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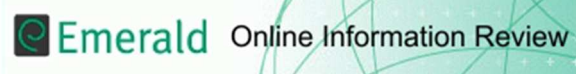
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Do personalisation and emotions affect the use of cancer-related websites?

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Keywords:	health websites, personalisation, emotions, cancer, online health information

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Abstract:*Purpose*

This paper explores 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

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 B&H 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 and practical 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 focuses 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: health websites, personalisation, emotions, cancer, online health information

Article Classification: 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); 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 contribution 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 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-

1
2
3 consumers need to filter this wealth of often irrelevant (Alpay et al., 2009) and
4 incomprehensible (Jucks and Bromme, 2007) content themselves, which is, possibly,
5 overwhelming (Yocco, 2015). Disregarding the specific needs of cancer-affected users can
6 trigger ending health-website visits. *Personalisation* could help by tailoring information to
7 user needs.
8

10 *Online personalisation*

11
12 A survey of Internet users suggests that 80% desire personalised services (Kobsa, 2007), and
13 are even specific about preferred features (eMarketer, 2013). Two main approaches are
14 applied to personalisation (Frias-Martinez et al., 2009): *adaptive* systems automatically adapt
15 system services to the user model (Brusilovsky, 1996); whereas *adaptable* systems rely on
16 manual user tuning (Frias-Martinez et al., 2009). Research suggests that the user-system
17 control process influences users' behavioural intentions (Alotaibi, 2013). Thus, this paper
18 also *analyses the target population's preference for adaptivity versus adaptability on cancer-*
19 *related websites.*
20
21

22
23 Personalised services can guide user behaviour, e.g., in health system, by educating
24 patients about a medical regime (Masthoff et al., 2014). Personalisation is a major usability
25 and functionality factor, determining users' preference for e-health websites (Topaloglu et al.,
26 2013). However, adoption of personalisation technologies in online health services continues
27 to be slow (Sillence et al., 2008, National Information Board, 2014).
28

29
30 A **pre-investigation** conducted for this paper, and the report by Fernandez-Luque et al.
31 (2011), **show there are few existing global health-websites, primarily US-based, offering**
32 **some personalisation**, e.g.: TrialX (trialx.com/), PatientsLikeMe (www.patientslikeme.com/),
33 Healthy Harlem (hcz.org/our-programs/healthy-harlem/), WebMD (www.webmd.com/),
34 MedlinePlus (www.nlm.nih.gov/medlineplus/) and EsTuDiabetes.org
35 (www.estudiabetes.org/). **Previous studies explored personalisation on health-websites from**
36 **specific perspectives**, e.g.: defining personalisation requirements for Dutch senior citizens
37 (Alpay et al., 2009); introducing personalised educational material on stroke-precaution for
38 elderly in Taiwan (Hwang, 2011); analysing personalised educational health content for
39 adolescents in the US (Cortese and Lustria, 2012); and, more recently, exploring the effect of
40 personalised feedback on physical activities among adults from seven European countries
41 (Marsaux et al., 2015). **Nevertheless, the mentioned health websites and studies do not focus**
42 **on cancer-affected people, and miss a wide range of personalisation features. This paper, on**
43 **the other hand**, takes a holistic approach in investigating the *availability of a comprehensive*
44 *set of personalisation-related services* on cancer-focused websites.
45

46
47 Whilst Web-personalisation services introduced elsewhere may be applicable to
48 cancer-related websites, it is important to evaluate this presumption, as the success of
49 personalisation depends on catering to unique target users' needs (Riecken, 2000). **It is, thus,**
50 **vital to introduce various personalisation features to the cancer-affected population and**
51 **obtain the feedback of these target users. Furthermore, data types commonly used in online**
52 **personalisation include gender, age and location** (Germanakos et al., 2009). However, while
53 users do not necessarily perceive this data as sensitive, they are, for example, apprehensive
54 about the fairness of gender-based online personalisation (Lange and Hans, 2016). In fact,
55 research implies that a complete user profile, encompassing also emotional states
56 (Germanakos et al., 2009), is essential for online personalisation.
57
58
59
60

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-focused 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 focuses on the needs for and 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). 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 3 criteria: perceived availability, user preference for specific features and personalisation approach.
- *Emotions as stimuli for health-website use* (RQ3). Thirteen emotions were measured on a 5-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 1992-95 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 3 family members and 2 close friends, and a conservative estimate that 1% 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% of Jajce's population) have reportedly joined for informative purposes. For the target population (confidence level 95%, response distribution 50%, error margin 8%), 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

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2
3 contact information and were invited to either distribute or advertise (on Facebook or their
4 website) the questionnaire. Four associations agreed to participate.

