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INTERACTIVE VIDEO TUTORIALS AS A TOOL TO REMOVE BARRIERS FOR SENIOR EXPERTS IN ONLINE INNOVATION CONTESTS

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Abstract

This article presents empirical results of a qualitative study on video tutorials for online innovation contests (OIC) for elderly people carried out in the interdisciplinary research project OpenISA. In the project experts from communication studies and linguistics focus on interface and help feature design with a high communicative usability. One research goal is the examination when to apply specific help features for elder users. Based on another study, carried out earlier in the project, barriers of the OIC use by elderly people are reported. The interactive video tutorial described here was created for the elderly with the aim to support learning and understanding main functions of OICs and to avoid the reported barriers. This interactive tutorial has been tested with senior experts. The results show that video tutorials seem to be an effective help feature for different groups of elder users. In combination with interactive toolkits the use of tutorials increases the time users need to fulfil tasks with a toolkit but reduces the number of errors. With respect to toolkits the demands of senior experts seem to be different depending on their Internet usage experience (low vs. high) and their usage profile (passive vs. active). Active dynamic users appreciate video tutorials to get an overview over main functions and to understand functions. Concerning toolkits they prefer solutions that allow them to use both the toolkit and the help instructions at the same time. From the findings recommendations for the design of interactive video tutorials on websites were derived.

Keywords: online innovation contest, elderly, user type, help feature, interactive video tutorial.

1 INTRODUCTION

Innovation contests (ICs) are popular tools to integrate the general public in the development of innovative technologies; they have often been used to solve problems affecting the whole society [1]. Especially companies utilize ICs to gather information about customers needs (need information) and to transform need information into innovative products and services (solution information) [2]. ICs are launched by an organizer (companies, organisations or individuals). They encourage a target group (specified or the general public) to submit contributions (online, offline or in both ways) in a certain time period (some hours, some months or on-going) to an assigned task by offering incentives (monetary, non-monetary or a mixture). The task can be open or specific. The required level of detail for submissions ranges from descriptions of an idea to elaborate solutions. Contributors may participate alone or in teams. Independent experts or the members of the IC evaluate the submitted ideas [3]. Especially community-based ICs offer community functions [4]. Such functions are available in online ICs (OICs) and enable users to improve ideas of other members, which leads to discussion, cooperative work and knowledge transfer [3].

Senior experts are an interesting target group due to their extensive life and work experience as well as due to the challenging product market for the elderly [5]. OICs are an appropriate tool to gain access to the knowledge of senior experts even after retirement and thus integrating them into solving the challenges of the demographic change ([1],[5])

Online innovation contests (OIC) for senior experts are the research focus of *OpenISA*, an interdisciplinary project at RWTH Aachen University, Germany[1]. The contribution of experts from communication studies focuses on ways to address senior experts (65-aged and older), to design usable OICs for the elderly and to support them to participate in OICs. To better understand difficulties older users may face during the usage of OICs, the contest www.einfachtelefonieren.de was launched and evaluated with different methods [6]. To overcome barriers elderly experience by using OICs, an

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interactive video tutorial was designed as a help feature for first-time users. The tutorial was evaluated in usability tests (chapter 4). From the tests recommendations for interactive tutorials on websites were derived (chapter 5).

2 RELATED WORK

2.1 The design of OICs

The design of OICs differs in functions and interface. According to the literature, relevant parameters for the virtual interaction design are: the intensity of interaction, the level of multimedia richness, the communication style, the incentives and the tools provided [7]. Typically OICs consist of different components like a landing page, functions like the possibility to submit ideas and to evaluate ideas and additional features like personal pages of participants [8]. Many OICs offer interactive toolkits that allow users to design new products. Toolkits for idea competitions (TIC) are "(…) coordinated sets of "user-friendly" design tools that enable users to develop new product innovations for themselves." [9]. User-friendly means, that users do not need additional training to use TICs, but can rather explore such toolkits in cycles of trial-and-error [9]. Other authors assume that normally users will ask for help or raise specific questions during the course of interaction and user support has to be provided [7]. How this support should be designed with respect to elder users and barriers they face by using OICs is, to our knowledge, not investigated.

