

# Mind Tape technique - a usability evaluation method for tracing cognitive processes in cross cultural settings

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**Abstract** Users involved in task fulfillment during usability testing undergo layers of affective and cognitive processing which has been of interest to the community of interaction designers. The iterative cycles of User Centered Design process utilize this information from users for the redesign process. Think Aloud, which is the most prevalent Usability evaluation method in practice, has been criticized on accounts of interference with task and incompleteness of reported verbal data. Cultural variation in Think Aloud usability test settings and its impact on reported findings have also been investigated and reported. This paper presents an argument for a form of retrospective verbalisation method called ‘Mind Tape’ for tracing deeper level cognitive processes of users without interfering with the task fulfillment. The users are probed and questioned about why’s and how’s of the on-screen behaviour under the stimulus of the replayed screen recording of user activities. In light of the reported cross cultural experimental study using Mind Tape method, this paper argues for the suitability, cultural sensitivity and effectiveness of the method. Results suggest that not only the sequence of activities but also the intentions and motives of the users behind choices made are traceable using this method.

## 1 Introduction

Though there is no consensus among the usability professionals and researchers over suitability of any particular Usability Evaluation Method (UEM) [1] [2], users’ verbalisations in the form of Think Aloud (TA) has been the most extensively used method in usability evaluation practice as well as in research [3]. TA is a form of concurrent verbalisation

which draws it's data from the verbally coded chunks of information in the short term memory of user. TA method has also been criticised on several accounts. One of the prominent criticism of TA is that of sharing the cognitive resources of the user with task fulfillment [5] [15]. TA has been reported to interfere with the task especially in cases where the task is cognitively demanding [22] [23]. TA has been reported to be incomplete as some thoughts are difficult to translate verbally [20]. It has also been argued that the mental process is faster than the verbalisation speed, making it difficult to get continuous data on thought sequences in the verbalisation [21].

As the evaluator is not expected to nudge or probe the user during the task fulfillment in TA method, for the fear of interference with thinking process of the user [4] [14], the evaluator cannot access data pointing out reasons for the users online behaviour. The designers, on the other hand, would need this information on the cognitive processes, including why's and how's of the behaviour. Though the need for obtaining data from UEM so as to be useful to a designer, has been stressed [27], prevalent TA method does not yield data in the required format. Further, the TA data consists of gaps of silence at instances of intensive thinking which leaves it to the imagination of the designer to interpret the intents of the user during these silent phases.

Prevalent HCI design issues, like socio cultural acceptance of an information system, cultural differences in users online behaviour, users adaptability to novelty of the system, surprise as a positive construct to satisfaction and identification of attention drawing elements of the interface etc. has not been the focus of the TA method. For instance, Novelty has been identified as an important construct to good design [29], and a designer would like to know from the evaluator the manner in which a user adapts to a novel design, but would fail to do so using TA method. As TA method gives data on surface level cognitive processes, the deeper associations used by users in dealing with novelty would not be present in TA report. It is posited here that the Mind Tape method will be useful in such cases.

This paper presents a case for Mind Tape method in view of cross cultural experimental test study, which reports observations on suitability of Mind Tape as a method and cross cultural similarities and differences observed in users' cognitive processes.

## **2 Mind Tape in HCI Design process**

The HCI design process has been identified to be iterative in nature [9] [24] [26]. The redesign phase in the process is based on the feedback received from the evaluation phase. It has also been recommended that the design process be based on users' cognitive models of the system and the tasks [25]. The prevalent usability test reports generate statistical information

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about the success rate, error rate, time to complete the tasks etc. However they do not give a detailed account on the underlying cognitive model of the users with respect to the system and tasks at hand. The TA test reports do not provide information on ‘why a certain error occurred’, ‘why did the user chose to select a particular menu item instead of another’ which might, in the first place, have been the reason for the reported error. In absence of any valid data in the form of cognitive models of the system, a designer has to make assumptions and reformulate the design based on guess work. Such guesswork is highly unreliable and may be the root cause of expensive design mistakes. Hence we need a usability evaluation method that could provide the designer with detailed information on the deeper level cognitive processes.

