DESIGN OF SYSTEM-INITIATED DIGRESSIVE PROPOSALS FOR AUTOMATED BANKING DIALOGUES

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Abstract

System-initiated proposals may be used to introduce new and unsolicited information into the dialogue flow of an automated telephone service in order to advise callers about products in which they may be interested such as short-term loans or overdrafts. Important dialogue design issues surrounding the introduction of such digressive proposals include how to interrupt the callers and where in the dialogue flow it is most suitable to locate a proposal. This paper describes the results from two experiments using a spoken natural language telephone banking application where two delivery strategies and three contrasting locations were investigated. Results showed that the delivery strategy had a stronger effect than the location.

1. INTRODUCTION

There are distinct business advantages in terms of cost saving and 24x7 accessibility associated with employing automated telephone applications in areas such as banking to enhance customer services. However, successful take-up of such applications may result in the enterprise losing opportunities for direct contact with customers, for example opportunities to advise them about new or relevant products and services, possibly based on the individual’s banking profile. A solution to this problem involves the introduction of system-initiated informational prompts (sales proposals) within the dialogue structure with the intention of cross-selling new products and services to the customer. These ‘Sales through Service’ (StS) proposals may be viewed as an extreme form of system-initiation in dialogues since they are not related directly to the current topic or to the prime goal of the call – hence the term digressive proposal.

Digressions are common in human-human conversation where participants use their knowledge about coherence, states of attention and intention in the discourse to find the appropriate timing to introduce new topics into the flow of a conversation [1]. This intrinsic human ability to co-ordinate and collaborate in interactive activities poses a challenge to designers of automated human-computer interfaces, particularly in the area of mixed-initiative interaction [2], [3].

Research into digression in human-computer interactions (often referred to as ‘out-of-turn interaction’ or ‘unsolicited reporting’ [4]) has focused mainly on providing models for handling user-initiated digression [5], [6], [7] where the user supplies extra or out-of-turn information in response to system prompts. Results from experiments into system-initiated back-channel feedback in human-computer spoken interfaces [8], [9] also suggest that the style and timing of such responses may affect user impressions of a service.

Human-computer dialogues in mass-market telephone applications generally employ a fixed-initiative strategy where the system prompts the user for information and the dialogue does not usually change between phone calls. System-initiated digressive proposals, which interrupt the regular call flow with extra information, therefore run the risk of being perceived as disruptive or distracting by habituated users.

2. APPROACH

It is expected that user attitudes to system-initiated digressive dialogue proposals will vary according to the relevance of the information to the user’s specific situation. Determining what is or is not relevant to an individual caller is a complex matter involving modeling of the caller’s intentions, wants, needs and goals. The research reported here did not address issues relevant to defining the criteria for deciding whether or not to make a proposal to a particular caller on a particular occasion. Rather, it addressed dialogue design issues relating to how to deliver and where to place digressive proposals in automated telephone service dialogues, assuming that the decision has already been taken to make the proposal.

The digressive proposals explored in this research were designed to inform callers about the availability of an overdraft and to give instructions on how to obtain the overdraft from within the service. A key issue with respect to the design of digressive proposals is their degree of obtrusiveness: a proposal needs to be prominent enough to capture the attention of interested users but not so prominent as to impact negatively on attitudes to the service.

3. EXPERIMENT DESIGN

3.1. PhoneBank Express Dialogue Overview

The automated telephone service used in this research was based on a commercially available telephone banking service provided by Lloyds TSB - PhoneBank Express. This banking service allows customers to find account balances, transfer money, hear a list of transactions, pay bills etc. by using spoken natural language input (in English). A high-level flowchart of the dialogue architecture is outlined in Figure 1 below.
The first stage in the dialogue is a Welcome greeting: "Welcome to PhoneBank Express". The customer is then asked to enter a membership number and two random digits from a secret identification number (TIN) in the Identification and Verification stage (ID&V). Following successful identification the caller hears, and selects an option from, the Menu of Services “Please select balance, recent transactions or another service” (‘another service’ calls the second part of the menu: “In addition, you can select funds transfer, item search, order statement or change TIN”). Each return to the Menu of Services is preceded by a question “Would you like another service?” (answering ‘no’ to this ends the call).

**3.2. Proposal Strategy**

For the purposes of the first experiment reported here the basic PhoneBank Express dialogue was augmented with a proposal strategy. System-initiated proposals can take one of two forms, referred to here as ‘Signpost’ and ‘Follow-on’. The proposals were located in the dialogue flow at a point following the readout of the balance of the current account (after ‘Selected Service’ in Figure 1).

The **Signpost Strategy** consisted of a short message embedded within the normal service dialogue informing callers about the availability and location of the overdraft option in the automated dialogue (in this case the overdraft option was available at the menu of services). The intention behind the Signpost Strategy is to interest and inform the caller without intruding too heavily on the call flow. It is then at the caller’s discretion to locate and select the product option within the dialogue structure. The wording of the Signpost proposal prompt was as follows: “You might like to know that you can have an overdraft on your current account. Would you like to arrange an overdraft now?”