2.2 Website design for elderly

Besides approaches like *Universal Usability* there is a growing interest in the impact of personal attributes like age on the usage of Internet applications. One theoretical as well as practical challenge is the question how to design usable interfaces for the elderly. Many studies describe the group of the elderly (users older than 50 years, often referred to as *silver surfers*). A weak point of many studies is an oversimplification of the target group in the sense that "the elderly" are seen as one group (the silver surfers, the group 50+) characterised by an increasing number of age-related deficits. Web usability recommendations derived from such studies focus on physically and cognitively impaired users ([10], [11], [12]). They do not take into account that the group of elderly represents a highly divers target group [6]. For example heuristics seem to be more focused on peoples disabilities rather than on peoples abilities [13]. As Chisnell, Redish and Lee tell us, "Not everyone over 50 has eyesight poor enough to require maximizing the size or contrast of text of a web page. Not every person over 50 has problems with motor control or significant short term memory loss. The diversity of this demographic group is stunning" [13]. One differentiating factor may be the social background. In Germany, more and more people end their working life at the age of 65 and older. Statistics like the (NON)liner Atlas [14] implicate that the Internet usage decreases more or less ten years after the retirement. In 2011, 75,4% of all Germans between 50 and 59 years old (the group 50+) are classified as so called *onliners.* In the group 60+ 57,3% use the Internet. In the group 70+ only a quarter of the population has access to this technology.

With respect to the diversity of older people subgroups like 60+ or 70+ and attributes like the degree of web literacy and Internet participation should be focused. Oehmichen and Schröter distinguish two main groups of users depending on criteria like usage patterns, practice in using web applications and usage interests: active dynamic users and passive selective users [15]. Active dynamic users are familiar with various website genres and spend more time on the Internet. The web literacy of passive selective users is low; they use a small fraction of website genres and show uncertainties regarding the Internet usage. This typology of web user groups is a promising approach to differentiate older Internet users into subgroups depending on the Internet behaviour.

Studies show that older users have higher demands concerning usable interface design [16] and want to understand technology rather than just use it [17]. A serious barrier is the growing complexity of applications. This complexity makes it more and more difficult to design intuitive interfaces. As Raskin points out, therefore a user interface should be self-teaching by using comprehensible explanations or instructions [18]. Such help features are one part of the research focus of the communicative usability, which deals with the question "(…) how linguistic and semiotic means may contribute to a transparent and pleasurable dialogue between humans and interfaces" [19]. Communicative usability refers to the linguistic and visual representation of components of electronic artefacts (e.g. websites, apps, tools) like content, interface and support tools (e.g. help features) and the question how the representation supports the user in achieving super- and subordinate goals [16]. Superordinate goals motivate people

to use a certain application (e.g. to take part and win in a contest). Subordinate goals (e.g. to read and understand an instruction) are seen as a prerequisite for accomplishing superordinate goals [16].

There are different types of help features, which may be offered on websites like FAQ, search function, tutorial, pop-up help, wizard or help community ([20],[21]). However, there is little knowledge about age-appropriate help features and the interrelationship of age, user type, help feature, type of website and actions to be supported.

Nevertheless there are insights, which information types need to be included in instructions to enable older users to operate modern technology: Tests conducted by van Horen et al. show that especially for older users *consequence information* (what is observed on the device) is important, because this information type allows older people to check if an action was performed correctly [22].

2.3 Video tutorials

One of many possible help features are video tutorials. In this article the term *tutorial* is used as followed: “Series of lessons, that introduce basic (and sometimes advanced) features of the system” [23]. Advantages of online tutorials are the availability from any remote location at any time, the possibility to provide many examples and that each user is able to determine the pace of perception. Disadvantages are the required provision of incentives, extensive planning for the creation and the need for frequent updates [24]. In the case of complex applications, users may face difficulties in managing both application and help system. Problems also arise, if users have to switch focus between the application and the help system and if they need to find specific information within the video [25]. Research focussing on web-based tutorials for libraries shows that they keep up with traditional face-to-face instructions ([26],[27],[28]). Harrison recommends including visuals (still graphics or animation) to support users in acquiring an accurate representations of the required steps [29]. A study comparing health video tutorials shows that users prefer segmented video tutorials that offer interactivity [30]. A study on animated demonstrations for the Hypercard programming system reveals that such tutorials were well liked. They enable users to accomplish tasks faster and more accurate than with textual instructions, but are not useful for later retention and transfer [31]. Video tutorials seem to be enjoyable and to provide visual clues how to accomplish tasks. The usage can be improved by automated play and pause [25]. The impact of video tutorials on first-time users as well as the suitability of video tutorials for websites is a less investigated issue.