5
6 Additionally, a combination of *convenience* and *respondent-driven sampling* was
7 used. The survey was advertised via social networks (primarily Facebook) to various B&H
8 contacts, predominantly in the 25-35 age group. Other emotion-related studies also employed
9 social networks (Mahmoud et al., 2012). This enabled reaching people indirectly affected by,
10 or interested in cancer, who are computer literate, and use the Internet for information search
11 - overall, a younger segment of the population.

12
13 Three methods of data collection were utilised: *survey questionnaire, interviews with*
14 *target users* and *evaluation of existing health websites*.

15 16 17 18 *Survey questionnaire*

19
20 Data was gathered for a period of *1.5 months in Spring 2014*, using both online- and paper-
21 based questionnaires. The paper questionnaire was distributed to: 'Biser' Association for
22 breast cancer (where 25 members participated), and 'Srce' Association for children with
23 cancer (10 members participated). The online questionnaire, developed in Google forms, was
24 advertised on Facebook pages of: PORT Association for people affected by malignant
25 diseases (with around 260 Facebook followers); UNA Association for breast cancer sufferers
26 (500 followers); the first author's Facebook page (270 followers). All participants were
27 encouraged to promote the study among their own contacts.

28 29 30 31 32 *Interview*

33
34 A follow-up focus-interview with seven participants was conducted in two B&H cities in
35 March 2016. The aim was to clarify the effect of **emotional state** when informing oneself
36 about cancer. Two men and five women were interviewed. This gender distribution is in line
37 with the situation in B&H, where the male population affected by cancer is less vocal. After
38 gathering background information, participants were asked two open-ended questions: "Do
39 you use the Internet to search for cancer information?" and "Do emotions stimulate your
40 search for cancer information online, and which are these?"

41 42 43 44 *Health-websites' evaluation*

45
46 Adopting the approach from a study assessing the quality of **Spanish hospital websites**
47 (García-Lacalle et al., 2011), 15 health-websites were manually evaluated, during Spring
48 2014, on the availability of the 25 personalisation features mentioned in the Study design
49 section (1 was assigned to **an available feature**; 0 otherwise). The selection of health-websites
50 was based on search engine rankings and their reputation in the respective countries. B&H
51 websites evaluated were: PORT (www.port.org.ba), Renesansa (www.renesansa.com.ba),
52 Srce (srcezadjecu.ba), Biser (www.biser.ba), Zagrljaj (www.zagrljaj-mo.org), Novi pogled
53 (www.novi-pogled.org), cancer-forum ([www.klix.ba/forum/karcinom-i-borba-sa-njim--](http://www.klix.ba/forum/karcinom-i-borba-sa-njim--t26209.html)
54 [t26209.html](http://www.klix.ba/forum/karcinom-i-borba-sa-njim--t26209.html)) and BHZdravlje (www.bhzdravlje.ba). UK websites were: Cancer Research UK
55 (www.cancerresearchuk.org), Macmillan Cancer Support (www.macmillan.org.uk), Action
56 Cancer (www.actioncancer.org), Maggie's Cancer Caring Centres
57
58
59
60

(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 1365 (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 SPSS v20 tool (IBM, 2012) was used for analysis. Descriptive quantitative research prevailed; additionally, inferential tests (Cronbach's Alpha, correlations, comparisons, and regression) explored the impact of emotions on health-website usage.

Participant demographic data is 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 ($\chi^2(1) = 1.3, p = .257$).

