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Do personalisation and emotions affect the use of cancer-related websites?

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102

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Abstract

Purpose – The purpose of this paper is to explore the type of personalisation services satisfying the needs of cancer websites' target users, and the influence of their emotional states on website usage intentions.

Design/methodology/approach – Three data collection methods were employed. Survey questionnaires were distributed to online health users. Interviews with representatives of the cancer-affected population further explored emotions as stimuli for online cancer-related activities. Finally, availability of personalisation features was evaluated on existing health websites in Bosnia and Herzegovina and the UK.

Findings – A clear preference emerged for personalisation on cancer-related websites. There are specific personalisation features the cancer-affected population desires. Interestingly, certain emotions were found to stimulate visits to health websites.

Research limitations/implications – Fighting cancer implies constant support, including from cancer-related websites. It is thus vital to understand the required personalisation, stemming from target users' actual needs, including the neglected user characteristics, as are emotions for cancer-affected people. This supports emotion-based personalisation.

Originality/value – The paper focusses on the cancer-affected population, and developing a comprehensive understanding of their personalisation needs in online health services. It further shows which emotions influence intentions to use cancer websites. The three concepts combined have not yet been studied, to the best of the authors' knowledge.

Keywords Cancer, Emotions, Personalization, Health websites, Online health information

Paper type Research paper

Introduction

Health-related web-based services are numerous (Topaloglu *et al.*, 2013), but raise issues of low usability, content presentation and content usefulness (Kushniruk, 2015). To improve “website stickiness” (Benlian, 2015), personalisation can be introduced (Zaied *et al.*, 2015; Topaloglu *et al.*, 2013). However, research on a systematic application of personalisation features to health websites is lacking (Cortese and Lustria, 2012; Fernandez-Luque *et al.*, 2011; Alpay *et al.*, 2009). This study analyses, therefore, the availability of personalisation on health websites, and personalisation needs of a specific target user group – people affected by cancer, in order to improve online cancer support.

Cancer is the leading cause of death worldwide (World Health Organization, 2014). The 33 million sufferers (International Agency for Research on Cancer, 2014) depend extensively on support from family and friends (American Cancer Society, 2014b), from diagnosis onwards (American Cancer Society, 2014a). Cancer particularly affects the emotional states (American Cancer Society, 2016; DeNoon, 2007). Hence, emotions of the cancer-affected population are studied here, and introducing prospects of emotion-responsive online health systems.

Emotions, as essential traits of human beings, influence actions and behaviour (Tomkins Institute, 2014). However, research connecting emotions and personalisation is limited. Facebook recently introduced a feature for emotional response to content (Zuckerberg, 2015). Other recent studies explored the relation between personalisation and emotions in: e-shopping (Pappas *et al.*, 2014), movie recommendations (Berkovsky, 2015), tourism recommendations (Aksenov *et al.*, 2014) and e-learning (Conati and Maclaren, 2009).



Nevertheless, apart from a follow-up study to this research (Hadzidedic Bazdarevic and Cristea, 2015a), to the best of the authors' knowledge, emotions have not been studied in relation to personalised cancer websites.

There are, thus, several contributions of this study. The role of emotions in using online services for cancer-information search is identified. A comprehensive set of personalisation services for cancer-related website is specified, as preferred by target users. Guidelines for a systematic approach to personalisation adoption on health websites worldwide are provided, based on evaluations conducted in two countries differing significantly in healthcare opportunities – Bosnia and Herzegovina (B&H) and the UK. Additionally shown is the scarcity of research connecting emotions and online personalisation, especially applied to health. If emotions stimulate online health services usage, implications emerge for incorporating emotions into personalisation algorithms for health websites. The paper, therefore, proposes the direction of the research and implementation in this area – towards emotion-aware personalised cancer-related websites.

This research also has broader implications for online information. It encompasses cross-disciplinary research in: human-computer interaction, behavioural and usability research, and the use of web content. Findings on user preferences for personalisation features and how emotions influence information usage are widely applicable. Interpreting the impact of emotions on search patterns can lead to the provision of more relevant and timely online information, adapted to users' emotional states.

Related research

The amount and variety of online health information appeals to cancer-affected people, by easing their physical and psychological ordeal (Xiao *et al.*, 2014). However, health-consumers need to filter this wealth of often irrelevant (Alpay *et al.*, 2009) and incomprehensible (Jucks and Bromme, 2007) content themselves, which is, possibly, overwhelming (Yocco, 2015). Disregarding the specific needs of cancer-affected users can trigger ending health-website visits. Personalisation could help by tailoring information to user needs.

Online personalisation

A survey of internet users suggests that 80 per cent desire personalised services (Kobsa, 2007), and are even specific about preferred features (eMarketer, 2013). Two main approaches are applied to personalisation (Frias-Martinez *et al.*, 2009): adaptive systems automatically adapt system services to the user model (Brusilovsky, 1996); whereas adaptable systems rely on manual user tuning (Frias-Martinez *et al.*, 2009). Research suggests that the user-system control process influences users' behavioural intentions (Alotaibi, 2013). Thus, this paper also analyses the target population's preference for adaptivity vs adaptability on cancer-related websites.