3 USAGE BARRIERS OF OICS

3.1 The OIC www.einfachtelefonieren.de

In order to investigate design principles for OICs appropriate for senior experts, in the project OpenISA the community-based contest www.einfachtelefonieren.de was launched in March 2010 und and continued as innovation platform after the winner determination procedure in June 2010. The topic of the contest was to design the next generation of mobile phones for the elderly. Ideas could be submitted as text (and supplemented with pictures, videos or other documents or not) or with help of an integrated TIC. The TIC allows the users to choose a certain basic type of mobile phone and design the chosen type by selecting attributes listed on the right side of the TIC (see Fig. 1). The contest offered three types of help features: a textual tutorial (informing about the contest and functions of the OIC) as well as short instructions and a pop-up help supporting the TIC usage.

Figure 1: The TIC of the contest www.einfachtelefonieren.de

3.2 Identified barriers

The communicative usability of the OIC was evaluated with two expert-related methods – a heuristic evaluation (based on [13]) and a cognitive walkthrough [32] – as well as two series of user tests. In the first series user tests were conducted with single participants (4 female, 5 male; between 60 and 75 years old). The test persons were asked to explore the OIC and to communicate their thoughts. In the second series the co-discovery method was used [33]. Teams of two persons were asked to accomplish tasks cooperatively regarding the main functions of the OIC (3 teams of two male participants; between 60 and 75 years old). At the beginning of each test the users had to fill out a questionnaires concerning their Internet usage patterns. After each session a retrospective interview was carried out. Based on the screening questionnaires, one female and three male test persons were classified as active dynamic users, the others as passive selective users [15].

The results indicates different barriers of OIC usage. Three major problem types are relevant for the topic discussed in this paper: Users struggled to get an overview over the website; they had difficulties to understand functions like login, idea submission or the TIC and to execute them.

Part of the overview problem is that users were not able to build up a mental representation of the overall website structure and the functions the OIC provides. Thus the average orientation phase took 7:58 minutes (n=15, σ=4:23). Passive selective users were not able to identify which functions to execute first (e.g. Login) and which ones later (e.g. TIC). All users had difficulties to locate certain functions of the contest. Especially the TIC, the most important function of the OIC, could often not be located at all and thus was not used (n=6).

Due to the second problem, passive selective users struggled to understand the purpose of the main functions. Due to the third problem to process functions, passive selective users had problems to determine whether a function had the desired outcome or not. This led to premature task terminations and raised task completion times as well as error rates. The problem occurred during the submission of ideas as text and resulted in average task completion times of 10:53 minutes (n=4, σ=5:18) and 7.8 errors (n=4, σ=3.1); some test persons aborted the task (n=3). Representatives of both groups, active dynamic and passive selective users, had problems to determine the login status (n=10), which led to an average processing time of 3:41 minutes (σ=1:54).

In general, the task completion was time-consuming and resulted in high errors rates. Especially the TIC places high demands on problem-solving expertise and causes usage problems. Both active dynamic as well as passive selective participants struggled to use the TIC efficiently. The submission of ideas took on average 19:36 minutes (n=5, σ=7:19). During the submission 33.4 errors were produced on average (σ=14.7).

The results show that active dynamic Internet users have other superordinate goals than passive selective users and thus demand other forms of help. Active dynamic users want participate actively in an OIC as soon as possible and prefer task-specific help features like a short introduction to the website and help features for complex functions (like the TIC) which do not interrupt the workflow. Passive selective users want to understand the functioning of the website to use an OIC without uncertainties. They demand detailed step-by-step instructions, wherefore, how and in which sequence to use the main functions.

4 INTERACTIVE VIDEO-TUTORIALS FOR REMOVING BARRIERS IN ONLINE INNOVATION CONTESTS

4.1 The design of the video tutorial

The video tutorial was designed to overcome the three identified problem types. It explains the usage of the main functions (how to register, login, view ideas, submit ideas (with the sub parts submit textual descriptions and use the TIC), evaluate and comment on other ideas, send messages) and gives an overview of the website structure.

Recording: The video tutorial contains nine videos. The length of the videos differs from 0:27 to 3:55 minutes (overall length of the tutorial: 11:18 minutes). Each video shows a screen-capture animation of the OIC usage; the animation was recorded with Camtasia Studio. The videos were uploaded on www.Youtube.com. To ensure the (communicative) usability of the tutorial, the design focused on both interface and content.

