Informing Design Decisions for Advice Mediating Handheld Devices by Studying Coffee Cup Reading

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ABSTRACT

Several studies have been made on advice encounters supported by tabletop displays, yet the potential of handheld devices in enhancing advice interaction still remains open to research. As an attempt to fill this gap in the literature, we chose Turkish coffee fortune-telling, as it is a centuries-old practice of giving advice that is based on the use of a cup and saucer. We organized sessions with 34 fortune-tellers and analyzed their verbal and non-verbal interaction during advice instances. Our analysis resulted in 7 preliminary design considerations: *single-hand interaction*, *beat gestures to augment advice messages*, *body as a reference point*, *different ways of sharing information*, *manipulating objects to soften advice messages*, *multiple advisor profiles* and *regulating gaze interaction*. To see how these considerations would be employed in practice, we organized a participatory design workshop which yielded 6 handheld device concepts that proposed stimulating mechanisms for advice interaction.

Author Keywords

Advice interaction; coffee culture; fortune-telling; co-located interaction; handheld devices; cylindrical displays.

ACM Classification Keywords

H.5.2 User Interfaces.

INTRODUCTION

Advice is present in our daily life in various contexts. In this research, we consider the definition of advice as "recommendations about what might be thought, said, or done to manage a problem" which is believed to be the most frequent single type of communication in supportive interactions [7, p1]. We tend to both give and ask for advice in interpersonal communication to provide or receive social support. Yet, advice-giving situations in informal settings [18,p7], such as meeting with a friend at a coffeehouse to ask for advice, have not been investigated comprehensively

in HCI. Existing research on advice interaction is limited to workplace as it addresses how information technology (IT) artifacts, specifically tabletop systems, could support formal advice interactions in institutional settings such as financial advice encounters [10,22,24]. Compared to institutional settings, the informal encounters are mostly marked by spontaneous social interaction that is unfolding according to the problems, mood, personality and expectations of the advisee, which are not always obvious or predictable. Therefore, establishing a helpful communication can be socially and emotionally demanding for the advice-givers as they have no reference except the conversation itself to interpret the situation of the advisee. We think that IT artifacts might present novel ways for advice-givers to confront such challenges in these settings. In this regard, however, the mediation of tabletop displays or large screens for face-to-face communication might be less common or undesirable in informal settings (e.g., home, cafes, pubs). Although smartphones are pervasive, they are not devices conceived to support co-located interactions [9]. Yet, familiar objects intrinsic to these places like coffee mug that people handle regularly, or sometimes play with on purpose to reinforce their verbal discourse, can be worth examining as they might assume a role in mediating conversations, in our case advice interactions.

These differences between two advice settings, and our literature review, guided us in formulating our research problem: how could we design for face-to-face advice interactions in informal settings in which the advice exchange between two people is mediated by a handheld device? *More specifically, what could be the elements to consider in designing for an advice mediating handheld device to be used in such a setting?* In approaching this design challenge, we considered that Turkish coffee fortune-telling practice, that one comes across almost everyday in Turkey, might trigger us as a source of reference and inspiration [27]. Investigating cultural phenomena and practices have been considered in HCI as a fruitful resource to exploit existing mental models of individuals and explore new metaphors for tangible interaction [12, 26]. Turkish coffee fortune-telling motivated us as it represents a traditional example of supportive communication, which is based on a co-located, face-to-face and object-mediated setting, just as the challenge suggests. From an HCI perspective, we can think of the cup and saucer as interactive handheld devices; the

coffee ground as content; the fortune-tellers and the listeners as users; and the communication between them as advice interaction. In this regard, how fortune-tellers handle and manipulate the cup and saucer, and their way of reading the coffee ground inside these objects have the potential to propose a stimulating vocabulary of interactions. Thus, we conducted fortune-telling sessions to understand if this cultural practice could provide any feedback for a potential handheld device for advice interaction. As the practice revolves around fortune-tellers' continuous interaction with the cup and saucer in various ways, and they cover the role of advice-giver, we focused on them in our study and kept the listeners constant across participants. Our aim was not to replicate or renew the traditional advice-giving practice but rather to explore its interaction mechanism that might help us to inform design decisions for advice mediating handheld devices.

In this paper, we first introduce and provide the context of Turkish coffee fortune-telling practice. Then, we report our empirical study by providing an account of how fortune-tellers, as advice-givers, manipulated objects, delivered advice messages, performed gestures and directed their gaze in interacting with the listener. We discuss how these behaviors and actions could inform the design of handheld devices for advice interaction by presenting preliminary design considerations and sharing the outcomes of the participatory design workshop we conducted.

IMPORTANCE OF TURKISH COFFEE FORTUNE-TELLING FOR ADVICE INTERACTION

In Turkey, this socio-cultural practice is a traditional form of advice giving. It is quite popular among people from all ages and is a common daily social activity. On one hand, there is a population quite interested in having their cup read by friends or relatives. On the other, there are special coffeehouses called "fortune-telling cafés" that offer readings to customers and where many people practice fortune-telling as a profession. As a matter of fact, there is no official document that certifies their level of expertise, or what they practice as a profession. However, the fortune-tellers working at these cafés are perceived by people as "specialists" or "professionals".