Retrospective methods for capturing users’ cognitive processes have been reported to be useful in such situations [10]. Retrospective Verbalisation(RV) method collects verbalisations of users’ performance after the task fulfillment session is over. The users provide explanatory information about their online behaviours after the task fulfillment is over[12]. RV appears to have good validity if conducted immediately after task fulfillment since the relevant cues for contextual recall are still in the memory [4]. Use of adequate procedures to elicit the retrospective verbal data in order to make retrospective verbal data more reliable has been duly emphasised by Ericsson and Simon [4]. Several studies [12] [11] have attempted to formulate adequate procedures for retrospective verbal data. Mind Tape Method used in this paper belongs to this category of studies and is likely to be of better use to an HCI Designer.

### 2.1 Mind Tape method

The Mind Tape method uses Stimulated Retrospective Verbalisation (SRV), which involves the use of a stimulus such as recording of computer screen activity captured to act as a trigger and refresher for the memory of the user. The stimulus acts as cue to enable the recall of reasoning behind a particular activity / action/ non action during the test. Retrospective replay is adopted with the assumption that, certain secondary and deeper level cognitive processes can be pulled up to the surface without loss or bias of after thought. Under the influence of the stimulus mind acts as a tape and unwinds the memory, thread by thread. By appropriate interviewing, each thread can help trace back deeper level reasoning.

In this paper Mind Tape method and its usefulness to designers is based on the ‘Level Processing Theory’ [30] [32]. This theory proposes that people analyse stimuli at a number of different levels. Shallow levels involve analysis in terms of physical or sensory characteristics and deep levels involve analysis in terms of semantics which consists of associations, images and past experiences in relation to the stimulus. Shallow level memory traces can be quickly forgotten whereas deep level traces are more durable and therefore more reliable. Craik and Lockhart’s [30] hypothesis

that deeper level processing produces better recall has been widely tested [33] [31]. The Depth of processing approach posits that greater the depth of processing, richer the meaning a person extracts from a stimulus.

Mind Tape method belongs to the category of Retrospective Verbalisation (RV). RV has been accused of subjective reporting and memory loss due to time lag between actual thinking process and reporting [4] [17][22]. However, the validity and reliability of data obtained through SRV has been established [12] and the issues regarding quality of SRV data have also been reported in comparison with Think Aloud (TA) [18][11][16]. The stimulation used in Mind Tape during recall ensures the reliability of the recall data.

In order to structure the recall process and to improve the reliability of verbalised data, users in Mind Tape are asked to synchronise the mouse movement with the eye movement on the screen during the task fulfillment stage. The replayed cursor movement over the interface screen during the Mind Tape interview, helps users structure their recall and verbalisation. This ‘hand-eye coordination’ which yields synchronised data on eye movements acts as a low cost substitute to the Eye Tracking equipment. The replayed capture of the cursor movement along with the background of the interface screen helps the user recall the threads of activities in sequence. The users are asked questions on why’s and how’s of the activities performed during the Mind Tape interview and a voice over video is created. The benefit of data collected in this way is that it is rich in content and thus can be analysed in various ways to answer different questions pertaining to future design activity.

## **2.2 Sensitivity of Mind Tape to Cultural differences**

Culture as an influence in socio-behaviour of individuals and as an influencing factor in the cognitive process of the users has been extensively debated [8] [6] [7]. The demand for culturally sensitive interfaces have been on a rise [34] and cultural influences on the prevalent UEM’s have also been investigated [35]. The evaluator- user relationship in the UEM has been an active area in research. Issues like differences in hierarchy, gender, seating arrangement and cultural differences of the user evaluator pairs as a factor in usability evaluation findings, have been raised [36]. The need to allow the user to fulfill the tasks in as natural condition as possible has been duly emphasised in the usability evaluation theory and practice.