Interface design: Each video includes a title card and a menu at the end summarizing all videos (see Fig. 2, left side). The menu items are listed in the sequence the main functions have to be used (usage path). Because there are two ways to submit ideas (as text or with the TIC), first the difference between these options is explained and afterwards a branching divides both functions.

As part of a menu spotlights with embedded links were added to the buttons in Youtube to support the choice of a certain video and enable interactivity. Thus users can access every part of the tutorial from any part. They can use the interface elements of the Youtube player to jump to certain positions in a video. In this way they can go directly to the required information [21], which provides flexibility [34]. Furthermore they are able to pause the video and to maximise the video size. The possibility to watch the video on Youtube allows users to run the tutorial concurrently to the OIC, which ensures the availability and unobtrusiveness of the help feature [34].

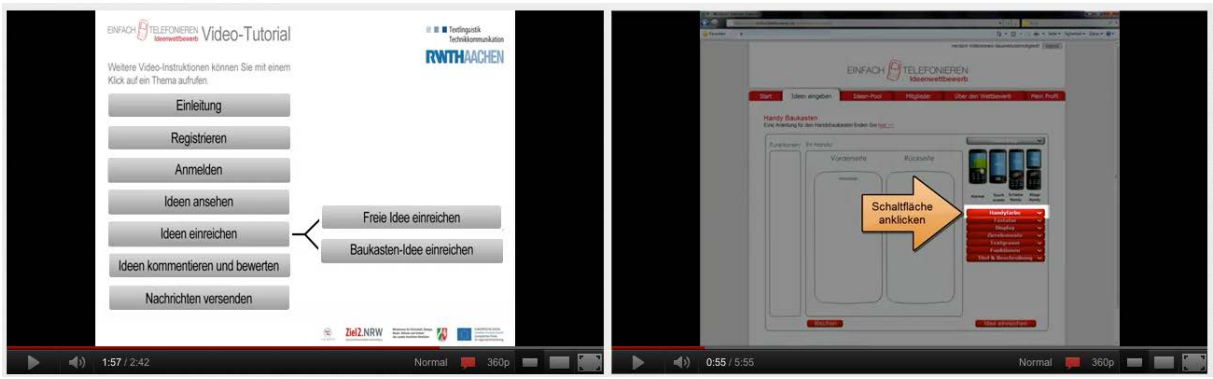

Figure 2: The menu (left) and semiotic means (right) in the video tutorial.

Content design: The instruction sequences in each video follow the same pattern: Starting on the landing page of the OIC it is explained step by step how to reach a function. If the function has been reached step-by-step instructions are given how to execute the function. Finally, *consequence information* [22] is given to enable users to check if they executed the function successfully (e.g. “You have submitted your idea successfully. It is now shown in the list of submitted ideas.”).

Instructions are provided as audio output in the videos. The audio data provide simple sentences and is read in a mid-tempo rate with clear intonations to increase understandability [35]. During an audio instruction the interactive elements mentioned are highlighted in the screen-capture of the website, as soon as they have been referred to (Fig. 2, right side). After the audio output the instruction is demonstrated as screen-capture animation. Afterwards the next instruction is given. The highlighting of interactive elements uses the following semiotic means: an arrow with short instructions points to the interactive element and shows short textual instructions concerning the operating mode (e.g. “click button”); the interactive element itself is emphasized by greying out the whole screen except for the element itself.

A high level of granularity was chosen for both, instructions and descriptions to be appropriate for first-time users [36]. The visual design and the formulation of instructions are kept consistent in each video part [34] and are provided in different modalities to reduce the cognitive load [37]. The texts for the audio instructions were successfully pretested before recording (to ensure their understandability without visual data).

4.2 The testing of the video tutorial

In task-based user tests with single participants in October 2011 the tutorial was evaluated using the OIC www.einfachtelefonieren.de (participants: 1 female, 5 male; 61 to 74 years old). The participants were classified by screening questionnaires regarding the Internet usage (3 male active dynamic; 1 female and 2 male passive selective users). They were asked to think aloud while completing tasks concerning the main functions of the OIC with the help of the interactive video tutorial. The tutorial could be used via split-screen on a second display. The users received an introduction how to the use the tutorial. Afterwards the test persons participated in retrospective interviews.

4.3 Results

4.3.1 Usage of the tutorial

All test persons used the tutorial before they began to accomplish the tasks. Four participants watched the whole tutorial, one passive selective user led out the parts concerning registration and messaging. One active dynamic user skipped the tutorial in the introduction part, because he found the video too blurry. The passive selective participants used the tutorial also if problems occurred while processing the tasks (e.g. where to find submitted ideas, how to use the TIC, how to submit an idea as textual description). In contrast, active dynamic users tended to rely on the textual help features (especially concerning the TIC) in such cases. This strategy led to problems due to a low quality of these features.