This cultural practice transforms the coffee from a type of drink into an object that mediates a conversation. The coffee ground in the cup is believed to bear traces related to the life of the person who has drunk the coffee, and the practice is based on "reading" this ground and talking about the past, present and future life of this person. Although, fortune-telling is usually associated with foreseeing the events to come, the practice is not limited to that [1,4,21]. Studies indicate that fortune-telling is perceived as a way to seek social support and advice in different societies [16,19,28]. During Turkish coffee fortune-telling practice fortune-tellers discuss the state of various aspects such as emotions, friends, relationships, education, family etc. They tend to express their opinions on these, ask questions and

give advice on problems in order to provide insight to one's life and personality. Turkish coffee fortune-telling pratice involves two people: the fortune-teller and the listener. The initial steps and cup reading in a typical Turkish coffee fortune-telling session are as follows (Figure 1): (1) The person drinks the coffee until there is only the residue left in the bottom. (2) Then, the saucer is placed on the cup; the cup is handled in this configuration and turned around three times. (3) Then the cup is turned upside down and placed on the table. This shapes the coffee ground inside the cup and extends it on the saucer. (4) When the bottom of the cup cools down, the fortune-teller starts the session by lifting and reading the cup. (5) By examining first the coffee ground inside the cup and then on the saucer the fortune-teller tells the person's fortune.

Figure 1. The initial steps (1,2,3) and cup reading (4,5) in Turkish coffee fortune-telling practice

Basically, the fortune-teller looks at the stains that the coffee ground created inside the cup, interprets them, construct the fortune-telling discourse and convey messages related to the life of the listener. Some shapes the coffee ground creates are signs that have fixed meanings. For example, a fish means good fortune; a snake refers to enemies; a camel indicates wealth and so on [3,p104]. However, they are open to diverse interpretations and the fortune-teller can use these meanings or interpret the shapes differently according to the listener.

EMPIRICAL STUDY: INVESTIGATING TURKISH COFFEE FORTUNE-TELLING PRACTICE

Procedure

In order to observe this traditional practice we organized fortune-telling sessions. Each fortune-telling session was composed of a fortune-teller, a listener and the researcher. The fortune-teller and the listener were sitting at the table facing each other. The fortune-teller was telling the listener her fortune by reading the cup and saucer she used to drink the coffee on location. The sessions were held at various coffeehouses around the city, or at similar places within the university campus. There was no limit to the duration of the session and the average duration of each session was around 10 – 15 minutes. Before each session the fortune-tellers were asked to complete an informed consent form and a questionnaire with demographic questions. We used a cover research subject in the form to avoid participant bias and told people that we aimed to examine "Fortune-telling scenes in Cinema" and compare real-life fortune-telling sessions with those in films. The sessions started with the fortune-teller reading the cup of the listener. When the fortune-teller was finished with the cup, she was moving onward by reading the saucer. When the reading of the

saucer was completed, the session ended. The sessions were video recorded by the researcher sitting at approximately 150-200cm from the table, with an iPhone 4. A small tripod was also used in order to obtain a stable image and give freedom to the researcher to observe and take notes during the sessions. The camera was positioned to frame the hands, arms and faces of both participants to record the body movements. In small locations we used wide angle lens. The video recordings were 720p video files that provided sufficient image quality to identify and examine our coding categories, including changes in gaze direction. For a clear audio the conversations were recorded by an iPad placed on the table. These audio files were later synced with the video recordings for the transcription and analysis.

Participants
We conducted the study with two groups of fortune-tellers. The first group consists of individuals that were telling fortune occasionally only as a social activity at meetings with friends or colleagues. We called them Occasional Fortune-tellers. The second group consists of individuals that were practicing fortune-telling regularly at coffeehouses as a service on payment. We called them Regular Fortune-tellers. We considered the existence of these configurations as a promising variety. In order to encompass and evaluate the whole range of possible interaction styles that this practice could offer, we included both of these fortune-teller profiles in our sample. In the end, we conducted fortune-telling sessions with 34 people who were knowledgeable in fortune-telling and have been practicing it in different contexts.

Fortune-tellers: 34 people participated in the study as fortune-tellers. Among them 16 were Regular Fortune-tellers and 18 were Occasional Fortune-tellers. In the group of Regular Fortune-tellers there were 12 females and 4 males (M_{age} = 38.4, SD= 9.4). In the group of Occasional Fortune-tellers there were 15 females and 3 males (M_{age} = 22.4, SD= 2.1). We recruited the Regular Fortune-tellers by contacting fortune-telling cafés. The Occasional Fortune-tellers were recruited among undergraduate/graduate students.

Listeners: Two female university students, one 22 and the other 23 years old, were selected to participate in the fortune-telling sessions. These participants were selected among female individuals who were undergraduate/graduate students and passionate about fortune-telling. Only one listener participated in each session and had her cup read by a fortune-teller. The purpose for recruiting two listeners was to schedule more sessions in a shorter time.