In the wake of aforementioned studies on culture as a factor influencing both social behaviour and cognitive processes of the user, it becomes imperative for UEMs to be aware and accommodative of it. The protocol, procedure and settings of the test have to be sensitive to and accommodative of the cultural differences at the socio-behavioural level. On the other hand UEM as a cognitive process data gathering instrument has to be sensitive to the cultural differences in the users’ cognitive processes.

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We posit that in comparison to Mind Tape method, prevalent TA methods may not be sensitive to cultural differences. It is argued here that the culture's influence on the user's cognitive processes works at cognitive levels much deeper than what TA has been intended to capture. It is here that the retrospective method named Mind Tape could be very useful especially for an HCI designer.

In order to examine viability of the above posits and also to find out the cultural sensitivity and scope of Mind Tape method in cross cultural settings, an experimental cross cultural study session was conducted across cultures involving Danish and Indian participants.

## 3 Aims of the cross cultural Mind Tape study

The aims of this study were to investigate

1. Effectiveness of the Mind Tape technique in extracting data from deeper levels of cognitive processes.
2. Effectiveness of Hand-Eye coordination in the Mind Tape, employed as a cuing tool in recall process.
3. Suitability of Mind Tape in cross cultural settings.
4. Effectiveness of Mind Tape method in observing differences and similarities in users' cognitive processes cross culturally.

The investigations and results obtained in response to these questions have been discussed in the following sections.

## 4 Methodology of the experiment

### 4.1 Tasks and Test Apparatus

Online official tourism websites of three different countries namely India, China and Denmark were used as sample systems for evaluation. The web sites were:

1. **India:** <http://www.incredibleindia.org>
2. **Denmark:** <http://www.visitdenmark.com>
3. **China:** <http://www.cnto.org>

The Scenario narrated to the users was as follows: "You and your friends dream of going on a holiday together. You have not decided where to go, but you have imagined different possibilities and during your talks three countries came up. You have access to computers and network so you promised others that you would check up on the countries to get inspired".

Users were given two tasks

- a. To explore the three websites so as to get an overview of places of tourist interest.
- b. To find one place of interest in each of the countries and gather data

to be able to give your friends an impression of the culture and idea of what a holiday could be in that place.

Screen recording software and an attached webcam was used to capture the activities on the screen as well as users gestures. An attached microphone was used to record the interview as voice over. Danish participants conducted the tests on laptops having satisfactory net speed and processing speeds. Indian participants conducted the tests on an LCD monitor with matching computer processing speed and internet connection speed. The tests took around one hour and forty minutes for each on average.

## **4.2 Participants**

The experimental studies were conducted with total of 28 participants from Denmark and India consisting of 14 users and 14 evaluators. 7 user-evaluator pairs were from Denmark and the study was conducted at Copenhagen, Denmark. 7 user-evaluator pairs were from India and the study was conducted at Guwahati, India. All the 28 participants from Denmark and India were enrolled for HCI courses and had knowledge of interaction design issues and usability evaluation practices. The test was conducted in English at both the places and the participants were conversant in English. The mean age of Indian participants was 21.57 with standard deviation of 0.73 while the mean age of Danish participants was 26.14 with standard deviation of 2.29. None of the participants had explored the websites extensively. A few of them had chance visits to the websites of their native countries but had not explored it. The selection of participants and place of study was conveniently sampled so as to study the effectiveness of Mind Tape technique in cross cultural settings.

## **4.3 Test procedure**

### **4.3.1 Initial briefing**

In Denmark, the users and the evaluators both were familiar to the hand eye coordination method and had used it in experiments earlier. In India, the users and evaluators were taught about the hand eye coordination method and made to practice a few times, couple of days prior to the tests.