Table I. Summary Statistics of Demographic Data

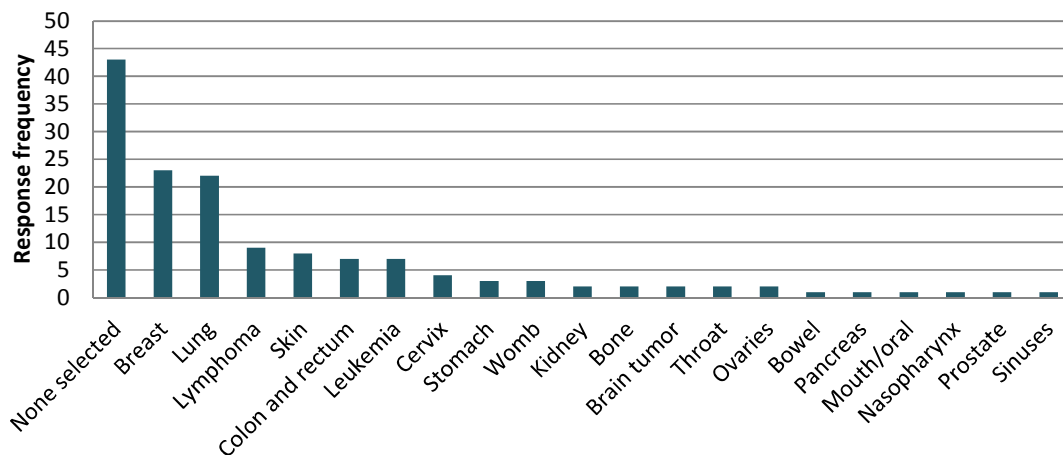


Figure 1. Cancer types: Cancer of...

Personalisation needs on health-websites (RQ1)

The majority of respondents stated that health-websites they used were not personalised (62%), but that they would like personalisation (68.7%). 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).

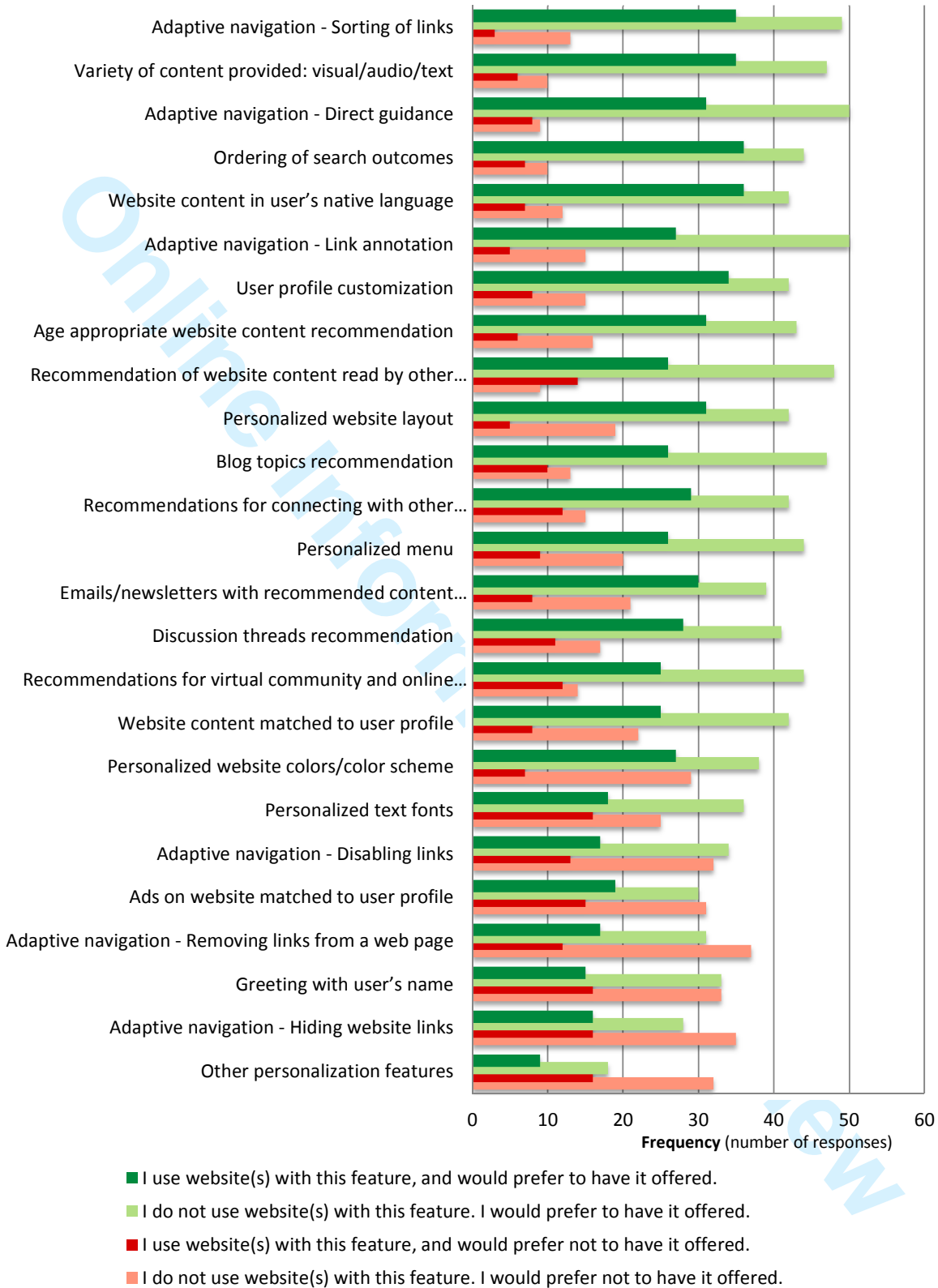


Figure 2. Availability of and preference for personalisation features on health-websites