CODING SCHEME
Our literature review [1,3,21,27], pilot fortune-telling sessions and preliminary view of all the recordings gathered from the study guided us in identifying the components to focus on for the coding and analysis of the data. Regarding the verbal interaction, identifying advice messages to mark

the advice instances was fundamental. By doing this, we wanted to see what type of advice the fortune-tellers delivered in order to observe if their nonverbal behavior with the cup and saucer changed according to their advice strategies. Therefore, our first component was *advice messages*. The fortune-tellers' hand movements were fundamental as they were an inseparable part of their discourse [20] and nonverbal interaction, with or without the cup and saucer. Consequently, our second component was *hand gestures*. How the fortune-tellers directed their gaze was another component that would provide information on their connection with the listener and the cup and saucer. Hence, our third component was *gaze direction*. The fortune-tellers' physical engagement with the cup and saucer, that is, how they get into contact with these objects and position them around, was of interest to us. This way, we wanted to understand if they tended to engage with these objects frequently or not, as well as how. Thus, our fourth component was *contact with objects*. In summary, we identified 4 components for coding: *advice messages*, *hand gestures*, *gaze direction and contact with objects*.

Advice Messages
We first transcribed the dialogues to identify the advice messages and mark the advice instances in the sessions. We searched for phrases that contained recommendation(s) by examining the use of linguistic features [11,17] recorded in the transcription. We coded these as advice messages and classified them into two types: *direct* and *indirect advice*. These indicated two types of advice-giving strategies that the fortune-tellers used. *Direct advice* consists of recommendations expressed with imperatives or modal verbs of obligation as in *"Talk to him"* or *"You should go there"*. *Indirect advice* is the expressions that imply a recommendation by using a milder language as in *"If I were you I wouldn't do that"*. By coding *Advice Messages* component, we wanted to analyze the advice strategies in order to see if they provoked a change in the way the fortune-tellers used the cup and saucer, or gaze direction.

Hand Gestures
Gestures, in particular meaningful ones including hand movements, have a significant place in embodied cognition theory since they help connect and transmit language and thought [2, p502]. We examined the fortune-tellers' spontaneous hand gestures with and without the cup and saucer, and types of gestures employed. We also looked at the frequency of all gestures performed by one hand or both hands. Then, we focused on the kind of gestures the fortune-tellers performed. Within the category of communicative gestures which do not involve handling or manipulation of objects, we followed McNeill's categories [20] and coded the gestures as *deictic, iconic, metaphoric* and *beat*. *Deictic gestures* are used to indicate an object, as in pointing at the table with the index finger. *Iconic gestures* reflect the objects' shapes and their relationship with each other. For example, when we give directions on the street we explain the way by moving our hand from left

to right. *Metaphoric gestures* are used to convey abstract concepts, and metaphors used in language. The role of gestures in this case is to express the abstract thought in a concrete manner with the aim of facilitating the mental imagery for both the speaker and the listener. *Beat gestures* are short and quick movements that accompany the rhythm of the speech. They are used to mark the words and reflects the structure of a narrative discourse. To these categories, we added *manipulative gestures* [13,15,23], which are related to objects such as moving, touching, twirling and shaking the cup or saucer. By coding *Hand Gestures* component, we aimed at revealing the the fortune-tellers' hand preferences (single-hand or double-hand) and analyzing the types of gestures to inform the design of potential interaction techniques for handheld devices to be used in advice interaction.

Gaze Direction

As managing eye contact is considered as an important behavior in interpersonal communication for reflecting self-confidence and trust in front of the other [5,6,17] as well as for regulating cognitive load, we wanted to see the fortune-tellers' use of gaze direction during advice-instances. During the interaction there were five possible spots where they might direct their gaze: *cup*, *saucer*, *listener*, *environment and other*. The *cup* and *saucer* refer to the gaze directed at the principal objects of the fortune-telling practice. *Listener* refers to the body of the person that was the target of advice messages. *Environment* refers to the gaze directed elsewhere, outside the space where the advice interaction occurs such as walls, windows etc. *Other* refers to the gaze directed at nearby objects such as pen, notebook and tarot cards. By coding *Gaze Direction* component, we expected to reveal if the fortune-tellers focused their attention on the cup and saucer , and how frequently, during advice instances.

Contact with Objects

We examined how the fortune-tellers approached the cup and saucer, and how they handled them. During advice giving the fortune-tellers held or positioned the cup and saucer in different states. We coded the different states that these objects assumed in the sessions. We identified four categories of object state for the cup and saucer as they were: *a) held on the table*; b) *held in mid-air*; *c) left untouched on the table* and d) *when the saucer was held above the cup*. The first two categories indicate the moments in which fortune-tellers held the cup or saucer. Holding refers to the state of keeping the object in the palm of one's hand with or without manipulating it. The third category indicates that fortune-tellers held neither the cup nor the saucer so their hands were free. The last category is a special case as a fortune-teller always has to place the saucer above the cup, at least for a while, to avoid the coffee ground from dripping down from the saucer down on the table. By coding *Contact with Objects* component, our aim was to analyze how frequently the fortune-tellers contacted the cup and saucer, and in which state, as well as

to observe if the contact changes according to the advice strategy in use.

