

Applying Cross-cultural theory to understand users' preferences on interactive information retrieval platform design

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ABSTRACT

In this paper we look at using culture to group users and model the users' preference on cross cultural information retrieval, in order to investigate the relationship between the user search preferences and the user's cultural background. Initially we review and discuss briefly website localisation. We continue by examining culture and Hofstede's cultural dimensions. We identified a link between Hofstede's five dimensions and user experience. We did an analogy for each of the five dimensions and developed six hypotheses from the analogies. These hypotheses were then tested by means of a user study. Whilst the key findings from the study suggest cross cultural theory can be used to model user's preferences for information retrieval, further work still needs to be done on how cultural dimensions can be applied to inform the search interface design.

Categories and Subject Descriptors

H.5.2 [Information Interfaces and Presentation]: User Interfaces – *user-centered design*

H.3.7 [Information Storage and Retrieval]: Digital Libraries – *user issues*

General Terms

Design, Human Factors, Theory.

Keywords

Cross-Cultural Information Retrieval, Web Site Design, Human Computer Information Retrieval (HCIR) Hofstede's Cultural Dimensions.

1. INTRODUCTION

The aim of this paper is to give an overview of cross cultural website design and how it links to cross cultural information retrieval (IR). Several methods of grouping users have been studied for example Liu et al [1] applied Information Foraging Theory in order to identify user types. Another example of user grouping has been identified by Riegelsberger and Sasse [2] as relationship seeking and function seeking, however in this paper the authors propose to group users based on their culture in order to facilitate a more personalised User Experience (UX) and IR

experience. Cross cultural theory has been used for general interactive design, for example cultural attractors¹ have been applied to the localisation of website design [3]. The term localisation refers to the changes required to make things, goods or services to meet the needs of a specific group of people generally located in the same place. The phrase website localisation refers to designing a website to meet the needs of a specific user group and consequently enhance the UX.

The Figures below are an example of a culturally localised working Malaysian search engine (SE), although all versions are intended for use by residents of Malaysia the SE has options for Malay, English and Chinese speaking versions; it would appear these SE interfaces have a level of localisation in order to appeal to users from different cultural backgrounds, created by the use of cultural attractors (as defined in footnote¹), this can be seen by the differences in the images displayed. The Malay speaking version (see Figure 1) displays family oriented images and images containing more than one person. The English speaking version, (see Figure 2) has fewer images, with no groups of people and displaying the country's flag. Whilst the Chinese speaking version, (see Figure 3) also shows images of people and families, it also contains 'cartoon' images together with the country's flag.



Figure 1. Malaysian Search Engine (Malay Version)²

¹ A cultural attractor is defined as: "any element of the surface level of an e-commerce interface whose main purpose is to match (reinforce a set of user expectations)" from French [4]

² <http://www.cari.com.my/>

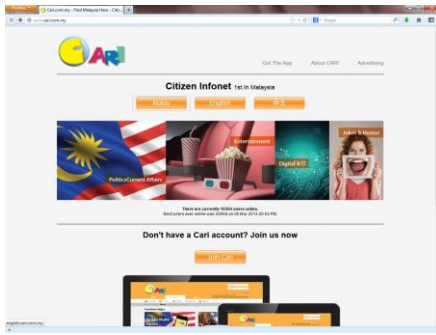


Figure 2. Malaysian Search Engine (English Version)



Figure 3. Malaysian Search Engine (Chinese Version)

Other aspects of website design which have been incorporated into localisation are usability and on occasion, Geert Hofstede's [5] five dimensions of cultural difference.

Although there is a large amount of research carried out on cross cultural web localisation [4] [9] [10] [11], translation [12], and cross language evaluation [13] there appears to be a limited amount of research conducted on cross cultural IR. Therefore, other parts of the cultural element apart from language need to be explored for Human Computing Information Retrieval (HCIR).