Personalised services can guide user behaviour, e.g. in health systems, by educating patients about a medical regime (Masthoff *et al.*, 2014). Personalisation is a major usability and functionality factor, determining users' preference for e-health websites (Topaloglu *et al.*, 2013). However, adoption of personalisation technologies in online health services continues to be slow (Sillence *et al.*, 2008; National Information Board, 2014).

A pre-investigation conducted for this paper and the report by Fernandez-Luque *et al.* (2011) show that there are few existing global health websites, primarily US-based, offering some personalisation, e.g.: TrialX (trialx.com/), PatientsLikeMe (www.patientslikeme.com/), Healthy Harlem (hcz.org/our-programs/healthy-harlem/), WebMD (www.webmd.com/), MedlinePlus (www.nlm.nih.gov/medlineplus/) and EsTuDiabetes.org (www.estudiabetes.org/). Previous studies explored personalisation on health websites from specific perspectives, e.g.: defining personalisation requirements for Dutch senior citizens (Alpay *et al.*, 2009), introducing personalised educational material

on stroke-precaution for elderly in Taiwan (Hwang, 2011), analysing personalised educational health content for adolescents in the USA (Cortese and Lustria, 2012) and, more recently, exploring the effect of personalised feedback on physical activities among adults from seven European countries (Marsaux *et al.*, 2015). Nevertheless, the mentioned health websites and studies do not focus on cancer-affected people, and miss a wide range of personalisation features. This paper, on the other hand, takes a holistic approach in investigating the availability of a comprehensive set of personalisation-related services on cancer-focussed websites.

Whilst web-personalisation services introduced elsewhere may be applicable to cancer-related websites, it is important to evaluate this presumption, as the success of personalisation depends on catering to unique target users' needs (Riecken, 2000). It is, thus, vital to introduce various personalisation features to the cancer-affected population and obtain the feedback of these target users. Furthermore, data types commonly used in online personalisation include gender, age and location (Germanakos *et al.*, 2009). However, while users do not necessarily perceive this data as sensitive, they are, for example, apprehensive about the fairness of gender-based online personalisation (Lange and Hans, 2016). In fact, research implies that a complete user profile, encompassing also emotional states (Germanakos *et al.*, 2009), is essential for online personalisation.

Emotions

The cancer-affected population is special, as cancer takes hold of a person's life over a long period of time (Cancer Research UK, n.d.), affecting patients and their support network (American Cancer Society, 2014b). Cancer sufferers are prone to negative emotions, e.g. distress, depression, anxiety and loneliness (Shaw *et al.*, 2000). It is, therefore, expected that emotions, as valenced reactions to events, agents or objects (Ortony, 1990), play an important role in the needs and behaviour of cancer-website users.

The basic emotions' theory, developed by Ekman (1992), was used here to identify emotions stimulating a visit to a cancer-related website. One of the differentiating factors of this study is considering emotions as a basis for behavioural intentions, and hence recommending the adoption of emotion-based personalisation on cancer websites, which, to the researchers' knowledge, has not yet been applied.

Affective computing has been given substantial attention recently (Picard and Picard, 1997) in human-computer interaction research (Park *et al.*, 2013). Computer systems recognising affective states can respond to users' changeable moods, provide encouragement and comfort, thus be perceived as more effective and natural (Khan *et al.*, 2013). Certain emotions were studied in specific contexts, e.g.: affective-priming in visual judgment (Harrison *et al.*, 2012), emotion detection in textual content (Balahur *et al.*, 2012), emotional intelligence based on recognition of fear, surprise and stress (Jang *et al.*, 2012). In online health, studies are rare: one addressed how sentiment is affected by community support (Zhao *et al.*, 2014); another claimed that online information search behaviour involves "strong emotions including fear, anxiety and hope" (Xiao *et al.*, 2014), without, however, specifically studying emotions as an impact factor.

In personalised systems, emotions were researched to an extent in online shopping (Pappas *et al.*, 2013), group decision support systems (Santos *et al.*, 2011), e-commerce (Germanakos *et al.*, 2009), online games (Blom *et al.*, 2014), online entertainment (Berkovsky, 2015) and recommendation agents (Aksenov *et al.*, 2014). For example, in e-shopping, it was shown that personalisation features and positive emotions positively affect purchase intentions (Pappas *et al.*, 2014).

Therefore, there are several arguments for incorporating emotions into adaptive systems, for an improved personalisation experience (Li *et al.*, 2007). However, the influence of emotions on user behaviour and use of cancer-focussed websites is understudied.

Additionally, research on implications of the relation between emotional states and visits to health websites, towards emotion-based personalisation, is currently not available, to the best of the researchers' knowledge. This paper further contributes in these areas.