4.3.2 Benefits from the tutorial

The video tutorial supported participants to overcome the problems reported above (see chapter 3.2). Test persons who used the tutorial gained an overview of the structure and functioning of the OIC. As a consequence they needed shorter orientation phases (n=5, ∅=0:53 minutes, σ=0:29) than the users who of the first two evaluation series without tutorials (see chapter 3). All participants who used the tutorial summarized the purpose of the OIC correctly in the retrospective interviews and reported that they had no problems to find the main functions.

The test persons who used the tutorial had fewer problems to understand the purpose of functions and to evaluate, if a function had been used successfully. All users succeeded to submit ideas as texts and with the TIC. Only one active dynamic user skipped the TIC, because he found that working with a TIC is a more appropriate task for designers. The entry of ideas as texts took 6:38 minutes (n=5, σ=3:19) and was performed with an average of 0.2 errors (n=5).

While executing the tasks, passive selective users made 7.0 errors on average (n=3, σ=1.4), although the use of the tutorial prolonged the processing time to an average of 15:04 minutes (n=3, σ=5:01). The active dynamic users did not consult the tutorial during TIC usage. They completed the tasks faster (n=2; on average 12:13 minutes) but produced more errors (n=2, 14.5 errors).

The findings are comparable to those of another study, which showed that users accomplish tasks faster and more accurate with animated demonstrations than with textual instructions [31].

4.3.3 Problems of the tutorial

Some test persons had problems with the interface elements of the Youtube player because of the small size of the elements. Most users wanted to watch the tutorial scaled to full screen. The enlargement required repeated clicks on the corresponding interactive element. Furthermore most test persons had problems to distinguish between the video and the website. They often clicked on interactive elements shown in the video with the result that the video stopped.

Furthermore the menu of the tutorial raised problems. The menu was only accessible during the runtime of a video. After the video ended, a restart and a jump to the end of the video were necessary to access the menu. The test persons were not aware of this and had problems to perform the task. Some users did not remember, which parts of the video they had already watched.

4.3.4 User evaluations of the tutorial

In a retrospective interview the participants were asked to evaluate the tutorial. In the following the results are reported illustrated by quotes. Information about the participants is coded as follows: *TP* indicates *test person*, *m* indicates *male*, *f* stands for *female*, *ad* means *active dynamic, ps* stands for passive *selective*.

One question referred to the purposes of video tutorials (*What do you think, which purposes can be achieved by using video tutorials on websites?*). The test persons named different purposes. One active dynamic user summarized the purposes as follows. The statement indicates, that the test person expects the tutorial to be an introduction to the use of the OIC:

TP_1_m_ad: “It should be presented directly at the beginning to get in the right mood, so you know, what this is about. It should just include, why and wherefore you want to participate, what the main purpose is and which tasks you need to accomplish. And it should show examples, how to fulfil these tasks”.

One passive selective user considered the tutorial to be a reference for arising problems during the processing of tasks. This assumption mirrors the observed usage of the tutorial during the tests.

TP_6_w_ps: “I think that the video tutorial is good, because it is very helpful. If you do not know how to carry on, you can click it and it tells you, what you need to do.”.

Other passive selective users mentioned that a video tutorial provides information in which order the functions of an OIC have to be used. They assume that the video tutorial can also be used as an alternative to standard help features (e.g. the search function). The aspect of safety perception was also mentioned: Users got the impression, that a video tutorial enables them to use a website without uncertainties.

Another question concerned the quality of instructions. The test persons evaluated the instructions as precise and understandable. One participant described the instructions and goal descriptions as too objective; he missed an incentive at the beginning that motivates the user to watch the tutorial. Another passive selective user stated the need for stepwise instructions.

TP_5_m_ps: “And here the combination of visual and audio support is good, because the instructions are simple and clear. The instructions need to refer what the user has to do to take one step forward”.

One passive selective test person mentioned that the flow of instructions was sometimes too fast to follow; he would prefer a slower explanation. Two active dynamic participants stated, that the tutorial provided too many instructions to keep every detail in mind if the video was only watched during the orientation phase. The problem may be solved by just giving key terms, by providing only two or three examples to illustrate the goal of a function or by reducing the total length of the tutorial (two to five minutes). Passive selective users did not detect any reluctance concerning the length of the tutorial and enjoyed watching it.