The evaluators and the users were given detailed instructions in the first session. Users were reminded about the hand eye coordination and were told to be free and natural during fulfillment of tasks. The evaluators on the other hand were informed to refrain from interfering in the task fulfillment by the user. Once the task fulfillment was observed to be over, the evaluators were to save the screen recording. For the Mind Tape interview, the evaluators were suggested to encourage free flow of thoughts during verbalisation. The evaluators were instructed to show attention and acceptance to the users' verbalisation through nod, gestures, phrases

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of acceptance and body language. The importance of users being able to recall by supportive listening and free verbalisation was duly emphasised.

### 4.3.2 Test stages

**1. Task fulfillment stage:** The evaluators started the websites and the screen recording. Scenario was narrated to the user. Tasks were introduced to the user. Request was made to explore each website for about 15 minutes and decide upon one place of tourist interest in each website. The evaluators watched quietly as users fulfilled the tasks and they took notes of the interaction behaviors which had importance in their viewpoint.

**2. Mind Tape interview stage:** The just recorded screen capture of the interaction was replayed. The evaluators conducted interviews using stimulus of screen recording being replayed, pausing the replaying when needed. Users were asked

a. “what were you looking for?” whenever the user’s mouse had wandered around for sometime without clicking at anything

b. “what were you expecting?” whenever the user clicked at something.

The researchers, in the meanwhile, observed the process and took notes of important evaluator-user behavioural characteristics.

**3. Semi-structured qualitative interview stage:** Finally, a semi-structured qualitative interview on the overall impression of the three websites was conducted. The users were asked to give overall rankings to the websites along the parameters ‘website most liked’, ‘website most easy to use’, ‘website having most pleasing interface’. The users were asked to elaborate upon the reasons for the reported Likeness, Friendliness and the most Pleasing interface in the interview. Ratings for the website on a 7 point scale under criteria of Attractive, Exciting and Friendly were collected.

## 5 Analysis and discussion

Mind Tape data collected in above experiment can be analysed in variety of ways such as tabulation, chronological displays, cause effect matrices, relationship and networks. It is source of rich verbal descriptions and explanations of cognitive processes. It is observed that the data preserves chronological flow helping the investigators identify which events led to which consequences. Serendipitous findings are also likely to emerge in different contexts of analysis.

As the present study is more focused on arguing for Mind Tape as a useful method in Usability study, especially in cross cultural context, only one way of the ways of analysing the Mind Tape has been explored. Using Grounded Theory principles [28], the replayed voice over videos were transcribed and important observations were tabulated chronologically. Researchers drew inferences from the Mind Tape verbal data of the

users in context of the online activity being displayed and jotted down the inferences by the side of the observations. By mutual agreement of the researchers some of the inferences were identified to be of importance in the redesign context. The qualitative interview data helped in triangulation of the findings. Statistical data was used to get a glimpse of the overall picture in the two groups of users while their individual responses about the overall experience of the websites was used for internal verification of their verbal reports.

Though the main aim of this study was to investigate the suitability and acceptability of this method, some interesting observations have also resulted which have been discussed categorically in section 5.4 below.

A segment of the user wise, tabulated Mind Tape data, with researchers' inferences, has been exhibited in table 1. In light of the data in table 1 it is argued here that Mind Tape data is much more rich in terms of descriptions and explanations. The users' understanding of certain terms like 'project', 'heritage', 'regions', 'culture', 'inspiration' etc., identified as possible causes of conflict between the users mental model and that of the interaction design, is difficult to identify in other methods like TA. A designer can analyse the data depending on the direction one wishes to take, to suit the required need. Table 2 and 3 display an instance of the statistical data from the overall rankings and ratings of the websites. This data has been used for triangulation and cross validation in the following sections.

## **5.1 Effectiveness of Mind Tape**

Mind Tape method was found to be effective in terms of quality of explanations provided by the users and also in terms of quantity of the verbal data. No user from the pool of 14 participants, reported difficulty in recalling the mental processes that accompanied the events during the interaction. The effectiveness of stimulation of recorded screen being used to aid the recall process became evident. The quality of the explanations provided by the users were found to be of a level that was satisfactory to both, the evaluators and researchers. Also, there were 6 instances when the users reported that they were able to explain things which they were not aware of at a conscious level during the interaction activity. The users also reported that there was no interference with task fulfillment during the test as evaluators watched silently. Thus it is being posited here that Mind Tape technique is capable of yielding sufficient amount of quality data from deeper levels of cognitive processes which will be useful to HCI designers.