Study design

This is an empirical study on the use of web-based health services by cancer-affected people. It focusses on the needs for and the adoption rate of personalisation on cancer websites, studying how emotions affect the use of these services, towards introducing emotion-based personalisation. Three research questions guided the research:

- RQ1.* Do people affected by cancer have personalisation needs on health websites and, if so, which personalisation approach do they prefer?
- RQ2.* Are personalisation features available on existing health websites and, if so, which?
- RQ3.* Can emotions predict internet usage for cancer information seeking?

The survey questions addressing the research questions cover:

- User personalisation needs (*RQ1*). In total, 25 personalisation features adopted from comprehensive studies on adaptive hypermedia (Brusilovsky, 1996; Brusilovsky, 2001; Kobsa *et al.*, 2001) and personalisation in e-commerce (Koutsabasis *et al.*, 2008) were evaluated on three criteria: perceived availability, user preference for specific features and personalisation approach.
- Emotions as stimuli for health-website use (*RQ3*). In total, 13 emotions were measured on a five-point Likert scale (1 – most likely; 5 – most unlikely), from basic emotions' taxonomy (Ekman, 1992) – see Table III.

RQ3 was further clarified by interviewing a group of people directly and indirectly affected by cancer. *RQ2* was answered by inspecting personalisation features' availability on selected health websites from B&H and the UK, countries significantly differing in online health service quality.

Sampling

The sample of cancer-affected people was drawn from B&H. Additionally, a part of this study was conducted in the UK, a country almost at the other end of the scale in terms of the offered health services. To thoroughly explore the possibilities of personalising online health services, it was deemed necessary to conduct the study in conditions not tampered by previous attempts of personalisation. B&H was chosen since the existing health websites offer no personalisation features. B&H is also interesting in this context as its public health services, after the 1992-1995 war, are still characterised by low quality of service, low efficiency and unequal healthcare access (Federal Ministry of Health B&H, 2012).

According to the 2012 statistics, in the population of 3.7 million, there were 9,911 new cancer cases in B&H (International Agency for Research on Cancer, 2012). Thus, the approximate size of the target B&H population (directly and indirectly cancer-affected people) is 96,466; i.e., 9,911 cancer sufferers, with at least three family members and two close friends, and a conservative estimate that 1 per cent of the overall B&H population is interested in cancer. The estimate was based on the data provided by Association Hope (U.G. Nada) from Jajce in B&H (population: 22,000), with 350 members (130 cancer sufferers). The remaining members of the association (approximately 1 per cent of Jajce's population) have reportedly joined for informative purposes. For the target population (confidence level 95 per cent, response distribution 50 per cent, error margin 8 per cent), the recommended sample size is 150 (Raosoft, 2004).

Following similar online health information studies (Kim, 2010; Mu *et al.*, 2010), convenience sampling was employed, combined with purposive sampling. Such sampling is used when employing probability methods is difficult, due to inaccessibility, unwillingness or inability of the target population to participate; barriers existing for this study. The two sampling methods aim at populations accessible to the researchers (convenience), and representative of the target population (purposive), e.g. cancer associations' members – encompassing cancer sufferers, caretakers (family and friends) and cancer associations' supporters. From around 20 active cancer associations in B&H in 2014, 12 had accessible contact information and were invited to either distribute or advertise (on Facebook or their website) the questionnaire. Four associations agreed to participate.

Additionally, a combination of convenience and respondent-driven sampling was used. The survey was advertised via social networks (primarily Facebook) to various B&H contacts, predominantly in the 25-35 age groups. Other emotion-related studies also employed social networks (Mahmoud *et al.*, 2012). This enabled reaching people indirectly affected by, or interested in cancer, who are computer literate, and use the internet for information search – overall, a younger segment of the population.

Three methods of data collection were utilised: survey questionnaire, interviews with target users and evaluation of existing health websites.

Survey questionnaire

Data were gathered for a period of 1.5 months in Spring 2014, using both online- and paper-based questionnaires. The paper questionnaire was distributed to: "Biser" Association for breast cancer (where 25 members participated), and "Srce" Association for children with cancer (ten members participated). The online questionnaire, developed in Google forms, was advertised on Facebook pages of: PORT Association for people affected by malignant diseases (with around 260 Facebook followers); UNA Association for breast cancer sufferers (500 followers); the first author's Facebook page (270 followers). All participants were encouraged to promote the study among their own contacts.

Interview

A follow-up focus-interview with seven participants was conducted in two B&H cities in March 2016. The aim was to clarify the effect of emotional state when informing oneself about cancer. Two men and five women were interviewed. This gender distribution is in line with the situation in B&H, where the male population affected by cancer is less vocal. After gathering background information, participants were asked two open-ended questions: "Do you use the internet to search for cancer information?" and "Do emotions stimulate your search for cancer information online, and which are these?"