This paper looks at how to apply cross-cultural website localisation design to interactive IR platforms, in order to 'build in' a culturally appealing aspect to search interfaces in order to deliver a better user experience.

Likewise, very little research has been conducted into the area of how cross culture influences search behaviour. However, Taksa and Flomenbaum [6] have taken Hofstede's five cultural dimensions and combined them with Unified Theory of Acceptance and Use of Technology (UTAUT), introduced by Venkatesh et al [7] to create a new research model. Taksa's research model looks at how a user's cultural background affects user behaviour. Following this paper by Taksa and Flomenbaum [6] the authors were motivated to conduct this study and apply the same Hofstede's [8] five dimensions as Taksa without UTAUT to identify if these dimensions can be used to model cultural differences for information retrieval.

Culture can be defined in many ways. One way of defining culture [5] is mental programming. Mental programming can be regarded as patterns of thinking, feeling and actions based upon what we have learned throughout our lifetime. Hofstede, a Dutch anthropologist, carried out in depth interviews with hundreds of IBM employees in 53 countries.

Using standard statistical analysis of moderately large data sets, Hofstede was able to identify patterns of similarities and

differences from the responses. (The limiting factor being, the subjects were from one multinational company, albeit the corporation's worldwide employees, it was the same company culture.) Hofstede [5] claimed for each country there is a prevailing culture. Hofstede developed an index and ranking for each country based upon the dimensions identified. The results have been indexed and ranked in tables, updated in 2010 with additional countries added. [8] In the next section we introduce Hofstede's cultural dimensions with brief descriptions of each of the five dimensions together with some examples.

2. HOFSTEDE'S FIVE CULTURAL DIMENSIONS FOR SEARCH ENGINES

Aaron Marcus [14] a specialist in user-interface design carried out a number of studies of Hofstede's work; his comments have also used as a basis for the following definitions for the five dimensions. The five dimensions are Power Distance (PD), Individualism vs. Collectivism (IDV), Masculinity vs. Femininity (MAS), Uncertainty avoidance (UA) and Long term time orientation (LTO).

2.1 Power Distance (PD)

Power Distance is the amount of unequal power within a culture that members of that culture are prepared to accept or expect. Hofstede observes high PD countries have a tendency towards a more centralised government. Company and organisation member's may have sizeable job and pay differentials and display a taller hierarchical management structure. High PD country members would expect and could even have a preference for inequality. This could be reflected in the design of web interfaces in the following ways.

A high PD country's website may have a taller/deeper navigation system, with preferences for images of buildings, official seals, or leaders. For instance Malaysia is considered a high PD country and is ranked joint highest in Hofstede's index of countries [8].

High PD cultures have a preference for SE results that are highly structured [2] and organised, possibly by grouping subject or related matters together, under one URL link, rather than just a list of search results, offering less navigation choices per level, but more levels. High PD countries also tend to follow instructions from persons in authority as noted by Taksa, [6] a ranking system by experts of SE results may be favoured. Conversely low PD countries would show a preference for a less structured approach for access to information [15].

2.2 Individualism vs. Collectivism (IDV)

Individualism within a culture is where the individual is expected to take care of one's self and their immediate family only. They are not expected to take care of anyone else; as opposed to a collectivist society where members look after extended families and other group members. Hofstede [5] notes that the area to be identified with individualism versus collectivism was most strongly associated with relative importance attached to certain work related goals.

Hofstede's Individualism dimension is similar to Rotter's locus of control (LC) [16] this is where an individual feels "events are the result of their own actions (internal locus) or the effect of the external environment and powerful others (external locus)" [4], This could be interpreted for information seeking where "internal locus" would relate to Individualism and where "external locus" would relate to Collectivism. "Internal locus" users may feel their

search actions have a direct bearing on their search results. Whereas an “external locus” user may feel there is only a loose link between their actions and the results.