Respondents who experienced personalised health-websites favoured (Figure 2): content in native language, search outcomes ordering, adaptive navigation - links sorting, variety of content, and user profile customisation. Respondents who had not used health-websites with personalisation but desired it, preferred: *adaptive navigation* (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%) 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*.

Table II. Preferred Personalisation Approach

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 UK (Figure 3). The percentage availability for the category, e.g. *Adaptive navigation* (AN) (9.4%), 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 (adaptive navigation, presentation) are mostly lacking.

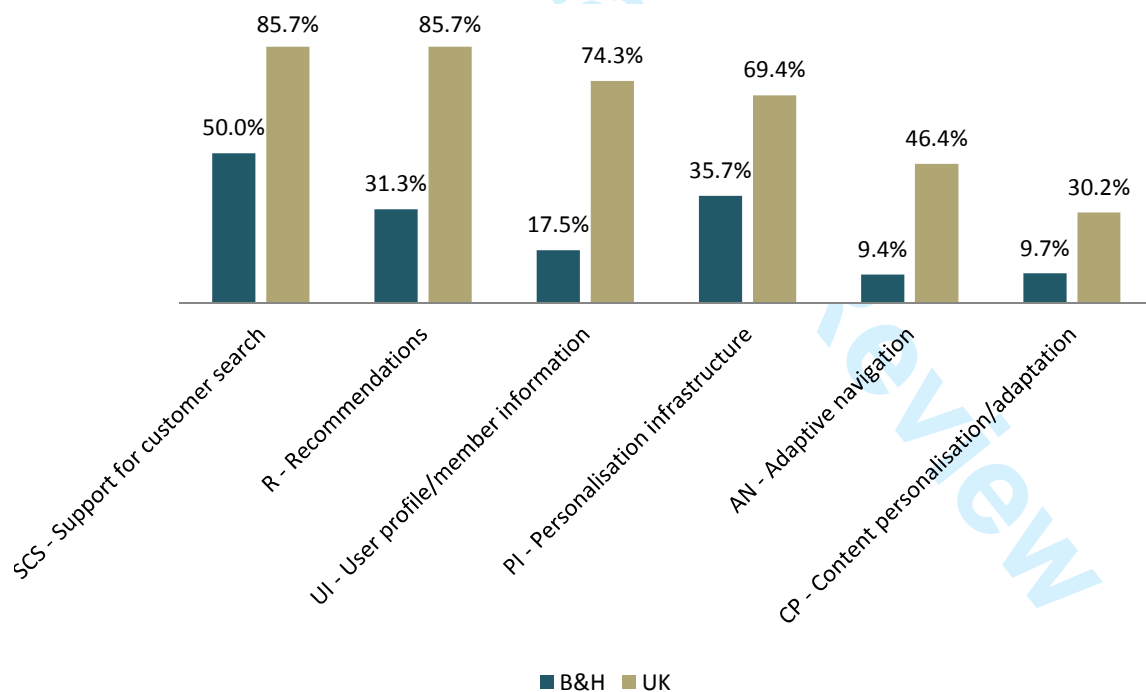


Figure 3. Categories of personalisation features available on B&H and UK websites

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), *adaptive navigation* (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.**

Emotions and cancer-related information search on the Internet (RQ3)

Cronbach's Alpha 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 Chi-square 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 ($p > 0.05$).**

Table III. Likelihood that Emotions Stimulate Health-Website Visit

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 ($\chi^2 = 7.8$, $p < .01$; 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.

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.