Health websites' evaluation

Adopting the approach from a study assessing the quality of Spanish hospital websites (Garcia-Lacalle *et al.*, 2011), 15 health websites were manually evaluated, during Spring 2014, on the availability of the 25 personalisation features mentioned in the Study design section (1 was assigned to an available feature; 0 otherwise). The selection of health websites was based on search engine rankings and their reputation in the respective countries. B&H websites evaluated were PORT (www.port.org.ba), Renesansa (www.renesansa.com.ba), Srce (srcezdajecu.ba), Biser (www.biser.ba), Zagrljaj (www.zagrljaj-mo.org), Novi pogled (www.novi-pogled.org), cancer forum (www.klix.ba/forum/karcinom-i-borba-sa-njim-t26209.html) and BHzdravlje (www.bhzdravlje.ba). UK websites were Cancer Research UK (www.cancerresearchuk.org), Macmillan Cancer Support (www.macmillan.org.uk), Action

Cancer (www.actioncancer.org), Maggie's Cancer Caring Centres (www.maggiescentres.org), Marie Curie Cancer Care (www.mariecurie.org.uk), Prostate Cancer UK (prostatecanceruk.org) and Breast cancer care (www.breastcancercare.org.uk).

Analysis and results

Due to the survey distribution methods used (particularly respondent-driven sampling), it was difficult to track the exact number of people reached and the response provenance. The minimum number of people reached was 1,365 (see Survey questionnaire section). The total number of responses was 123, close to the desired sample size of 150. Out of these responses, 21 paper questionnaires were collected, the remaining were online questionnaire responses.

The well-known IBM (2012) SPSS v20 tool was used for analysis. Descriptive quantitative research prevailed; additionally, inferential tests (Cronbach's α , correlations, comparisons and regression) explored the impact of emotions on health-website usage.

Participant demographic data are summarised in Table I. The majority of participants were not cancer patients themselves, but were indirectly affected, reflecting the actual state in the population. Figure 1 shows the distribution of cancer types. Respondents could have reported all the cancer types they or their loved ones suffered from. Breast and lung cancer prevailed. All the male participants claimed to use the internet for cancer/health information search; however, correlation with gender was not significant ($\chi^2(1) = 1.3, p = 0.257$).

Variable, valid responses (<i>n</i>)	%
<i>Gender, n = 123</i>	
Female	88.6
Male	11.4
<i>How cancer has affected the respondent?, n = 123</i>	
I have lost a family member/friend to cancer	26.0
My family member has/had cancer	22.8
I am interested in cancer information. I or people close to me are not affected by cancer	17.1
My friend has/had cancer	8.1
I had cancer before. I am cured now	5.7
I, and people close to me, have/had cancer	4.9
I am a cancer patient	4.9
Several people close to me have/had/or died from cancer	3.3
None above	5.7
I am a caregiver of cancer patient(s)	1.6

Table I. Summary statistics of demographic data

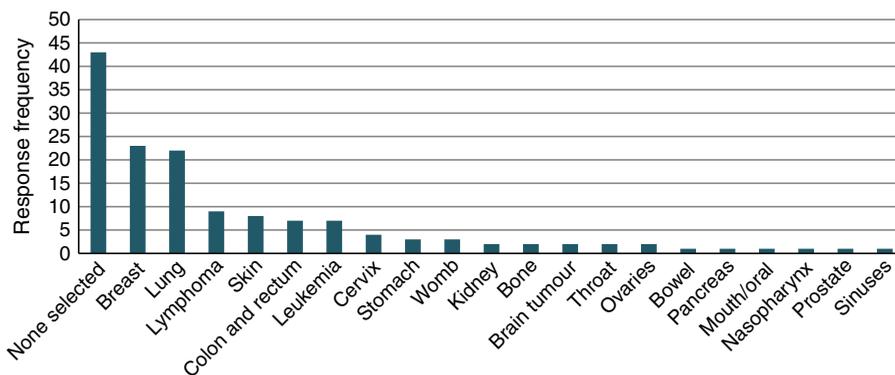


Figure 1. Frequency of different types of cancer

Personalisation needs on health websites (RQ1)

The majority of respondents stated that health websites they used were not personalised (62 per cent), but that they would like personalisation (68.7 per cent). Figure 2 presents the personalisation features which are desirable (green bars) or not (red bars) by users who have used personalised websites (dark bars) or not (light bars).

Respondents who experienced personalised health websites favoured (Figure 2): content in native language, search outcomes ordering, adaptive navigation (AN) – links sorting, variety of content, and user profile customisation. Respondents who had not used health websites with personalisation but desired it, preferred: AN (direct guidance, link annotation and sorting) and recommendations (of content and other similar users). The least desirable features for both groups were hiding website links, possibly because of worrying of missing something important. Potential dislike for personalisation was also shown, in descending order, for: greeting with user's name, removing links, website ads matched to user profile and disabling website links.

Participants were additionally asked about their preference between adaptivity and adaptability for each personalisation feature (Table II). Respondents marginally preferred (52.8 per cent) customising features themselves (adaptability), specifically: user profile customisation, content in native language, and removing and hiding website links. Whereas adaptivity was popular for: text fonts, website layout, colour scheme, and links sorting.