The USA and Great Britain are identified as being Individualism (IDV) countries being ranked first and third respectively [8]. As discussed by Taksa and Flomenbaum, [6] users from a country with a tendency towards an Individualism culture would tend not to be influenced of the views others hold regarding search engines. Whereas, users from collectivism cultures would be “more aware and more influenced” by the views of others regarding search engines. An example towards a collectivism country and culture would be China.

2.3 Masculinity vs. Femininity (MAS)

Here, Hofstede refers to the gender roles rather than the physical gender. Masculine roles consist of assertiveness, toughness and competition. Masculine work objectives incorporate “earnings, recognition, advancements and challenge” [14.] Whereas feminine roles are traditionally ones of more caring with home, family/children, people and tenderness being considered predominant. For example Japan is identified as a high Masculinity country, whereas Sweden is considered a low MAS country being ranked last in Hofstede’s index [8].

People from high MAS cultures would show a preference for quantitative information as opposed to qualitative information [6]. High MAS cultures would be more interested in higher ranked search results that are task or goal oriented. [19][20], whereas low MAS cultures may show a preference for more qualitative information with a preference being shown for more visual aesthetics [15].

2.4 Uncertainty Avoidance (UA)

Uncertainty avoidance is to what extent a culture is comfortable or uncomfortable with uncertainty or unknown situations. Greece is a high uncertainty avoidance country being ranked first in Hofstede’s index [8], where as Singapore is considered a low uncertainty avoidance country.

There would appear to be localization of Yahoo! Search engines, note the differences within the appearance of the Yahoo! Search engine home pages. For the Greek SE home page (see Figure 4) exhibits a clearer, less cluttered interface with a more simple design, constructed with fewer but more concise links. Whereas, low UA cultures, an example of which is the Singapore (see Figure 5) SE home page is more complex, displays more content with more options than would be desirable to High UA countries.

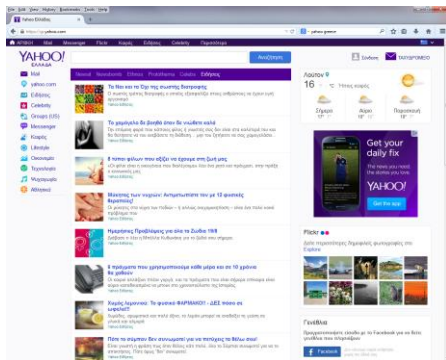


Figure 4. Yahoo! Greece Search Engine Interface³

³ <https://gr.yahoo.com/>

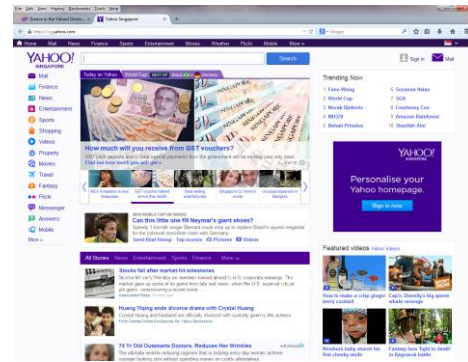


Figure 5. Yahoo! Singapore Search Engine Interfaces⁴

People from high UA cultures are more likely to do more searches and use more than one SE to complete their task. Also, high UA cultures are more likely to have a preference for clear, concise and non ambiguous search results. Whereas, Low UA countries would be considered to be more confident to click on more ambiguous SE result links.

2.5 Long-term Time Orientation (LTO)

This dimension was identified later by Hofstede & Bond [17] where Bond, had a questionnaire re-designed, with a Chinese culture bias, this he called the Chinese value survey, (CVS). LTO is a Confucian philosophy, where members value long term gain over short-term gain. Examples of high LTO countries would be South Korea, Taiwan, Japan and China, the top four in Hofstede’s index [8], where as low LTO country examples would be USA, Ireland and Australia.