## **5.2 Suitability of Mind Tape in cross cultural settings**

It has been argued earlier in this paper that the usability testing methods need to be sensitive to the cultural nuances of test setups, users comfort

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User	Activity	Mind Tape Response	Inference
Dan1	Mouse wanders in the beginning	Looking for Tajmahal, I have heard of only that from India	Users search by what they already know in an unfamiliar site
Dan1	Clicks <i>heritage</i> link	Expected that it will give me some picture of Tajmahal	(users cognitive model of information architecture) Tajmahal = heritage category, need to see visuals first
Dan1	One Image and associated text appears	I am not going to read 10 pages of text I needed more pictures	Need for more visuals, Text is not preferred (at least in the beginning)
Dan1	clicks menu <i>inspiration</i> , many sub menus, clicks <i>culture</i> , further options come	I am not looking specific information, give me a general idea of the place	People want a more general idea of visiting places when they are new, specific information may put them off in the beginning
Dan3	Clicks on link <i>places to visit</i>	I do not know anything about this country so may be it is a good place to begin	Cognitive strategies for search in unknown places is by category and not by names for names are unfamiliar
Dan3	List of places to visit are displayed	I do not know any of these places, how do I choose?	Categorisation of places according to characteristics might have helped
Dan6	Clicks link <i>project tiger</i>	had heard of Tigers from India and thought it will be some kind of tourist plan but it was something else	Mismatch of information cues and actual content. Misleading term <i>Project</i> .
Ind1	After a lot of clicks and searches	Purpose of this site is not clear, whether it is about introducing me to the culture or also helping me get there	The need to get a general idea of the place and to get informing and inviting accounts of the same
Ind2	Reading Text	What kind of writing style is this? are they writing poetry on the place or giving information?	Indian participants indulged in more reading and expected it to be precise
Ind3	First Look of the site	It looks like that this is my country's site, I can Identify with it	Does it have to do with a stronger feeling of cultural identity in this culture?
Ind4	Sub menu with several items	I know most of these but what is this?	In known group of links, urge to explore the lesser known is strong.
Ind5	Page of categorised tourist places	Why is it categorised state wise? I am not visiting states, I am want to know the places. Season wise would have been better.	As opposed to Danish user, the Indian user in the native site was unhappy with the state wise info organisation, Is it a cultural phenomena?
Ind6	Highlights text while reading	I always do it as it helps me identify the text I am reading	Most of the Indian users had habit of reading by highlighting the text with mouse, and they also read more text comparatively. Can we generalise it?

Table 1: Mind Tape Verbalisation Data

Rk	Indian Website						Danish Website						Chinese Website					
	Liked		Easy		Looks		Liked		Easy		Looks		Liked		Easy		Looks	
	I	D	I	D	I	D	I	D	I	D	I	D	I	D	I	D	I	D
1	5	3	4	2	2	1	2	3	1	4	5	5	0	1	1	1	0	1
2	1	2	2	2	4	4	4	3	2	3	2	1	2	2	2	2	1	3
3	1	2	1	3	1	2	1	1	4	0	0	1	5	4	4	4	6	3

Table 2: Users’ Rankings of websites on given attributes

Website	Indian Website					
	Attractive		Exciting		Friendly	
User Group	Ind	Dan	Ind	Dan	Ind	Dan
Indian Website	5.4	5.0	5.4	3.6	4.5	4.5
Danish Website	4.7	4.3	4.0	4.0	4.7	5.0
Chinese Website	3.5	3.8	3.4	3.6	3.2	3.1