Probing further, several patterns emerged, coinciding with the 5 stages of grief (Elisabeth Kuebler-Ross Foundation, 2016). Firstly, **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

1
2
3 people have different ways of dealing with cancer. For some, *experiencing fear meant*
4 *completely guarding themselves*. IntC disliked being given detailed information, for fear of
5 the unknown. However, *fear stimulates information seeking in others*. IntD needed social
6 support and personal stories of other parents in similar situations, to gain *hope*.
7

8 *Hope* and the *wish to learn* more are common driving forces in the final stage -
9 acceptance. The “will for life” stimulated IntA’s cancer-awareness. *Interest* (in finding
10 something new), *will* and *hope*, stimulated IntE to find various cancer-related information.
11 IntD similarly was ‘hungry for information’, spending hours searching the Internet; *surprise*,
12 *interest* and *hope* stimulating her.
13

14 15 16 17 **Discussion**

18 The literature review (Online personalisation subsection) showed that personalisation
19 services are rare on health-websites. Furthermore, research on how emotions affect online
20 health-information search is lacking (Emotions subsection). However, *affective computing*
21 *research* is growing in popularity, with an increasing number of studies looking into *emotion-*
22 *based personalisation*. Hence, to connect these domains, this paper aimed to investigate,
23 firstly, whether the target group of health-website users – cancer-affected people - prefer to
24 be offered personalised services, and which specific features they desire. *Secondly, to*
25 *understand whether target users’ emotions induce them to use cancer-websites.*
26 *Understanding the influence of these two factors – personalisation and emotions – on health-*
27 *website use, provides implications for applying emotion-based personalisation to online*
28 *cancer-related services. Thus, a foundation for future studies in this area is established.* The
29 results of this study are based on the cancer-affected population from B&H, which, as
30 explained in subsection Sampling, has implications for cancer-website personalisation
31 beyond a *single* country.
32
33
34

35 The findings indicated that B&H population is mainly affected by breast and lung
36 cancer, which are in fact two of the four most common cancer types in B&H (International
37 Agency for Research on Cancer, 2012). It was further established that having someone close
38 diagnosed with cancer is the main reason to search for health information online. *This*
39 *coincides with previous results that showed that the majority of users of a B&H cancer forum*
40 *joined to support their cancer-affected family member or friend (Hadzidedic Bazdarevic and*
41 *Cristea, 2015b).*
42

43 The latter source also indicated that women are predominant participants in such
44 online cancer-oriented communities in B&H. Moreover, B&H cancer associations mainly
45 focus on *women* in the cancer-affected population. *Even though this paper’s results showed*
46 *that men use the Internet for health information, and are an important segment of the targeted*
47 *population, female participants dominated the study. Given the sample’s bias towards*
48 *women, care should be taken in applying the findings to the services exclusively targeting the*
49 *male population, in which case further research is needed. Nevertheless, lower participation*
50 *of men in online health research is not uncommon (e.g., 37% of male participants in (Xiao et*
51 *al., 2014)). This study’s finding are implications for providers of cancer-related online*
52 *services aimed at both genders, where women are expected to be predominant users, based on*
53 *the common trends.*
54
55

56 Gender was repeatedly found to influence online health information search (Morgan
57 et al., 2015), women being more inclined to it (Xiao et al., 2014). Internet is the first resource
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3 for health information for both men and women, however men have a higher tendency toward
4 personal interactions to find additional information (Hallyburton and Evarts, 2014).
5 Introducing personalisation is seen as a foundation for gender equalisation in online health
6 seeking (Hallyburton and Evarts, 2014). In online personalisation, however, gender-based
7 content tailoring has been questioned in some areas (Lange and Hans, 2016). In this study's
8 context, there are only a few cancer types which are gender specific, and the majority of
9 cancer content is applicable across genders; thus personalisation based on comprehensive
10 user profiles, as argued here, is more appropriate for cancer websites.

11
12
13 With regard to emotions, research does indicate there are gender differences in
14 processing emotions (Spalek et al., 2015), in particular negative emotions (McLean and
15 Anderson, 2009), which women show more often in stressful daily events (Matud, 2004;
16 Levenson et al., 1994), as is fighting cancer. Women also tend to be more emotionally
17 stimulated by (negative) emotional image content (Spalek et al., 2015). However, it was seen
18 that emotional appraisal is not influenced by gender (Spalek et al., 2015). Hence, there should
19 be no significant differences between genders in their emotional reactions to the online
20 cancer content they interact with.

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

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

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

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- Currently unavailable features: link generation, stretch-text, webpage layout partitioning/zooming, *template fitting*, webpage rearrangement, and website colour scheme customisation.
 - Features somewhat lacking: content/item reviews, *content presentation control*, adaptive navigation, personal guide, inserting/removing fragments, content style customisation, dimming fragments, zoom scale, menu appearance rearrangement.
 - Available features: community-type services, and features related to information quality, relevance and comprehensiveness.