RESULTS

Once data was collected, every instance of speech in the video recordings was transcribed into text by native Turkish speakers. We coded and analyzed how the fortune-tellers manipulated objects and used advice messages, gestures and gaze in interacting with the listener. Coding was done by one of the authors who is experienced in linguistic and gesture research areas. We present the results under the 4 categories according to the components explained in the previous section: *advice messages*, *hand gestures*, *gaze direction and contact with objects*.

Advice Messages

We identified 151 advice messages in total. Among the 34 fortune-tellers 5 did not give any advice. In the analysis, we excluded these 15% of the fortune-tellers from our sample. All fortune-tellers gave mostly direct advice: 83% of all the advice messages they used reflected direct advice, while they only used indirect advice 17% of the time (Table 1).

Advice Type	Advice Messages
Direct advice	83.39%
Indirect advice	16.61%

Table 1. Types of advice employed by the fortune-tellers

Hand gestures

All fortune-tellers preferred to produce gestures with one hand while communicating advice messages (*86% single-hand vs. 14% double-hand*), *t(28)=3.72, p=0.001*.

Hand Preference	Gestures
Single-hand	85.96%
Double-hand	14.04%

Table 2. The fortune-tellers' hand preference for gesturing

Gestures that do not involve handling of objects such as pointing, iconic and beat gestures, in other words communicative gestures, were also used more than manipulative ones *(%82.51 communicative vs. %17.49 manipulative)*, *t(28)=4.24, p=0.001*.

Gesture Types	Gestures
Iconic	7.62%
Deictic	6.73%
Metaphorical	9.42%
Beat	58.74%
Manipulative	17.49%

Table 3. Gestures performed by the fortune-tellers

These results indicate that fortune-tellers mostly used one hand only and preferred free-hand gestures in communicating their advice (Figure 2).

Gaze Direction

We found that all the fortune-tellers changed their gaze direction according to the type of advice messages they used (Table 4). In giving direct advice messages fortune-tellers tended to spend more time talking while their gaze was directed at the face of the listener (*53%*). However, in

giving indirect advice messages fortune-tellers tended to focus their gaze on the cup (47%) and saucer (22%).

Figure 2. Screenshot from an experiment recording. Listener on the left; fortune-teller on the right.

Gaze Direction	Direct Advice	Indirect Advice
Cup	22.26%	46.94%
Saucer	13.14%	22.45%
Listener	53.28%	16.33%
Environment	5.84%	6.12%
Other	5.47%	8.16%

Table 4. Gaze behavior during direct and indirect advice

Contact with Objects

In engaging with objects we noticed a particular distinction between Regular Fortune-tellers and Occasional Fortune-tellers (Table 5). During the communication of advice messages Regular Fortune-tellers held the *coffee cup 19%* of the time and the *saucer 35%* of the time. In the remaining *47% of the time they used free-hand gestures. In other words, they* did not engage with the cup and saucer for half of the advice instances. In contrast to Regular Fortune-tellers, Occasional Fortune-tellers *held the cup %54* of the time and *held the saucer 34%. Only 11% of the time* did they leave the objects on the table. Therefore, the free-hand situation frequency was significantly different between Occasional Fortune-tellers and Regular Fortune-tellers (*47% vs. 11%), t(27)=2.92, p <0.01.*

Contact with Objects	Regular Fortune-tellers	Occasional Fortune-tellers
Holding the cup	18.75%	54.4%
Holding the saucer	34.66%	34.4%
Both hands free	46.59%	11.1%

Table 5. Showing how the fortune-tellers engaged with objects

DISCUSSION OF THE STUDY

We derived the following preliminary considerations for the design of handheld devices to be used in advice interaction. We provided the rationale based on our findings under each consideration:

Precedence to Single-hand Interaction

Designers should consider that advice-givers use mostly single-hand whenever they manipulate the objects or perform freehand gestures. Therefore, the handheld device should allow input from single-hand gestures and it should offer a space that would not hinder free-hand gestures used for expressing oneself in social interaction.

Above consideration is based on Table 2 and 3. Table 2 shows that the fortune-tellers preferred using single-hand gestures, whether their hand was empty or manipulating an object. In addition, Table 3 shows that the fortune-tellers used mostly communicative gestures. We can explain this preference by the narrative nature of fortune-telling. Fortune-tellers look at the cup and saucer, interpret the coffee stains, build a narrative around them and transform it into a discourse. In doing this, as the results suggest, they do not benefit only from verbal language but also from expressive hand movements. However, holding the objects with two hands gives no room for producing communicative gestures, that is, expressive freehand gestures. Therefore, the fortune-tellers tended to hold the cup or saucer in one hand so that the empty hand was ready for gestures to communicate the discourse. Regarding the double-hand gestures, we can say that employing both hands might give the advice-givers more freedom to express themselves as it is possible to perform also simultaneous gestures by using empty hands together. However, this would interrupt the contact with the cup and saucer, which might not always be preferable as they represent the source object of advice. When it comes to manipulative gestures, using both hands could be preferred to rotate and revolve a cup-shaped handheld device, as in our study, to examine the contents in a careful manner.

Beat gestures as an input to augment advice messages

Designers should benefit from beat gestures by exploring their function of highlighting speech and helping memory, and integrate it into the device to augment advice messages.