Users from high LTO countries would be more likely to wait a little longer for more search results and be more prepared to consider looking at lower ranked results if this would achieve their goals or accomplish their tasks. Short term time orientation cultures would have a preference for faster search results, and only be interested in results for the task in hand [14] [18].

This section presented the five Hofstede’s dimensions in detail and illustrated each of the dimensions in a SE context. In the following sections, we are going to look at the illustration of different dimensions in the SE context based on a user study.

3. USER STUDY SET UP

One aim of this research is to determine if cross cultural theory; in particular Hofstede’s dimensions, can be modeled to identify user groups. In an effort to find this out we conducted a user study in order to assess if these dimensions can be applied and to test if the results will match the hypothesis.

User participants have been taken mostly from the staff and student base of the University of Bedfordshire, England; students from Nantong University China who are studying Computer Science; together with members of a local ‘Chinese School’.

A questionnaire has been constructed which asked users to identify the SE(s) they use both in the UK and if applicable, their home country. The questionnaire contains closed questions relating to gender, age, occupation, country of origin and culture most identified with. Also, several open questions relating to

⁴ <http://sg.yahoo.com>

which SE(s), participants use and their rationale for using them. There are six questions using the likert scale with five possible answers for each statement/question. The statements/questions, cultural dimension and hypothesis are shown below (see Table 1).

Table 1. User Study - Cultural Dimensions, Hypotheses, and Questions

Cultural Dimension	Hypothesis	Questionnaire Statement/Question
Power Distance (PD)	H1. High power distance cultures prefer search results to be organised by groups or subject matters.	Q1. I prefer search results that are reviewed, grouped and/or provided by official bodies.
Individualism v collectivism (IDV)	H2. Individualism cultures would not take into account the views of others regarding search engine queries.	Q2. I would use a search query to obtain a particular search result, if recommended to me by a friend.
Masculinity v Femininity (MAS)	H3. People from high masculinity cultures would show a preference for quantitative information as opposed to qualitative information.	Q3. I prefer to see more fact than opinion in the highly ranked search results.
Uncertainty Avoidance (UA)	H4. High uncertainty avoidance cultures are more likely to have a preference for clear, concise and non ambiguous search results.	Q4. I only click on the search results if they are clear, unambiguous and strongly relate to the query.
Long Term Time Orientation (LTO)	H5. Long term time orientation countries would look through more search results pages than short term time orientation countries for relevant results.	Q5. I am happy to look through several results pages to find more relevant search results.
Individualism (IDV) and Locus of Control	H6. Individualism countries feel their search actions have a direct bearing on their search results.	Q6. I refine my queries because I feel my search query has a major effect on my search results.

The possible answers for each statement are ‘Strongly Disagree’ ‘Disagree’, ‘Neither Disagree nor Agree’, ‘Agree’, ‘Strongly Agree’. Five of the statements relating directly to Hofstede’s five dimensions and a sixth statement relating to the locus of control which is partially related to IDV. A paper based version of the questionnaire was initially created with 30 copies being distributed and 26 returned. An online version was also created obtaining an additional 29 responses.

The 55 participants in total were from a number of countries, unfortunately, many of the countries only had 1 to 2 respondents and as such we have not included their results. The countries and cultures results analysed are China, Malaysia, Hong Kong, Russia and Great Britain (British) with a total 40 participant’s results. China, Malaysia and Hong Kong, have been grouped under

Chinese culture. All countries “rank” are taken from the updated work of Hofstede and can be found in [8].

4. DATA ANALYSIS

After we collected the data we have used standard statistical software to analyse the quantitative data and used content and theme analysis to analyse the qualitative data.

4.1 Data Analysis Results

We analysed the data for each of the six hypotheses [see Table 1] as shown below. Results are shown in percentages with the number of users shown in brackets.