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57 Specifically, features lacking relate to personalised content and services. As explained
58 in the *Related research section*, it is not the amount of information that makes online health
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3 services usable, but being able to quickly find the content reflecting **the complete set of user**
4 **characteristics**. This is best achieved by introducing **comprehensive personalisation services,**
5 **encompassing content, its presentation, as well as layout and navigation of the health-**
6 **website.**
7

8 Target users desire features providing a variety of understandable information,
9 directing them to relevant content, but also enabling control over how personal information is
10 used and how website content is presented. The results of the health-websites' evaluation
11 show, however, that these features are scarce. Personalisation features disliked by the target
12 users, e.g., *removing, hiding and disabling links*, show their concern of missing out
13 information, and their rejection of advertising. Users like direct guidance, but dislike
14 *personalised text fonts*. Presumably users consider such features on cancer-related websites
15 not as important as content-related personalisation. **The same presumption is applicable to the**
16 ***greeting with a user's name*, the latter also indicating a preference for anonymity and privacy.**
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19 To increase the results' reliability, **triangulation was used** – *health-websites*
20 *evaluation* and the *survey of user perceptions*. Overall, **personalisation features related to**
21 **content** – *presentation, recommendation, easier and faster retrieval of relevant (cancer-*
22 *related) information* – are the ones users are most interested in; all features which are
23 currently lacking. This should incentivise cancer-related website providers to adopt more
24 focused personalisation services.
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26 Triangulation - *interview* data confirming the *survey* responses - was also used to
27 obtain emotions-related findings. It was shown that specific *emotions - fear, interest, sadness*
28 and *surprise* – stimulate health-website visits. **Cancer-affected people experience** fear, and
29 surprise, of what is still the disease with the highest mortality rates. *Fear* and *sadness* of what
30 they or their beloved one could be, or are, suffering from, leads them to seek cancer-related
31 information, triggering *surprise* and *interest* in finding out about treatments, **other people's**
32 **experience or alternative diagnosis.**
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35 Furthermore, the findings, not shown here due to lack of space, indicated one
36 statistically significant (applying Bonferroni's corrections) and five *possible* associations
37 (without corrections): *enjoyment* with gender, *interest* with education level, *happiness* with
38 gender and education level, *surprise* with breast cancer, and *awe* stimulating cancer treatment
39 information seeking. Thus, emotions should be further studied in this context, to better
40 estimate their impact on health-website use.
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43 To conclude, *emotions play a role in the behaviour of cancer-affected people*, who
44 *appreciate specific types of personalisation*. **A post-study (Hadzidedic Bazdarevic and**
45 **Cristea, 2015a) was conducted, to further delve into the association between emotions and**
46 **online cancer-information. A cancer-focused website (for and in collaboration with the B&H**
47 **cancer association PORT) was developed based on this paper's findings about the**
48 **personalisation features desired by the target users. The post-study's experiment with the**
49 **cancer website implied that users who experience interest-like emotions pre-website-use are**
50 **more likely to perceive that website personalisation services meet their needs. Moreover, it**
51 **was shown that post-usage emotions (*interest* and *excitement*), i.e., emotions evoked by the**
52 **interaction with the personalised cancer website, increase users' intentions to reuse the**
53 **website.**
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Implications and future work

Importantly for website providers, this study firstly showed that emotions stimulate health-website visits. Secondly, 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 is 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 focused 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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Table I. Summary Statistics of Demographic Data

Variable, valid responses (N)		Percentage
<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

Information Review

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Table II. Preferred Personalisation Approach

Adaptability versus 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%

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Table III. Likelihood That Emotions Stimulate Health-Website Visit

Emotion	Likelihood		
	Mean	Mode	SD
Interest	1.73	1.0	.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

Response to Editor's and Reviewer's Comments

We thank the editor and the anonymous reviewer for additional comments, allowing us to further clarify our research. We have finalised our paper, according to these comments, as described below, pointing to the parts in the paper where the changes have been made. We have also answered any issues raised by the reviewer.

Editor's Comments	Our Response
The reviewer(s) have recommended publication, but also suggest some Major revisions to your manuscript.	Thank you for the chance to improve our paper. We have addressed the additional feedback received and finalised our paper accordingly.
Therefore, I invite you to respond to the reviewer(s)' comments and revise your manuscript.	The reviewer's comments have been attended to. We have structured the responses by listing a reviewer's comment (or part of the comment) followed by our response to it. Each of the comments has also been addressed in the manuscript accordingly, as described in the corresponding response.
Please also ensure that in doing so your paper does not exceed the maximum word length of 8000 words and that it meets all the requirements of the author guidelines at http://www.emeraldinsight.com/products/journals/author_guidelines.htm?id=oir=ubl727mru90lg3hc8sa5p5qrt2 ."	We have ensured that the revised paper abides by the journal's requirements and author guidelines, whilst working on improving the main message of the paper, and its overall delivery. The paper meets the 8000 words limit.