**Figure 1: PhoneBank Express Dialogue Flow-chart**

<table>
<thead>
<tr>
<th>Welcome</th>
<th>ID&amp;V</th>
<th>Menu of Services</th>
<th>Selected Service</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>'yes'</td>
<td>'no'</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Another Service?</td>
<td>Good Bye</td>
</tr>
</tbody>
</table>

Potentially more intrusive, the **Follow-on Strategy** involves prompting the caller who must then make a decision (and respond ‘yes’ or ‘no’) to either accept or reject the offer before the dialogue can continue. If the caller agrees to the proposal, the system starts a ‘follow-on dialogue’ giving relevant information about the details or terms of the overdraft and confirming the agreed amount. Callers who declined the proposal were given a Signpost message with information about how to (later) obtain an overdraft (by saying ‘overdraft’ at the menu of services). The wording of the Follow-on proposal was as follows: “You might like to know that you can have an overdraft on your current account. Would you like to arrange an overdraft now?”

**Figure 2: Signpost Proposal Strategy**

<table>
<thead>
<tr>
<th>Menu of Services</th>
<th>'balance'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overdraft Proposal</td>
<td>'yes'</td>
</tr>
<tr>
<td>Follow-on Dialogue</td>
<td>Balance</td>
</tr>
</tbody>
</table>

**Figure 3: Follow-on Proposal Strategy**

**3.3. Proposal Location**

The second experiment explored where it is suitable to make a proposal in the spoken dialogue. Participants were offered system-initiated overdraft proposals using the Signpost Strategy in one of three contrasting locations in the dialogue (see Figure 1 above). The locations were: (1) at the Welcome stage of the dialogue; (2) following a successful completion of the ID&V stage; or (3) after a specific Selected Service transaction (following the balance of the current account).

The **Welcome Proposal** location followed the introductory message in the service “Welcome to PhoneBank Express”. It was worded to be applicable to all callers. Due to its location within the dialogue, it might be expected that the proposal would pose a lower risk of distracting the caller from their task at hand. However, because the caller had not yet been identified at this stage in the dialogue there was a risk that prospective applicants may have to be turned down. The wording of the Welcome Proposal was as follows: “[Welcome to PhoneBank Express.] We’ve added a new overdraft facility to this service. To find out more, just say overdraft at the menu of services.”

The **ID&V Proposal** location followed immediately after the successful verification of the caller in the dialogue. The proposal could therefore be made customer-specific with targeted information about the particular account (such as the allowed overdraft limit), reducing the risk of having to turn down the applicant. The wording of the ID&V Proposal was: “You might like to know that you can have an overdraft of £400 on your current account. To find out more, just say overdraft at the menu of services.”

Finally, the **Transaction-linked Proposal** location was a nested, system-internal prompt that followed a particular transaction or sub-dialogue in the service and would be used to link the proposal information to certain account details, a particular transaction, topic or service in the dialogue. The ability to create a logical link between proposal information
and specific details in the dialogue can be useful but it can also be potentially more distracting to the caller who may be heavily involved with the task at hand. The Transaction-linked Proposal follows immediately after the current account balance readout and was worded as follows: “You might like to know that you can have an overdraft of £400 on this account. To find out more, just say overdraft at the menu of services.”

3.4. Experiment procedure

In each of the two experiments carried out using these modified PhoneBank Express dialogues, participants each made three phone calls to the service undertaking two banking tasks in each call (finding and noting down the balance of their current account followed by ordering a statement for their savings account). The first two phone calls involved use of PhoneBank Express without StS proposals, allowing callers to become familiar with the service functionality. The third phone call included the overdraft proposal dialogue. In the Proposal Strategy phase of the experiment, one-third of callers constituted a control group and did not experience an overdraft (‘no-proposal version’).

After the first two phone calls to the service, participants completed a usability questionnaire which used a standard Likert format [10] to assess participants’ attitudes towards the automated telephone banking service interface. Four basic aspects of usability were covered: cognitive issues, quality of interface and system performance, transparency and fluency of the service, and conversational model [11]. The data obtained from this questionnaire were used as a baseline reference for participants’ attitude towards the PhoneBank Express service.

A second usability questionnaire was completed following the third call to the service in order to allow investigation of the impact on usability and attitudes of the digressive proposal. The results from this questionnaire were used to compare the attitude towards the StS proposal dialogue between proposal groups. This second questionnaire, again with a Likert format, included items specifically designed to elicit information directly related to the proposal experienced: intrusiveness (proposal was annoying, intrusive, too long, interrupted the call, distracting); user confidence in the service (trust the information, happy to apply through the service, relying on the service when applying, preference of having a human giving the proposal information); quality of the proposal (helpfulness of proposal information, efficiency of method, level of politeness); cognitive effort (easy to understand, knowing how to use the service to apply for an overdraft) and relevance of the proposal.