4.2 Hypothesis 1 (H1) - Power Distance (PD)

Great Britain is a low PD country, this means a culture which supports the concept that inequalities in their society be kept to a minimum. Therefore for Q1 (see Table 1), the expected results for the H1 for Great Britain would be for users to disagree with Q1, however, this was not found and the hypothesis was not supported with only 16% (2)⁵ disagreeing with this question. Although, 42% (5) neither disagreed nor agreed.

China and Malaysia are considered high PD countries whereas Hong Kong falls in the mid to high range for a PD country. Users from a Chinese culture results learned towards supporting H1, with 44% (11) of users agreeing with Q1.

Russia is also considered to be a high PD country. The results support H1 with 67% (2) of Russian culture users agreeing with Q1.

4.3 Hypothesis 2 (H2) - Individualism vs. Collectivism (IDV)

In Q2 (see Table 1), Great Britain is considered to be an Individualism country. However, the British results do not support H2. It was anticipated the British users would disagree with Q2 relating to H2.

China, Malaysia and Hong Kong lay more between the central point and the collectivism end of this dimension, the Chinese culture results are more supportive of H2, with 40% (10) of users agreeing and 40% (10) neither disagreeing nor agreeing with Q2

Russia is considered to be more towards the collectivism end of the central point for this dimension, their results do support H2; however they are more what would be expected from a country that has tendencies towards collectivism, with 100% (3) of users either agreeing or strongly agreeing with statement.

4.4 Hypothesis 3 (H3) - Masculinity vs. Femininity (MAS)

For Q3, (see Table 1) Great Britain is considered a high masculine country; we would expect our results would support the hypothesis of a preference for more quantitative rather than qualitative data, in highly ranked searched results. The British results for H3 hold true, with 92% (11) of users either strongly agreeing or agreeing Q3.

China, Malaysia and Hong Kong countries users have been grouped together under Chinese culture users, both China and Malaysia are high Masculinity cultures. Hong Kong would also be considered to be a Masculinity culture albeit more towards the

⁵ Number of participants are shown in brackets.

central point. The Chinese user's results would appear to reflect this and support H3, with 48% (12) of users either strongly agreeing or agreeing.

Russia would be considered to be a low Masculinity country; however the results did not support H3.

4.5 Hypothesis 4 (H4) - Uncertainty Avoidance (UA)

Great Britain, China, Malaysia and Hong Kong are all considered to be countries low UA countries. We would expect our results to show low UA countries would be more confident to click on more ambiguous SE result links.

Q4, (see Table 1), H4 for Chinese and British cultures would appear not to hold true as both cultures have expressed their agreement with the question. With 52% (13) of Chinese users either strongly agreeing or agreeing and 83% (10) of Great Britain users strongly agreeing or agreeing.

Whereas Russia would be viewed a high UA country. H4 was found to hold true for Russian culture users, with 100% (3) of users either strongly agreeing or agreeing.

4.6 Hypothesis 5 (H5) - Long-term Time Orientation (LTO)

Long term time orientation cultures value virtuous behaviour, perseverance and patience for achieving goals and results, whereas Short term time orientation (also known as low LTO) countries, cultures value instantaneous results and the fast accomplishment of goals. We would expect high LTO countries to be inclined to agree with Q5 and low LTO countries to be inclined to disagree with Q5.

Great Britain would be considered to be on the high side of the central point, leaning towards high LTO. Q5, (see Table 1) H5 for Great Britain these results show, 58% (7) of users either agree or strongly agree, However, 34% (4) disagree with this statement and 8% (1) Neither disagree nor agree, these results although mixed, would lean towards supporting H5

China and Hong Kong would be considered to be high LTO countries with Malaysia towards the low LTO side of the central point. H5 would appear to hold true, with 52% (13) agreeing or strongly agreeing, 24% (6) neither disagreeing nor agreeing and 24% (6) disagreeing or strongly disagreeing.

Likewise, the results for Russia, considered to be a high LTO country, were found to hold true for H5, with 100% (3) strongly agreeing or agreeing.

