Developing Effective Interactive Multimedia Software: Concepts, Dimensions, and Procedures*, Hanyang University, Department of Educational Technology, Seoul, Korea. Retrieved from http://ifets.ieee.org/periodical/vol_2_99/sung_heum_lee.html.
- Overheid heeft Antwoord (2008). *Actueel*. Retrieved August 2008 from <http://www.advies.overheid.nl>.

Serengul Guven Smith, A. (2000). *Application of Machine Learning Algorithms in Adaptive Web-based Information Systems*, School of Computing Science Technical Report Series. Retrieved from <http://www.cs.mdx.ac.uk/staffpages/serengul/Pdf/chapter%204.PDF>.

Winkel, N. (2005). *Publieke dienstverlening 65% elektronisch, Viermeting van de elektronische dienstverlening van de overheid in 2005*, Advies Overheid.nl en Ministerie van Binnenlandse Zaken en Koninkrijksrelaties. Retrieved from <http://advies.overheid.nl/3137/>.

KEY TERMS

Back Office: The back office forms the heart of the organisation were, invisible for the outer world, the primary (data distributing) processes are performed.

Back Office System: A back office system/application offers data distributing functionality and is used in this way by a mid office .

Customisation: Customisation is the adaptation of a website to his/her personal preferences of a user.

E-Form: An e-forms is a given procedure designed to register, read, edit, transport, reproduces, save and search data in an uniform, systematic

and complete way (fill in and fill up).

E-Government: E-government is the use of ICT in government services in combination with organizational changes and new abilities of the employees.

Electronic (digital) Service Counter: An electronic service counter is a (government) service counter where the government and the citizens/companies communicate through electronic channels with the goal to optimally adjust their services to the demand of the citizens/companies.

Front Office: The front office forms the presentation layer of the organisation to the outer world; all interaction with the outer world is being performed by the front office.

Mid Office: The mid office is a collection of functionalities that connects the processes and corresponding applications and data in the front office and the back office.

Personalisation: Content is offered in a personalized way by a website to individuals or groups of persons, based on profiles, demographic data and/or previous transactions.

Portal: A portal offers functionality to offer relevant information and applications to (groups of) end users in a personalized way.