This consideration is based on Table 3, which shows that more than half of the gestures produced by the fortune-tellers were beat gestures. Beat gestures are rhythmic or repetitive hand movements. We believe that the frequent use of beat gestures are linked to emphasizing advice messages and increasing their memorability [25]. In addition, they are considered as a sign of feeling competent about the subject matter.

Whole body as an extension of handheld devices

Designers should consider the potential of connecting the body and the handheld device for advice-giving. They might introduce wearables and smart textiles as a part of advice interaction. For example, bodies can become interactive spaces where advice messages can be projected.

The consideration above is derived from Table 3 as well, which shows that during giving advice messages the fortune-tellers used few deictic gestures. Interestingly, among these pointing gestures 53% of them referred to the body of the listener or that of the fortune-teller. 27% of them referred to tarot cards or a notebook. *Only 20%* referred to the saucer. In other words, the fortune-tellers used deictic gestures mostly to point at bodies, but not at

the objects. This means that the coffee ground in the cup and saucer is not the only representative of the listener but the listener's body is a reference point as well. Therefore, the body, alongside the objects, appears to be a significant reference point for gestures in advice interaction.

Different ways of sharing information

Designers should recognize the information sharing preference of advice-givers and consider the effect of different form factors of handheld displays (curved vs. flat) on this behavior.
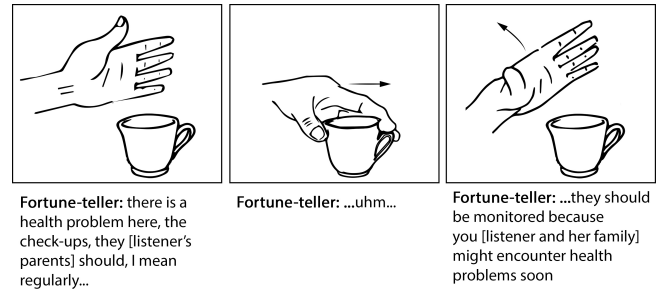
Also this consideration is based on Table 3. We see the deictic gestures used by the fortune-tellers suggest that they did not prefer to disclose the content of the cup during advice instances. However, they pointed at the saucer to show what they saw. This behavior seems to have a relation with the form factor of the objects. The saucer is slightly arched but has a flat surface. The small cup is shaped like a cone and is marked by a cylindrical surface. The inner surface of the cup that holds the coffee ground is most easily seen by whom handles the cup. The form factor of the cup might make it more demanding to show the inner surface. The saucer instead offers an open and flat surface therefore it presents a more exposed surface respect to that of the cup. This might have rendered easier for fortune-tellers sharing the images they saw inside the saucer with the listener.

Handheld devices as a tangible support to soften advice messages

Designers should consider how the existence of an interactive object would support the advice-giver in softening advice messages. Slight touch or movements applied on the device that do not seem as commands might be an important input for the device in advice-giving situations.

The consideration above emerged when we examined the manipulative gestures performed by the fortune-tellers. We noticed a particular use of hand movements. We can compare it to a phenomenon in linguistics: the words employed to soften strong expressions are called *hedge devices*. For instance, instead of "You should talk to him!", one says "*Just* try talking to him". Hedge words are used in advice interactions to mitigate the oncoming advice [14]. We observed that this linguistic phenomenon demonstrated itself also in the way the fortune-tellers used objects. Among the manipulative gestures employed, *28% of them* were related to softening the advice by contacting objects such as touching the cup for a short time or moving it slightly (Figure 3). The data indicates that the fortune-tellers used one-third of their manipulative gestures for mitigating the advice messages. These suggest that fortune-tellers tend to soften the impact of their advice on the listener not only by playing with words but also by playing with the objects. This behavior might be linked to reducing face threat in interpersonal communication, which is an important part of social communication [4]. The short

touches and slight movements applied on the cup and saucer creates an implicit and tacit interaction between the fortune-teller and listener. This also demonstrates that the presence of the objects could function as a tangible aid in advice interaction.

Fortune-teller: there is a health problem here, the check-ups, they [listener's parents] should, I mean regularly...

Fortune-teller: ...uhm...

Fortune-teller: ...they should be monitored because you [listener and her family] might encounter health problems soon

Figure 3. Fortune-tellers move objects slightly, or touch them, to soften advice messages

Individual differences in engaging with objects

Designers should consider the existence of multiple advice-giver identities and approaches, and the resulting non-verbal behavior. The handheld device should be responsive both to the confident and the inexperienced.

This consideration is connected to the results in Table 5, which indicates that Regular Fortune-tellers contact objects less frequently than Occasional Fortune-tellers. In other words, Regular Fortune-tellers tended to give more importance to use free-hand gestures in communicating advice. This result was particularly important for us as it demonstrated the usefulness of including both fortune-tellers profile in the experimental design. This way, we were able to reveal more than one approach in the fortune-tellers' engagement with objects. Previously we stated that the Regular Fortune-tellers are perceived as "experts" as they practice fortune-telling as a profession and read more cups than the Occasional Fortune-tellers. Playing with other objects during speech can be interpreted as being nervous or not feeling confident [8] therefore keeping the cup and saucer in hand during the advice instances could compromise the "specialist" and "expert" image of the Regular Fortune-tellers. The result indicates that there is more than one advice-giver profile and each one might have a level of confidence and experience of their own. Behavior and needs of each might dictate different design decisions. Welcoming diverse approaches and identities emerges as an important point in designing for advice interaction.