4. EXPERIMENT RESULTS

To investigate the impact of the system-initiated proposals, repeated-measures analysis of variance (ANOVA) was carried out using the mean responses to the Likert usability questionnaire completed after the two familiarisation calls and after the third call (for calls where the overdraft proposal was experienced). To compare the effect and attitude towards the different proposal locations and strategies used in the experiments uni-variate ANOVAs were carried out on those Likert questionnaire items specifically addressed to the proposals. Three between-subject factors were included in the analysis as follows: age group; gender and proposal condition.

4.1. Proposal Strategy Results

A total of 179 callers contributed data to the analysis for Proposal Strategy. Re-assuringly there were no significant differences between the overall mean responses to the general usability of the service before and after experiencing a proposal. The results suggest that neither the presence of a proposal nor the type of the proposal explored in this experiment impacted (positively of negatively) on the overall perceived usability of the banking service. Two attributes were more statistically positively rated (p<0.05) for the no-proposal version of the service with participants finding that the service without the proposal needed a lesser degree of concentration and was a more efficient service. Detailed analysis of the perceived usability data overall confirms that there were no significant interactions between the proposal conditions experienced by the participants and any of the participant factors, age and gender.

There were, however, highly significant differences in responses to the items relating to the proposal strategies. Those who experienced the Follow-on Proposal took a more negative attitude to the length of the proposal than did those who experienced the Signpost Proposal (mean for Follow-on = 4.28; mean for Signpost = 5.02, both on a 7-point scale where scores above 4.0 indicate positive attitudes, p<0.01). The Follow-on Proposal Strategy was also perceived to interrupt the call more than the Signpost Proposal Strategy (mean Follow-on = 3.72; mean Signpost = 4.65, p<0.01). At a lower level of significance (p<0.05) the Follow-on Proposal Strategy was also considered to be more annoying and less appropriate to this kind of service and more distracting than the Signpost Proposal Strategy. However, participants thought they knew better how to apply for an overdraft having experienced the Follow-on Proposal Strategy.

4.2. Proposal Location Results

A total of 119 participant data sets were used in the analysis of Proposal Location. There were no significant differences in overall usability between the three proposal locations and no effects for gender or age. The results suggest that, in terms of overall usability, the actual location of the proposal had little effect on participants’ attitude towards the service.

More differences were found with respect to questionnaire items relating specifically to the proposal location. Two items showed statistically significant differences between the three proposal locations in the dialogue: appropriateness for the proposal for the type of service and the perceived length of the proposal.

The service containing the overdraft proposal as part of its Welcome message was judged to be significantly better (mean=4.65, p<0.01) in terms of appropriateness, than the Transaction-linked proposal (mean=3.20) and the ID&V proposal (mean=3.46). In terms of perceived length of the proposal, participants were more positive (p<0.01) towards the length of the proposal when it occurred as part of the Welcome message (mean=5.05) and after the ID&V process (mean=4.87), compared to the Transaction-linked proposal (mean=4.15). Although the lengths of the three proposals did not differ more than two seconds, this result suggests that proposal location does influence callers’ perceptions of objective properties of the message such as duration.
Overall, the results suggest that there were differences between attitudes to the service corresponding to the three locations. The design which included making the proposal in the Welcome message tended to receive a more positive evaluation.

5. CONCLUSIONS

The research reported here investigated some key dialogue design issues surrounding how and where to introduce system-initiated proposals in the dialogues of automated telephone banking services. Two strategies for proposals were designed and investigated (Signpost and Follow-on); and Signpost-style proposals were tested in three locations in the dialogue (Welcome message, ID&V process and Transaction-linked).

Participants made two phone calls to a stand-alone mirror version of PhoneBank Express. On a third call they experienced a digressive overdraft proposal. Data show that, in terms of usability of the service, neither the location nor the strategy of the proposal in these experiments has any overall effect on callers’ attitudes to the service.

When studying the Proposal Location, the service containing the overdraft proposal in its Welcome message was judged to be significantly better in terms of the appropriateness of the proposal for the type of service. Participants were more positive towards the perceived length of the proposal when it occurred in the Welcome message (or after the ID&V process) compared to when the proposal followed a transaction (balance of the current account).

Experimental results for the Proposal Strategy for digressive overdraft proposals showed a measured lower attitude to the length of time the Follow-on Proposal Strategy took relative to the Signpost Proposal Strategy and the Follow-on Proposal Strategy was perceived to interrupt the call more than the Signpost Proposal Strategy. The Follow-on Proposal Strategy was also considered to be more annoying and less appropriate to this type of service and more distracting than the Signpost Proposal Strategy. However, participants thought they knew better how to apply for an overdraft with the Follow-on Proposal Strategy.

6. REFERENCES