4.7 Hypothesis 6 (H6) - Individualism (IDV) and Locus of Control (LC)

Great Britain is considered a high individualism country. We would expect our results to show a high IDV (internal locus) country to agree with Q6, "I refine my queries because I feel my search query has a major effect on my search results", and a low IDV (external locus) country to disagree with it.

The results for Q6 (see Table 1) for Great Britain does support H6 with 92% (11) either agreeing or strongly agreeing Q6.

The Chinese culture countries, China, Malaysia and Hong Kong are positioned towards the collectivism end of this dimension. Chinese culture results do not support H6, with only 12% (3) strongly disagreeing.

Russia is considered to be more towards the collectivism end of the central point for this dimension, their results do not hold true as 100% (3) of users agreed or strongly agreed, with Q6.

5. Discussion

We found some inconsistency with our data and the hypotheses, with three cultures being tested per hypothesis, there is a possibility of eighteen outcomes, three per hypothesis i.e. one per culture tested. We found we had mixed results, with the results for some cultures being found to be true, some and others found not to be true per hypothesis. However, overall we have found eleven outcomes to be true out of the possible eighteen. In an attempt to explain these inconsistencies we offer the following analysis.

In our study, fourteen out of our twenty five Chinese users live in the UK, and could have assimilated some of the British culture. Consequently their responses may be more British in nature.

Another influencing factor could be user experience, with difference occupations and different age groups having different levels of experience. For example the younger age groups being possibly more confident with technology and IR. Many of our users are from the younger age ranges, (see Figure 6) The participants' occupations could have influenced the outcome with the largest user groups being computing students, academics, IT professionals and professional services (i.e. accountant, business consultants) making them familiar with IT and information retrieval, for breakdown of occupations (see Figure 7).

This together with a countries length of experience with technology could also relate to users experience of IR.

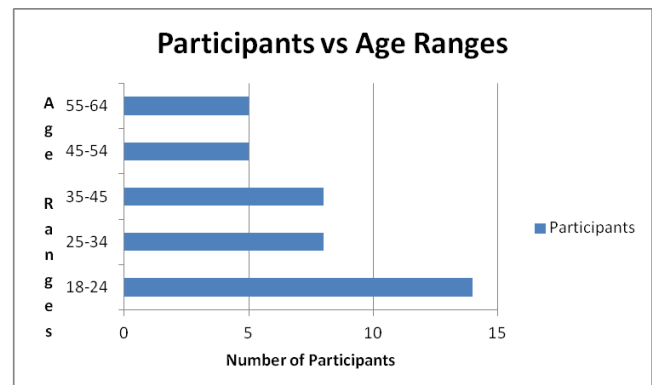


Figure 6. Participants Age Ranges

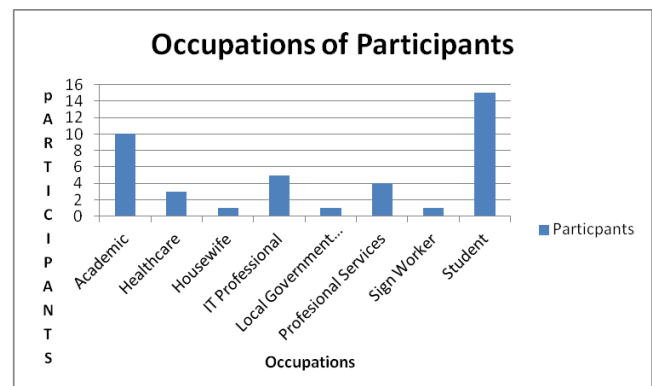


Figure 7. Occupations of Participants

We found our sample had a relatively even makeup of male and female participants with 45% (18) female and 55% (22) male.

We found 100% (12) of users who identified as British to use Google.co.uk. It would appear 67% (2) of users who identified with Russian culture, did not use Google.co.uk whilst in the UK but another Google localisation. Whereas, 100% (14) of users identifying with a Chinese culture who live in the UK use Google.co.uk, and whilst in the UK, additional search engines were also identified as being used.