Regulating gaze interaction

Designers should take into account that in a potential interactive system mediating advice, the feedback should not be invasive and interrupt the natural flow of gaze interaction. In this regard, different kinds of feedback in the same device might also be considered according to the level of experience or confidence of the advice-giver (i.e. haptic feedback for the experienced and visual feedback for the inexperienced). As the gaze is not always directed at the

object, the device should allow input/output also in eyes-free mode.

The consideration above is related to the results of our gaze direction analysis in Table 4. It shows that the fortune-tellers tended to look at the face of the person with whom they communicated while they were giving direct advice. In other words, when the fortune-tellers were confident about their advice they maintained eye contact most of the time with the listener. This data supports previous research on the effect of eye contact with the other interlocutor as a sign of competence and credibility [17]. The previous research shows that financial advisors dedicated considerable amount of time looking towards their clients during advice encounters supported by tabletop display [10]. Our study demonstrates that also in the context of using handheld objects the same behavior occurs. However, in giving indirect advice the fortune-tellers tended to move their gaze towards the cup or saucer rather than the face. In other words, if advice-givers are inexperienced, or not confident enough about their advice, they tend to direct their gaze at the source object rather than the face. Another point to consider regarding gaze interaction, and also hand gestures, is that they are related to cultural behavior as well and therefore their use might differ across cultures. In summary, a potential handheld device should be responsive to the changes in nonverbal behavior caused by different advice strategies and cultural approaches.

PARTICIPATORY DESIGN WORKSHOP

To observe what kind of device concepts, themes and settings the design considerations we obtained could trigger in practice, we organized a participatory design workshop by recruiting 16 people: 6 interaction designers, 6 product designers and 4 potential users. We created 6 groups: 4 of them were made of 3 people selected from each circle of participants. As 2 potential users renounced in the last moment, the remaining 2 groups were composed of an interaction designer and a product designer. Although the lack of two potential users created a numeric difference in terms of group members, it did not alter the flow of the workshop. Interaction designers and product designers were practitioners and fundamental for the workshop as we wanted to see how they would interpret our design considerations in practice and transform them into interactive system prototypes. In recruiting potential users, however, we did not ask for a specific background, as everyone was a potential user in the study since the advice interaction in question was not institutional (i.e., financial, legal or medical advice). Yet, we preferred those engaged in different fields respect to the other two participant profiles to maintain diversity during the group discussions.

We can refer to Design Thinking for the steps we followed to guide the workshop. We started by describing to the participants the conditions of the advice interaction to be considered during the workshop. These conditions were deliberately mentioned as they were corresponding to the interaction setting we examined in our study on Turkish coffee fortune-telling. Therefore, as the discovery and interpretation phase the participants studied the face-to-face and co-located advice encounters a) *between two people*; b) *occuring in a non-institutional and informal setting*; c) *taking place while sitting at the table*; d) and *based on the use of handheld objects*. We also introduced our preliminary design considerations however we did not mention coffee fortune-telling neither disclose our research on the phenomenon. Following this, we asked them to generate as many ideas as possible for a conceptual handheld device without considering technological or form factor boundaries for the described setting. Then we wanted them to work on prototyping their selected idea(s).

Workshop Outcomes
Concept No.1: A ball-shaped object for personal use that supports an individual in giving advice by allowing her to share own experiences and memories related to the similar problems faced by the advisee (Figure 4). The concept aims to strengthen the advice by showing evidence from one's own life. The object is based on a layered structure, which unfolds in form of leaves as the conversation goes on. These leaves behave as small displays that show visuals related to personal experiences of the advisor. The object slowly assumes a flower-like shape in the course of interaction. *This "blooming" is regulated by the advisor, and the level of acquaintance between the interlocutors is determined according to hand gestures and other data recognized from the sensors. The mechanism benefits from beat gestures as a way to highlight an important point on the leaves by tapping. Moving this personal object towards the advisee is considered by the group as a way to soften advice messages.* Regarding this, they stated that sharing a personal artifact with the other demonstrates trust and thus sincerity or belief in the advice.