Table 3: User’s mean ratings for website

levels, evaluator user relationships during test etc. In light of this theoretical framework the participants were observed from both Danish as well as Indian cultural backgrounds during the test to be comfortable with the Mind Tape method. No participant reported physiological discomfort due to constant verbalisation which has been observed in TA sessions. On the contrary, the users were observed to be quite involved in the Mind Tape verbalisation. A possible explanation, which was submitted by one of the users for this, could be that the presence of a listener made verbalisations more natural in comparison to the TA method where the user verbalises most of the time looking at the screen. The conversation setting between the user and evaluator, even though the evaluator uses silent nods and gestures mostly, makes this method more involving and satisfying to the user in comparison to the TA method. Sometimes users also divulged personal information that they were reminded of during the interaction. Indian users participated more voluntarily and divulged more information on their own and provided logical explanations than the Danish participants. Indian users were found to speak more elaborately about what their expectations and outcomes during the interaction were. On the whole, the Mind Tape data was richer in terms of explanations in case of Indian users than Danish users.

Since, no negative observations regarding suitability of Mind Tape method in cross cultural settings was made by the researchers and the evaluators and positive reports regarding the comfort level were given by the users, suitability of the Mind Tape in cross cultural settings is posited here.

### **5.3 Effectiveness of Hand-Eye coordination**

As the hand eye coordination was used to help cueing the recall process in Mind Tape, it was essential to also validate effectiveness of this tool through observation and user report. There was a mixed response observed to the hand-eye coordination tool from the users. Of the 14 participants altogether, 3 Danish participants reported 'no problem' using the hand eye coordination and that it was 'natural', 2 Danish participants reported that it was difficult when 'scanning the pages' and that 'the eye moved faster than the hand'. 4 of Indian participants reported the difficulty in 'scanning the page' and 2 said 'it was natural while reading'. From the above observation, since majority of the users across cultures were positively oriented about the hand-eye coordination in case of menu viewing, scrolling, text reading and searching, it is posited, that it is an effective tool for later cueing the recall process without interference to the task or causing discomfort to the users. The effectiveness of the hand-eye coordination was observed to be less in case of picture viewing and quick perusal of webpages. This may be so because eye moves faster than the hand and in cases of unstructured tasks, it is expected to be more chaotic, making the coordination between the two more difficult. This tool needs to be further investigated for effectiveness and possible interference in task.

### **5.4 Effectiveness of Mind Tape in observing cross cultural difference in cognitive processes**

Though this study was focussed on investigating suitability of the Mind Tape method, the experiment itself revealed suggestive data towards similarities and differences in the cognitive processes of users cross culturally. This finding is being reported here to help intensify the argument in favour of Mind Tape on one hand and on the other to argue the need to consider the cultural nuances of cognitive processes for interaction design.

#### **Observations suggestive of cultural differences in cognitive processes**

**Observation 1:** Danish users were observed to indulge much less in reading texts on the web pages compared to their Indian counterparts. The Danish users emphasised more on the need of images (Table 1, row 3) on the websites than the Indian participants. The Danish participants also stayed a lot less amount of time on each webpage as compared to the Indian users. Some Indian participants also commented on the composition style of the text (Table 1, row 9) and complained about the inappropriateness of the style of writing for the site, which was not observed in any Danish user. 4 of 7 Indian users also exhibited a peculiar habit of highlighting the text while reading which was not exhibited by the Danish

users. This observation was in accordance with the observation of their reading habit. The hypothesis generated thus, “Danish users are willing to read less in comparison to Indian users” could be tested further for generalisation.

**Observation 2:** Indian participants’ tendency to get a holistic impression of the site before actually fulfilling the task was more prominent as compared to the Danish participants. Even though both the groups of users, Indians as well as Danish, were unfamiliar about their counterpart country’s tourist places, the Danish users started with more specific queries like, Tajmahal, Tigers, Beaches etc. (Table 1) in comparison to Indian users who went about first getting a general picture of the place by browsing through contents. Apart from a number of other possible reasons, this phenomena could also be due to a more holistic thinking approach by the east Asians than westerners, as reported by Nisbett et al [7].