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<p>You will be unable to make your revisions on the originally submitted version of the manuscript. Instead, revise your manuscript using a word processing program and save it on your computer. Please also highlight the changes to your manuscript within the document by using the track changes mode in MS Word or by using bold or coloured text.</p>	<p>All the changes in the manuscript have been highlighted by using coloured text – coloured in red - as recommended.</p> <p>We will point out here the main changes made to the manuscript and the list of tables:</p> <ul style="list-style-type: none"> - Discussion and Related research sections were enriched with reports on the effect of gender on - emotions, online health information searching, as well as on personalisation - Figure and explanation on cancer type distribution in the sample was added - Findings on the correlation between gender and cancer-related Internet use were included in the Analysis and results section - The Discussion was further improved by clarifying the population of users the findings of this study are applicable to - All sections were proofread again and improved for readability - Some titles, subtitles and table titles were shortened
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Reviewer 1's Comments	Our Response
<p>Since the data collection is only for Breast Cancer interested users, and a lot of female respondents. This is a specific type of cancer, and the paper talking about personalization and emotions, given the gender effects and the possible impact for personalization, emotions and interaction patterns for website and information seeking for women.</p>	<p>Thank you for pointing out this ambiguity, as it gave us the opportunity to improve our paper. However, it was just an ambiguity resulting from the lack of space to present our findings in a more detailed manner. Thus, we understand that to a reader it might have potentially seemed that the majority of the sample was drawn from members of cancer associations, and as the majority of them are associations for women, therefore the sampled participants would be affected only by breast cancer. However, this is not the case.</p> <p>As explained in the paper (<i>Sampling</i> section), some of the members of the cancer associations are indirectly affected by cancer, some are just</p>

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	<p>supporters, but more importantly, the surveyed cancer associations are not just for women affected by breast cancer. Two of the associations that participated in this study were for - children affected by leukemia (and other cancers) and for people affected by malignant diseases in general. Even the cancer associations aiming at women with breast cancer welcome and have members with other cancer types, and more importantly, the breast cancer sufferers commonly reported to have metastasis, which means the occurrence of cancer in other parts of the body.</p> <p>Moreover, as explained in the <i>Sampling and Survey questionnaire</i> sections, a large part of the sample was obtained via social networks and from among the first author's contacts.</p> <p>Therefore, it was not only breast cancer interested users who were surveyed in this study, nor only breast cancer related existing websites were evaluated.</p> <p>The survey questionnaire used for this study allowed the participants to select one category which best reflects how they have been affected by cancer, and then for that category report (open-ended question) all the cancer types they or their loved one battled with, or are interested in.</p> <p>To better clarify the distribution of cancer types in the dataset, in the <i>Analysis and results</i> section we have added Figure 1 and the accompanying explanation within the section (as well as a brief discussion in the Discussion section) presenting the participants' demographic data. The figure shows that while a large portion of respondents did not report which cancer affected them, the reported cases coincide with the official statistics for B&H by the WHO and IARC organizations. Breast cancer was reported most frequently, but in almost equal numbers was lung cancer reported. In fact, within the sample used in this study, the</p>
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	<p>proportion of people affected by other cancer types compared to breast cancer is much larger.</p> <p>Additionally, we have checked the entire paper to ensure the ambiguity regarding cancer type distribution has been clarified and that a reader understands that, even though a part of the sample were members of (breast) cancer associations, the respondents were actually affected by a variety of cancer types, and are thus representative of the larger population this paper targets, who are the people affected by cancer, and not just breast cancer.</p>
<p>Author(s) shall consider a section in lit review discussing about gender impact for personalization, emotions and website interaction.</p>	<p>Since the paper does not focus on the gender-effect on the studied factors – personalisation, emotions or online information seeking – a discussion on the possible impact of gender on these factors has been provided in the Discussion section, as well as a brief report on gender-based personalisation in the Related research section.</p> <p>Even though the data is based on more than 80% of female responses, this does reflect the situation in the real world. To date, men are the minority users of health websites. Personalisation services do not only tailor content based on gender, in fact we argue for comprehensive profiles. Moreover, gender-based personalisation has been questioned in some instances (Online personalisation section). Additionally, we counterbalanced the sample homogeneity issue by including the in-depth interview data of male participants.</p> <p>Furthermore, in the evaluation of existing B&H and UK websites, the focus was on online cancer services for the population affected by various cancer types, irrespective of gender.</p>
<p>Since this is a particular type of cancer, and other type of cancer might not have the same patterns as reported like in this paper. Pls consider change your paper title to include "women user" and "Breast Cancer".</p>	<p>We thank the reviewer for the suggestion. However, taking into account our clarifications above, as our data was obtained from a population not necessarily just affected by breast cancer, reflecting the perception of the male population using the Internet for health information seeking, we believe our findings are applicable to a larger population of people affected by different cancers. Therefore, we</p>