Concept No.2: A turn-based advice exchange system based on the hourglass metaphor (Figure 4). Both interlocutors have a small cup-shaped object. Their form is similar to that of the two recipient parts of an hourglass. In the beginning of the conversation the cups of both sides are placed on the table upside down. *Both sides talk in turns by grasping the cup and whispering into it. Then to transmit what is told inside, a question, problem or advice, the cup is placed on the other interlocutors' cup, which creates an hourglass structure. In accordance with the metaphor, the content in the advisee's cup flows into the advisor's cup. In the end the advisor turns the hourglass structure upside down to grasp and brings it close to the body, specifically to the ear to listen to the cup now filled with the advisee's message.* This concept tries to regulate the advice exchange by introducing in a face-to-face interaction, which is by nature a synchronous communication, a turn-based character to regulate the advice exchange. *On one hand, this aims to prevent both sides to interrupt their talk and on the other it allows to maintain the characteristics of a co-located interaction as it allows eye contact and gestural interaction*

during talking/listening. During the ideation process this group also sketched an alternative concept which was an artifact in form of pyramid inspired by fortune-telling practice. We considered this approach particularly interesting and supportive to our research as the participants regarded, and tried to benefit from, coffee fortune-telling as an advice-giving experience, too, although we did not disclose our research on the phenomenon.
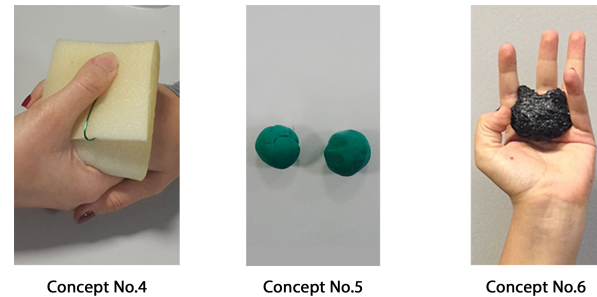

Concept No.1   Concept No.2   Concept No.3
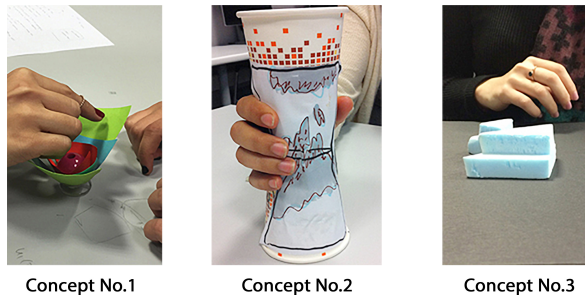
Figure 4. Concept No.1, Concept No.2 and Concept No.3

Concept No.3: A concept on creating mutual empathy by allowing the exchange of emotions and rational thoughts in advice interaction (Figure 4). It is a game based on the use of two different pieces, one for each interlocutor, that unite and becomes a single object when both sides reach a consensus. *These pieces are capable of recognizing the gestures, voice and biofeedback of both the advisor and the advisee.* They help both sides track the communication in progress. Once put on the table, they position themselves closer to each other or viceversa according to the data received from the sensors. *The aim of the concept is to provide a support to the advisor in evaluating the advice situation and guiding the interaction.* One piece, made of hard material, represents reason while the other, of flexible structure, represents emotion. The scenario used for the concept was about a relationship in crisis. If an emotional approach is expected from the advisee, the advisor handles the emotion object and gives advice, for example, by focusing on the feelings, sentimental state of the partners. During the interaction the advisor might also want to take the reason object in hand to highlight the importance of rational behavior according to the case. *The pieces also warn the advisor by vibration whenever a situation arises that requires softening the advice message or general approach in advising. So the pieces in this concept, like the cup in coffee fortune-telling, assign a certain role to the advisor and become an instrument to understand and guide the interaction.*

Concept No.4: An object that resembles a claw is conceived to support verbal expressions by the material changes of its inner surface (Figure 5). *It is equipped with various sensors to track biofeedback of the interlocutors. By using this claw with one hand, the advisor can grasp or rub the other person at various body points and transmit in a way a haptic discourse.* The concept is inspired by hand movements, specifically touch gestures, that some Turkish

women employ while talking to each other. Some of these are used to express encouragement, warning or to highlight an argument in the conversation. *This object is supposed to accompany the advisor and help strengthen the discourse by providing a tactile impression to the body of the advisee of what is being advised. The inner surface assumes different material characteristics according to what is told. For example, if the advisor talks about difficulties ahead or a moment of crisis in the past, the inner surface of the claw becomes softer to lessen the negative effect of the discourse.*

Concept No.4   Concept No.5   Concept No.6

Figure 5. Concept No.4, Concept No.5, Concept No.6

Concept No.5: The concept aims to aid in creating awareness of the advisee's sensibility regarding the privacy or the range of topics to be discussed (Figure 5). It is inspired by stress balls and based on the use of two small balls equipped with sensors, one by each interlocutor. *The ball held by the advisee recognizes hand gestures, body temperature, blood pressure. For example, when the advisee is feeling embarrassed he plays around with the ball, which warms up the ball held by the advisor. This informs the advisor of the emotional reaction of the advisee regarding a statement or question.* This system might help a person talk about difficult subject matters in face-to-face advice settings. In this regard, we can say that this concept assumes a kind of diminished reality as an approach.

Concept No.6: A small charcoal-like personal object that increases self-confidence to engage in supportive interaction with complete strangers (Figure 5). It concerns situations in which a person thinks that someone is emotionally in a difficult or stressful moment. Train journey was used as a scenario for the concept where the passenger in front of the person has a quarrel on the phone. Then this person approaches to provide support to the passenger. In these moments advising and convincing someone requires skill and experience. *The concept particularly aims to support people with low self-confidence and inexperienced in advice-giving.* The objects is conceived as a personal artifact, like a necklace or bracelet, that is not intimately known to the others. *The object, held inside the palm, guides the owner in advice-giving by conveying the emotional states of the stranger as vibrations or color codes.* The owner can customize what emotion each color corresponds to so that the stranger does not know about their meanings. Interestingly, also this group mentioned fortune-telling: they used it as an analogy

to describe that the object "reads" the emotional state of the advisee as a fortune-teller reads a coffee cup.