Availability of personalisation features on B&H and UK health websites (RQ2)

Personalisation features were grouped into six categories, for a comparison between B&H and the UK (Figure 3). The percentage availability for the category, e.g. AN (9.4 per cent), was found by averaging the percentages of all B&H websites having AN features. The findings show that simple personalisation features exist, while major features (AN, presentation) are mostly lacking.

The categories of features that prevail on both B&H and UK websites are support for customer search and personalisation infrastructure. UK websites more frequently offer user profile information, and have more advanced personalisation features, including: recommendations (e.g. content/item recommendations), AN (e.g. guidance) and content adaptation (e.g. sorting fragments). Nevertheless, even on UK websites, personalisation is normally based on content popularity and recency, not on user profiles, resulting in same recommendations to all users. Implementation of purely adaptive, personalised features is significantly less frequent. Overall, while the findings clearly show B&H lagging behind the UK, actual personalisation features are rare on health websites in both countries.

Cronbach's α of 0.834 (> 0.7 cut-off point) confirmed internal consistency for the 13 studied emotions. Results (Table III) showed that fear and interest are likely to stimulate health-website use. Additionally, sadness and surprise may play a role (based on mode values). A one-sample χ^2 test ($p \leq 0.003$) and Wilcoxon signed rank test (emotions' median value is different than neutral; $p \leq 0.008$) confirm statistical significance for results of all emotions, apart from awe ($p > 0.05$).

The logistic regression model, predicting internet use for cancer/health information search based on the likelihood that basic emotions stimulate a health-website visit (average of the 13 surveyed emotions), was statistically significant ($\chi^2 = 7.8$, $p < 0.01$; Nagelkerke $R^2 = 0.184$). Therefore, emotions (very) likely to stimulate visits to health websites have a higher probability in predicting internet usage for cancer-information search. A Mann-Whitney U test indicated that respondents who still do not use the internet for cancer-information search (but would consider doing so) are less likely stimulated by anger ($U = 94.5$, $p = 0.001$), shame ($U = 157.5$, $p = 0.011$) and guilt ($U = 140.5$, $p = 0.007$), than are those who already use the internet.