Participants were asked about the perceived quality of the semiotic means used in the videos. The combination of semiotic means as support of the audio instructions (see chapter 4.1) was seen as working successfully, because the arrows show the direction where to look on the screen; the highlighting distinguishes the interactive element from other elements nearby. One test person stated that the same effect could be achieved with blinking elements. One passive selective user described the semiotic means are a suitable support of the speech output.

TP_6_w_ps: “I think it supports the speech well, because you don’t know immediately what the speaker refers to. And if the arrow pops up, you know: Ah, that is what he is talking about. This helps a lot.”

Another question concerned the quality of the audio data. The audio support was experienced as necessary and compared to a navigation system in a car. The speaker was well liked. One test person stated, that video tutorials in combination with audio output contribute to the accessibility of a website regarding older people with impaired vision.

Asked about their opinion on the splitting of the tutorial into parts, participants described this mean as essential, because in this way single topics could be reached directly and there was no need to watch the whole tutorial in case of problems during the use of the OIC. Concerning the quality of the menu test persons stated, that the menu is usable due to its big buttons and provides a logical and chronological order, how to use the main functions. One participant mentioned, that functions which can be found in the same part of the website should be clustered in the menu like it was done with the branching of idea submission.

5 RECOMMENDATIONS FOR INTERACTIVE VIDEO TUTORIALS ON WEBSITES

5.1 Interface design

Provide the video tutorial, where users expect it, especially on the landing page. If users do not recognize the help feature, they will not use it. The bigger the video, the more are older users able to follow the operations recorded on the corresponding website. Therefore ensure, that users can watch the video in full screen mode and provide the video parts in the best possible resolution. Also indicate, that it is just a video and not part of the website (e.g. by showing the text “Video tutorial” throughout the video and by clearly framing the video as help feature). Provide visual clues which interface elements of the website are referred to in the video. Take care that users are able to locate the

referred elements and to distinguish them from other elements nearby. Provide a big progress bar and big interactive elements in the video player. This should include a button to call the menu of the tutorial whenever the user needs it. Provide a logical order in the menu in which sequence the main functions need to be operated. Also indicate which parts the user already watched. If functions are located in the same part of the website, cluster them in the menu. Indicate choses between different functions of a similar use via branching in the menu.

5.2 Content design

Clearly state the purpose of the website at the beginning and give an overview of the most important functions. Also provide incentives, which motivate users to watch the tutorial and to use the website afterwards. Such incentives may include humour and support a joyful experience. Provide visual as well as audio support and choose an appropriate length of the video parts to reduce the cognitive load. Users with impaired hearing should be able to choose a textual version of the tutorial. Few examples exemplifying the intended goal of a tutorial part support the user to reproduce the given instructions. Keep namings of interactive elements consistent in all video parts.

The formulation of the instructions should aim at the superordinate goals of the users. Therefore provide simple and short instructions of a granularity not too high to enable users to reach their goals. Clearly state the purpose of a function at the beginning and explain, which benefits the user receives from using it. Instructions should explain processes stepwise and let users choose, when they are ready to proceed with the next step. Instructions should be kept simple and clear: Only obligatory operations should be explained. Pitfalls of the website (especially of complex applications like a TIC) should be mentioned in the tutorial to reduce errors and frustration. Instructions should be suitable for the experience with the website genre of the users and not presuppose technical knowledge or skills: Operations should be explained in detail if necessary and technical terms need to be explained. The tutorial parts should enable the user to process follow-up actions: At the end of each video part, the user needs to know, what to do next. This may be achieved by offering interactive elements, which take the user directly to the part of the website, where the described operations need to be executed.

6 CONCLUSION

The evaluation shows that video tutorials are an appropriate tool to give an overview over an OIC and provide information about the main functions. With the help of video tutorials error rates and premature task terminations can be reduced, nevertheless task-processing times may rise. This holds true for more complex functions (like TICs) only if the tutorial is used concurrently to such functions. Novice users need segmented step-by-step tutorials, which provide knowledge about the functioning of an OIC. More advanced users prefer help features, which do not interrupt the workflow and let them use the OIC as soon as possible. This is especially true for complex web applications like TICs. Therefore other help features may be more appropriate for experienced users. Help features for both types of users should support superordinate aims. Nevertheless, this investigation was designed as a qualitative study and further quantitative examinations are necessary to support the findings.

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