When asked, 11 Chinese users said they did not currently live in the UK, however, 14 said they did currently live in the UK. We found there is a trend for all Chinese users, both UK and non UK resident to use www.baidu.com, also for Russian users to use www.yandex.ru or www.ya.ru when asked. The results would also seem to suggest that Chinese users living in the UK tend to use alternative search engines to Google when searching for information relating to their home country or culture. One Chinese user said they use Yahoo! When asked why they said "Better results for Hong Kong matter[s]", a second Chinese user said they also use Baidu, the reason given was "To get more information apart from google. Some cultural things such as Chinese food, new[s] and so on". Another Chinese user also said Baidu the reason given was "For searching Chinese websites". Speed, convenience and ease of use were also given as reasons for using Baidu.

It would seem Russian users also tend to use a Russian search engine whilst in the UK, with one user saying "I believe that Yandex searches over Runet (.ru) and/or in Russian better (though google has improved lately). Yandex has a built in dedicated search for poems and I search for quotes from poems quite often". Yandex being a major Russian search engine was also given as a reason why it was used.

It would seem British users also use additional search engines to google.co.uk, however these appear to be for more specific search results rather than cultural results. One British user using bing.com and wolframalpha.com saying "They occasionally give me more specific results". Another British user using Yahoo! & Altavista when asked why said "Sometimes it is easier to get an answer from a specific search engine". The web browser, Internet Explorer defaulting to bing.com was also given by British users as a reason they used it.

5.1 Lessons Learned

With our user study group consisting of mainly PhD students and staff from the Computer Science and Technology Department of the University of Bedfordshire, England, Students from Nantong University China, studying Computer Science and members of a local 'Chinese School', we would have a bias with regards to the occupations and the educational levels of the participants, with many being students and academics, although we did have several healthcare workers and participants from the professional services occupations (see Figure 7).

Our study is also biased with regards to age, many being from the younger age ranges. An additional bias is the level of computer skills, as the PhD students, computing students and computing staff are highly skilled in information technology. In an attempt to address these issues any further study would be conducted to reach other sections of the community e.g. other departments within the University, other Universities, other work places and other age groups.

6. CONCLUSION AND FUTURE WORK

In an effort to understand user search preferences and to develop a model to enhance the user search experience, we carried out a literature review in which we identified Hofstede's five cultural dimensions. We used these dimensions as a model for our research. We created an analogy based on each of the dimensions and an additional hypothesis using the locus of control. From these analogies we developed our six hypotheses.

We created a user study to test and evaluate if hypotheses are correct, and if the cultural model can be adapted into human-computer information retrieval (HCIR).

The authors would like to add Geert Hofstede has now updated his dimensions. They are now six in number with Long Term Time Orientation now being known as Long Term Orientation vs. Short Term Normative Orientation and referred to as (short term) normative vs. (long term) pragmatic (PRA), in Hofstede's business context and country comparison tool [22]. The additional sixth dimension, Indulgence vs. Restraint (IND), relates to happiness, freedom of expression and feeling in control of your own life. [21]

As discussed earlier there is little research on cross cultural IR, this paper is an attempt to establish a relationship between cross cultural theory and user grouping. This relationship could help us to inform the interactive design for cross cultural search platforms to support different cultural search platforms. The results of this user study are promising, if not conclusive.

However there is sufficient evidence to suggest cross cultural theory could be used with IR, although further work is required using a much larger user study, modified questions and additional questions, using more cultural participants still resident in their country of origin. In addition Hofstede's updated dimensions would be used and incorporated into any future user study conducted [21] [22].

Cross cultural IR may be useful for corporations that operate globally for instance to provide customers suitable product or service search functionalities, or to provide their employees operating in different countries with enterprise research functionalities that are adapted to their respective culture.

7. ACKNOWLEDGMENTS

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