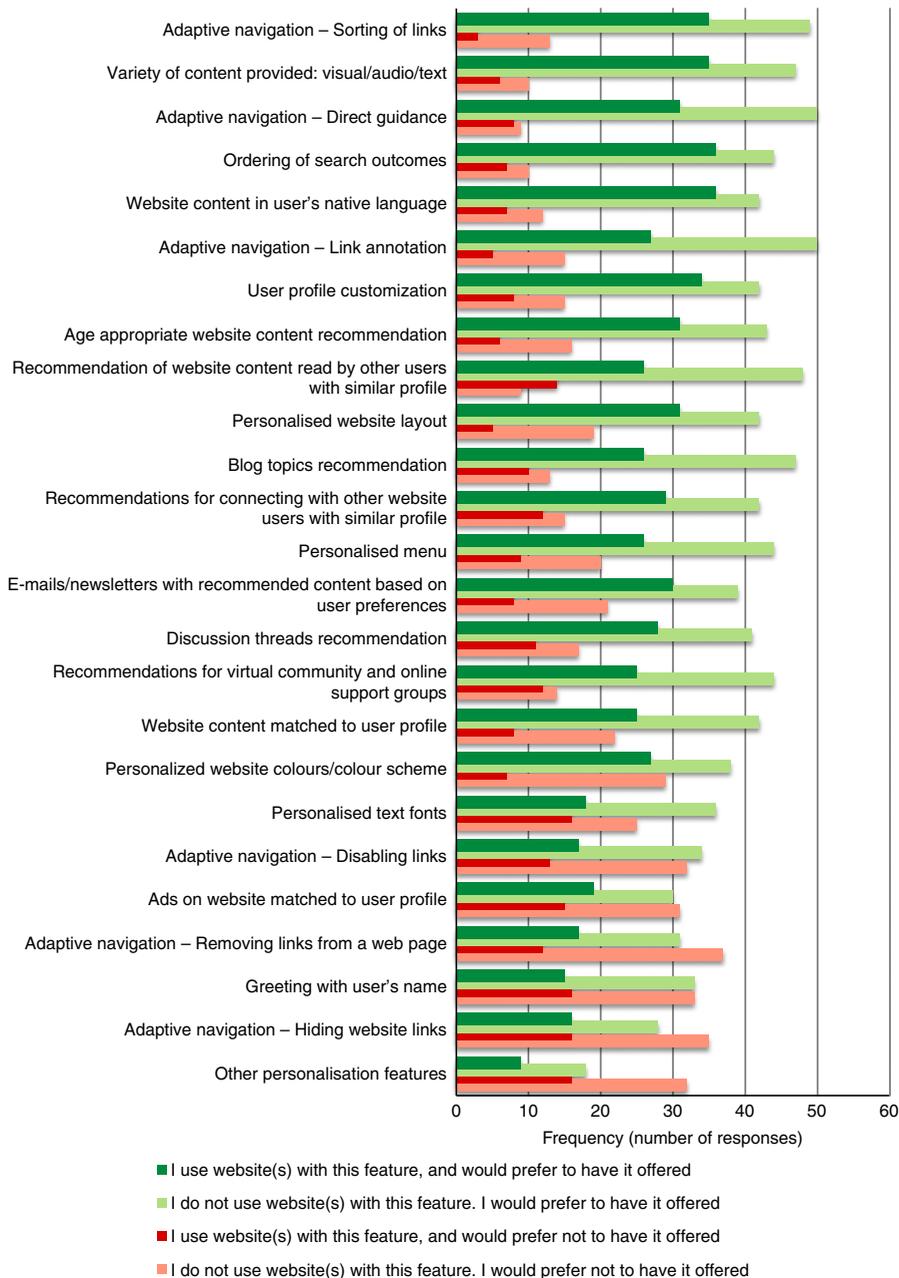


Figure 2. Availability of and preference for personalisation features on health websites

To support the emotion-related findings, representatives of the target population from different B&H cities were interviewed. Manual qualitative analysis was applied to the responses. The interviewees were equally distributed in the age groups: 30-35, 40-45 and 60-65. Five women participated: a cancer association's president – cancer survivor (IntA), a

psychologist working with children cancer patients (IntB), two mothers of children with leukaemia (IntC and IntD) and a daughter of an ovarian cancer-patient (IntE). Male participants were a father to one of the children (IntF) and a young cancer survivor (IntG).

The majority of the interviewees did not perceive specific emotions influenced their cancer-information search. IntD stated that there was no relation between the information sought and her emotional state. IntG, however, claimed that “the psychological state has great influence on the ill person”, affecting the desire to fight cancer – including by informing oneself.

Table II.
Preferred personalisation approach

Adaptability vs adaptivity	Percentage
User is enabled to choose whether or not to use this feature	52.8
System automatically chooses for the user	47.2
Total	100.0

Figure 3.
Categories of personalisation features available on B&H and UK websites

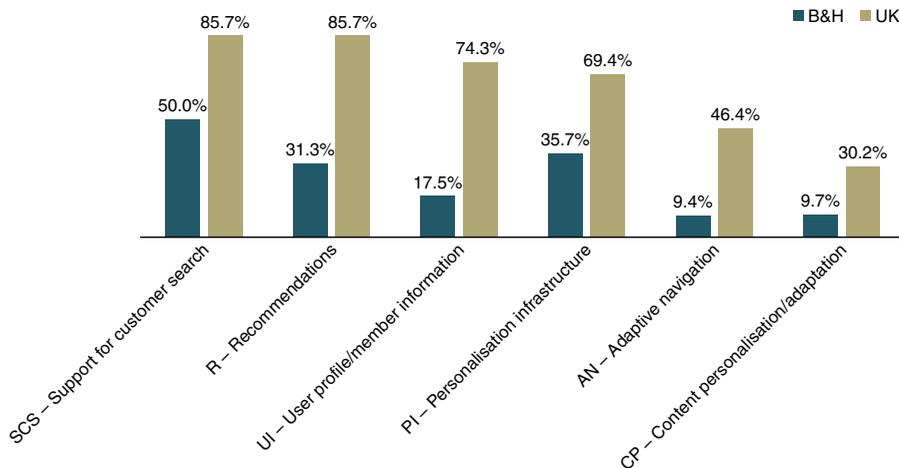


Table III.
Likelihood that emotions stimulate health-website visit

Emotion	Mean	Likelihood Mode	SD
Interest	1.73	1.0	0.96
Fear	1.99	1.0	1.33
Sadness	2.46	2.0	1.33
Surprise	2.61	2.0	1.31
Awe	3.08	2.0	1.41
Anger	3.38	5.0	1.39
Embarrassment	3.54	5.0	1.42
Guilt	3.59	5.0	1.35
Enjoyment	3.93	5.0	1.27
Shame	3.94	5.0	1.29
Happiness	3.96	5.0	1.3
Contempt	4.07	5.0	1.13
Disgust	4.2	5.0	1.16

Probing further, several patterns emerged, coinciding with the five stages of grief (Elisabeth Kubler-Ross Foundation, 2016). First, after being diagnosed cancer, interviewees predominantly reported experiencing confusion and fear. These emotions have different effects on people, as the psychologist – IntB – explained. IntD agreed that different people have different ways of dealing with cancer. For some, experiencing fear meant completely guarding themselves. IntC disliked being given detailed information, for fear of the unknown. However, fear stimulates information seeking in others. IntD needed social support and personal stories of other parents in similar situations, to gain hope.

Hope and the wish to learn more are common driving forces in the final stage acceptance. The “will for life” stimulated IntA’s cancer-awareness. Interest (in finding something new), will and hope, stimulated IntE to find various cancer-related information. IntD similarly was “hungry for information”, spending hours searching the internet; surprise, interest and hope stimulating her.