**Observation 3:** Indian website was liked more by Indian users than by Danish users (Table 2). 4 out of 7 Indian users identified themselves culturally with Indian website (verbal expression of one such participant is exhibited in Table 1, row 10) whereas no such accounts were observed from Danish users for Danish website. This could indicate presence of stronger cultural identity in Indians which may affect tacitly the overall impression of the websites reported by them. Though bright colours of the Indian website was reported to be ‘attractive’ to both the Danish and Indian users (Table 2) they made the Indian users feel more ‘at home’ due to traditional cultural graphic elements. This could be a reason for Indian users rating the Indian site as more ‘exciting’ (Table 3) compared to the Danish users who found their native country’s site (Table 3) more exciting. Both the group of users reported that it was ‘easier to use’ their own native countries website (Table 2). Such cultural differences in the cognition of interfaces due to difference in strength of cultural identity thrown up by Mind Tape technique can become inputs for interaction design in cross cultural situations.

**Observation 4:** Though the Information was categorised geographically on both websites, most Indian users (6 out of 7) were critical of information categorisation on Indian website in comparison to the Danish website. One of the possible reasons for differential thinking by Indian users could be, that Indian users, who were aware of the greater seasonal variation in Indian subcontinent, thought of holidaying in the context of seasons. Indian users expected and expressed the need for a ‘season wise’ (Table 1, row 11) categorisation of the tourist information instead of geographical. This could be a cultural phenomena which the cross cultural HCI designer will need to take into account.

*Observations suggestive of similarities in cognitive processes*

**Observation 1:** Participants from both countries while searching in

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unfamiliar territory, tended to order their search from more known to lesser known places. For instance, Danish participants exploring Indian website, started their search from looking for 'Tajmahal'. This search by familiarity in unknown places was significantly observed in both groups of users. Upon probing they replied that they knew only famous tourist spots so they explored them first. The complementary phenomena of prioritising search by choosing unfamiliar places in known country was also observed. Users while searching for places of interest in familiar set of places, when confronted with a previously known set of places, clicked on items less known to them. Upon probing they replied that they were curious to explore the lesser known. This observation could be critical for the information design in scenario of cross cultural usage. It would help designer to prioritise the sequence of appearance of information for greater satisfaction of culturally different users.

**Observation 2:** Almost all participants (6 out of 7) were critical of lack of images on websites. They articulated the need to get a feel of the place which in their opinion was only possible through images. They quit webpages with no images more quickly and rated such websites lower. Users also preferred to read the text accompanying pictures more than other instances.

**Observation 3:** Both the groups of users found the Danish website almost equally attractive and exciting. The explanations given for this by both the groups of users were 'it had a clean and simple look' and 'information looked organised'. It may be posited here that the visual cues associated with 'simplicity' and 'cleanness' of the website layout, are similar in the perception of the Danish and Indian users in spite of other culture related cognitive differences and preferences. From the above observations it is posited that Mind Tape method yields rich data in cross cultural settings.

## 6 Conclusions

This paper has highlighted the suitability of Mind Tape method for usability evaluation in light of findings from a cross cultural experimental test study. The need for detailed information on users' deeper level cognitive processes to aid the design of interactions has been identified. The Mind Tape method's capability to mine the deeper cognitive information has been observed. Accommodation of cultural variations in behavioural patterns of users has been recognised as a factor in the usability test setups and Mind Tape's suitability in this regard has been observed. The sensitivity of Mind Tape method in surfacing out the cultural cognitive differences and similarities for direct usage by designers has been observed.

The cultural suitability of the Mind Tape Method was found to be more prominent in case of Indian users in comparison to Danish users. This could be attributed to relational, dialectical and personal charac-

teristics of the east Asians [13]. Further development of the Mind Tape method could make it a useful tool in HCI profession. Mind Tape as a method for remote testing could be explored as it is easy to obtain the mouse track data remotely and thus could make it more reliable method for remote testings.

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