DISCUSSION OF THE WORKSHOP

Our expectation from the workshop was not to find the right design but rather to see a range of design possibilities explored by empirical data. In this sense, it was encouraging to see that our considerations presented stimulating directions for the participants in exploring the design possibilities for advice mediating handheld devices. Although they could not integrate every consideration into their concepts, they took into account all of them and created meaningful system prototypes in the sense that they provided us a space to discuss the role of handheld devices specific to advice settings.

An important contribution of the concepts proposed in the workshop was a series of themes and settings for advice interaction. As themes they dealt with *maintaining privacy*, *emotional support*, *creating mutual empathy*, *sharing personal experiences* and *improving self-confidence* in advice-giving. In other words, they focused on creating a device that allowed for an advice interaction based on providing emotional support rather than information. In this regard, the groups had a tendency to benefit from the bodily cues to provide the emotional and mental state of the advisees. Therefore, biofeedback emerges as an important aspect of a potential handheld device for advice exchange. We can list the settings the workshop groups came up with as follows: *augmenting non-verbal cues in social gatherings between women*; *enabling supportive communication in public transports, such as in train journeys*; *triggering conversation among strangers in public spaces such as coffeehouses*; and *facilitating supportive dialogue between friends in various places*. The settings proposed by the participants demonstrate that our design considerations are not limited to the advice interaction in Turkish coffee fortune-telling and can be extended to other advice-giving situations. For instance, a concrete use case could be that of browsing and interpreting the lifelog/quantified-self data of the advisee by a handheld device which might trigger new forms of conversation and advice interaction. Moreover, although we obtained our design considerations by analyzing the interaction with the cup and saucer, the participants produced device concepts that have different form factors respect to these. This shows that the considerations did not limit them to think within a certain form factor.

All the concepts used single-hand interaction as the primary input method. In relation to changing the tone of strong advice messages the participants thought of a kind of haptic discourse by using tactile metaphors: in Concept no.4 the inner surface of the claw was becoming softer to mitigate the negative effect of a message. Regarding beat gestures, Concept no.4 proposed an interesting approach. Even though beat gestures are performed with freehands, the same group combined these with grasping gesture applied on the hand. For example, the advisor could perform a beat gesture while holding the hand of the advisee with the claw. Holding a hand and shaking it gently is perceived in Turkey as a gesture to encourage/calm the other person. The group thought that using the claw object, with the help of the changing tactile quality of the inner surface, could augment this existing gesture, which they interpreted as a beat gesture. Here we see that the cultural aspect of gestures is important in advice interaction as they allow the advisor to convey subtle messages. The handheld device can be designed to augment such gestures by the help of haptic technologies. Two concepts included the whole body in the design. For Concept no.2 the ear is a fundamental element for the advisor to hear the messages. Concept no.4 behaves almost as an extension of the body as the claw becomes somehow attached to the hand. The other projects did not include the whole body in the interaction. However, nearly all the concepts tended to consider biological data an important element in the device. The participants preferred multimodal interfaces for their concepts by integrating touch gestures with palm and fingers, mid-air gestures for around-device interactions, and voice input. However, we noticed that no concept used gaze as an input method. Although we mentioned gaze interaction among our considerations, the concepts did not include it in the interaction as an expressive element. This is interesting as the concepts highlighted the importance of emotional support and the eye was not considered as a biological data.

CONCLUSION

In this paper, we reported our research on designing handheld devices for face-to-face advice-giving situations in informal settings. Our contributions are as follows: (1) studying for the first time a traditional form of object-mediated advice interaction, Turkish coffee fortune-telling practice, as a source of inspiration to inform design decisions for advice mediating handheld devices. Our approach and framework could be an example for similar studies based on cultural practices; (2) 7 preliminary design considerations derived from the empirical study of this cultural phenomenon; (3) participatory design workshop guided by these considerations that proposed themes, settings and 6 handheld device concepts.

The concepts demonstrated that the emotional dimension of advice interaction in social contexts is important and thus the participants tended to use biological data in designing the devices. Therefore, sensors that enable biofeedback from the advisee to the advice-giver are an important element of potential handheld devices for advice settings. However, the input and output modalities for this feedback presents challenges in terms of design and ethics. On the other hand, we found that handheld devices can be used to augment or re-interpret culture-specific gestures. We also noticed that the participants did not consider gaze as an input method in their devices. We believe that the findings of this research contribute to discussion on the role of handheld devices for advice settings in a more informed

manner. As future work, we aim to build upon these conceptual prototypes and evaluate their usefulness in real advice-giving scenarios. As we mentioned in the discussion of our findings, the use of gaze and hand gestures might differ from culture to culture. Conducting cross-cultural studies to investigate this point would help us understand better their generalizability. This way, we also expect to test further the validity of our design considerations.

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