Discussion

The literature review (Online personalisation subsection) showed that personalisation services are rare on health websites. Furthermore, research on how emotions affect online health-information search is lacking (Emotions subsection). However, affective computing research is growing in popularity, with an increasing number of studies looking into emotion-based personalisation. Hence, to connect these domains, this paper aimed to investigate, first, whether the target group of health-website users – cancer-affected people – prefer to be offered personalised services, and which specific features they desire. Second, to understand whether target users’ emotions induce them to use cancer websites. Understanding the influence of these two factors – personalisation and emotions – on health-website use, provides implications for applying emotion-based personalisation to online cancer-related services. Thus, a foundation for future studies in this area is established. The results of this study are based on the cancer-affected population from B&H, which, as explained in subsection Sampling, has implications for cancer-website personalisation beyond a single country.

The findings indicated that B&H population is mainly affected by breast and lung cancer, which are in fact two of the four most common cancer types in B&H (International Agency for Research on Cancer, 2012). It was further established that having someone close diagnosed with cancer is the main reason to search for health information online. This coincides with previous results that showed that the majority of users of a B&H cancer forum joined to support their cancer-affected family member or friend (Hadzidedic Bazdarevic and Cristea, 2015b).

The latter source also indicated that women are predominant participants in such online cancer-oriented communities in B&H. Moreover, B&H cancer associations mainly focus on women in the cancer-affected population. Even though this paper’s results showed that men use the internet for health information, and are an important segment of the targeted population, female participants dominated the study. Given the sample’s bias towards women, care should be taken in applying the findings to the services exclusively targeting the male population, in which case further research is needed. Nevertheless, lower participation of men in online health research is not uncommon (e.g. 37 per cent of male participants in Xiao *et al.*, 2014). This study’s findings have implications for providers of cancer-related online services aimed at both genders, where women are expected to be predominant users, based on the common trends.

Gender was repeatedly found to influence online health information search (Morgan *et al.*, 2015), women being more inclined to it (Xiao *et al.*, 2014). Internet is the first resource for health information for both men and women, however men have a higher tendency towards personal interactions to find additional information (Hallyburton and Evarts, 2014). Introducing personalisation is seen as a foundation for gender equalisation in online health

seeking (Hallyburton and Evarts, 2014). In online personalisation, however, gender-based content tailoring has been questioned in some areas (Lange and Hans, 2016). In this study's context, there are only a few cancer types which are gender specific, and the majority of cancer content is applicable across genders; thus personalisation based on comprehensive user profiles, as argued here, is more appropriate for cancer websites.

With regard to emotions, research does indicate there are gender differences in processing emotions (Spalek *et al.*, 2015), in particular negative emotions (McLean and Anderson, 2009), which women show more often in stressful daily events (Matud, 2004; Levenson *et al.*, 1994), as is fighting cancer. Women also tend to be more emotionally stimulated by (negative) emotional image content (Spalek *et al.*, 2015). However, it was seen that emotional appraisal is not influenced by gender (Spalek *et al.*, 2015). Hence, there should be no significant differences between genders in their emotional reactions to the online cancer content they interact with.

As predicted, personalisation was found to be a motivator for health-website use. Importantly, the majority of the target users claimed they had not experienced personalisation on health websites, confirming the lack of (adequate) personalised services in this domain. Moreover, respondents were divided about where the control should be: with them or the system, which coincides with findings in, e.g. e-learning studies (Alotaibi, 2013). Thus, on health websites, adaptivity and adaptability should co-exist and complement one-another. To attract and retain users, health-website providers should introduce personalisation based on users' needs, instead of "one-size-fits-all" solutions.

The adoption of personalisation on health websites, specifically cancer-related ones, is slow worldwide. This study showed that the full potential of personalisation has not been explored in either B&H or the UK. An in-depth interview with the owner of one of the B&H health websites – PORT.org.ba – revealed reasons for this; the main issue being the lack of financial resources. While business models for online services usually rely on acquiring earnings through ads, this is not a common practice on health portals. Moreover, caution has to be exercised in exploring the type of personalisation features responding to the target users' needs and preference, instead of assuming that approaches used on other online services are directly applicable.

This work is, therefore, valuable, as it identifies three main clusters of personalisation features related to health websites:

- (1) currently unavailable features: link generation, stretch-text, webpage layout partitioning/zooming, template fitting, webpage rearrangement and website colour scheme customisation;
- (2) features somewhat lacking: content/item reviews, content presentation control, AN, personal guide, inserting/removing fragments, content style customisation, dimming fragments, zoom scale, menu appearance rearrangement; and
- (3) available features: community-type services, and features related to information quality, relevance and comprehensiveness.

Specifically, features lacking relate to personalised content and services. As explained in the Related research section, it is not the amount of information that makes online health services usable, but being able to quickly find the content reflecting the complete set of user characteristics. This is best achieved by introducing comprehensive personalisation services, encompassing content, its presentation, as well as layout and navigation of the health-website.