	have decided to keep the original title: <i>“Do personalisation and emotions affect the use of cancer-related websites?”</i>
<p>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60</p> <p>1. Originality: Does the paper contain new and significant information adequate to justify publication?: the revision had made some progress.</p>	<p>Thank you for acknowledging that the revised paper more clearly identifies the original, new and significant contributions.</p> <p>We believe that this topic is important and relevant to the journal audience - and for the society at large. The paper combines concepts – emotions, health website personalisation and cancer-affected population - which have not yet been studied, to the best of the authors' knowledge.</p> <p>As explained in the Introduction section, this study contributes to:</p> <ul style="list-style-type: none"> - identifying the role of emotions in using online services for cancer-information search - specifying a comprehensive set of personalisation services for cancer-related website, as preferred by target users - providing guidelines for a systematic approach to personalisation adoption on health-websites - exploring how the two factors - personalisation and emotions - influence the cancer-affected population to use health-websites - showing the scarcity of research connecting emotions and online personalisation, especially applied to health - highlighting implications for incorporating emotions into personalisation algorithms for health-websites - proposing a direction of the research and implementation in this area towards emotion-sensitive personalised cancer-related websites.

	We have further made effort to check the second revision to ensure clarity and consistency of the message throughout the paper.
<p>2. Relationship to Literature: Does the paper demonstrate an adequate understanding of the relevant literature in the field and cite an appropriate range of literature sources? Is any significant work ignored?: literature were added.</p>	Thank you for acknowledging the work we have put into the literature review. In the second revision of the paper, we have additionally expanded the Related research section connecting gender and personalisation.
<p>3. Methodology: Is the paper's argument built on an appropriate base of theory, concepts or other ideas? Has the research or equivalent intellectual work on which the paper is based been well designed? Are the methods employed appropriate?: method section was enriched</p>	We thank the reviewer for agreeing with the completeness of the methodology section.
<p>4. Results: Are results presented clearly and analysed appropriately? Do the conclusions adequately tie together the other elements of the paper?: more results were added</p>	Thank you for the positive feedback on the revised paper's Results section. With the addition of the descriptive statistics on cancer type responses, we believe this section now comprehensively supports the study's aims and provides a clear foundation to further support this research area.
<p>5. Implications for research, practice and/or society: Does the paper identify clearly any implications for research, practice and/or society? Does the paper bridge the gap between theory and practice? How can the research be used in practice (economic and commercial impact), in teaching, to influence public policy, in research (contributing to the body of knowledge)? What is the impact upon society (influencing public attitudes, affecting quality of life)? Are these implications consistent with the findings and conclusions of the paper?: some degree of implication</p>	<p>We thank the reviewer for noticing that the revised paper has more clearly highlighted the practical and theoretical implications of our work in the dedicated section Implications and future work. As stated there, the paper:</p> <ul style="list-style-type: none"> - showed implications for the society, as we are working with an actual commercial provider of online health information for those affected by malignant diseases, to apply the outcomes of this theoretical research in practice. - gave a better insight to website providers about the target population; pointed out the personalisation features that the target users desire - deduced the implications for linking emotions with personalisation in researching emotion-based personalisation in the online health domain.

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	The study's implications have been checked again to ensure the future use of the findings in research, practice and overall contribution to the body of knowledge.
6. Quality of Communication: Does the paper clearly express its case, measured against the technical language of the fields and the expected knowledge of the journal's readership? Has attention been paid to the clarity of expression and readability, such as sentence structure, jargon use, acronyms, etc.: demonstrate some degree of quality	Thank you for acknowledging the quality of how the message was communicated in our work. The second revision of the paper has been proof-read again to ensure readability and clarity of expression to the intended audience.

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