Target users desire features providing a variety of understandable information, directing them to relevant content, but also enabling control over how personal information is used and how website content is presented. The results of the health websites' evaluation show,

however, that these features are scarce. Personalisation features disliked by the target users, e.g. removing, hiding and disabling links, show their concern of missing out information, and their rejection of advertising. Users like direct guidance, but dislike personalised text fonts. Presumably users consider such features on cancer-related websites not as important as content-related personalisation. The same presumption is applicable to the greeting with a user's name, the latter also indicating a preference for anonymity and privacy.

To increase the results' reliability, triangulation was used – health websites evaluation and the survey of user perceptions. Overall, personalisation features related to content – presentation, recommendation, easier and faster retrieval of relevant (cancer-related) information – are the ones users are most interested in; all features which are currently lacking. This should incentivise cancer-related website providers to adopt more focussed personalisation services.

Triangulation – interview data confirming the survey responses – was also used to obtain emotions-related findings. It was shown that specific emotions – fear, interest, sadness and surprise – stimulate health-website visits. Cancer-affected people experience fear, and surprise, of what is still the disease with the highest mortality rates. Fear and sadness of what they or their beloved one could be, or are, suffering from, leads them to seek cancer-related information, triggering surprise and interest in finding out about treatments, other people's experience or alternative diagnosis.

Furthermore, the findings, not shown here due to lack of space, indicated one statistically significant (applying Bonferroni's corrections) and five possible associations (without corrections): enjoyment with gender, interest with education level, happiness with gender and education level, surprise with breast cancer and awe stimulating cancer treatment information seeking. Thus, emotions should be further studied in this context, to better estimate their impact on health-website use.

To conclude, emotions play a role in the behaviour of cancer-affected people, who appreciate specific types of personalisation. A post-study (Hadzidedic Bazdarevic and Cristea, 2015a) was conducted, to further delve into the association between emotions and online cancer information. A cancer-focussed website (for and in collaboration with the B&H cancer association PORT) was developed based on this paper's findings about the personalisation features desired by the target users. The post-study's experiment with the cancer website implied that users who experience interest-like emotions pre-website-use are more likely to perceive that website personalisation services meet their needs. Moreover, it was shown that post-usage emotions (interest and excitement), i.e., emotions evoked by the interaction with the personalised cancer website, increase users' intentions to reuse the website.

Implications and future work

Importantly for website providers, this study first showed that emotions stimulate health-website visits. Second, cancer-affected people find personalisation on health websites desirable. Thus, there is potential to integrate the two concepts. Providers should recognise that, if emotions motivate the use (and reuse) of (personalised) health websites, they should cater to user emotions, by providing emotion-based content and feature personalisation. This can increase user interest and trust in the website, and thus the likelihood of future visits.

Practical implications can further be expanded into propositions for adaptation/personalisation rules (derived from the previously mentioned associations omitted due to lack of space) for cancer websites in the form of: IF emotion A is experienced THEN highlight/guide to feature X, ELSE hide feature X. For example:

- IF a person is happy or interested at log-in, THEN recommend them content preferred by users with lower education levels (highlighting links or generating content recommendations).

This study also has theoretical implications. Emotions shape actions and behaviour of human beings, and can potentially influence users' perception about and requirements from the systems they interact with. This is specifically important in online cancer-related services, as one of the main target users' characteristics are fluctuations in emotional states. Thus, there is potential in developing emotion-personalisation services and algorithms specifically applicable to cancer-related services. Generally, there is a need to further understand the impact of user emotional states on online information usage. This study confirms that personalisation of online information and services is not just desirable in e-commerce, e-learning and online entertainment domains, but in general.

Limitations

Even though part of this study was based on a comparison between two countries – B&H and the UK, the sample of cancer-affected people was drawn only from B&H. Therefore, to generalise the results, data from other countries are needed.

The non-probability sampling methods used are prone to bias, and may have resulted in the overrepresentation of female respondents. Given that the existing cancer association in B&H focus on supporting women cancer sufferers, and that distribution to Facebook contacts was mainly to females, the study had a slightly biased, homogeneous sample. However, prior studies have shown that women are generally more likely to seek health-information online (Fox and Duggan, 2013). In addition, relatively few cancer sufferers were part of the sample; thus, indirectly affected people may have been overrepresented. Nevertheless, cancer incidence rates and this study's considerations for sample calculations (see Sampling subsection) show that such proportions can be expected in studies involving people directly and indirectly affected by cancer.

The emotions-related results confirm that emotions influence cancer-affected population's behaviour, including their use of (personalised) cancer websites. However, the relation between emotions and personalisation, as well as the concept of emotion-based personalisation, on health websites needs to be further researched.

Conclusion

This paper focussed on investigating the existing state and use of web-based cancer-related service and information in B&H and the UK. The findings should be used as guidelines for providers of health websites in B&H and other European countries, and may inform wider communities. They present specific emotions affecting health-website use and comprehensive recommendations of currently unavailable personalisation features, required by cancer-affected people.

Importantly, this paper's findings show that emotions can predict internet usage for cancer information seeking. The study gives a valid argument to take emotions into consideration in health-website usage, and potentially in online information usage in general. Further studies are needed to show how emotional states can be used to personalise health content and services, as well as other online content types.

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