Angler: Collaboratively Expanding your Cognitive Horizon

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Abstract

Angler is a tool to help analysts explore, understand, and overcome biases that result from previous experiences and background, and to collaborate in expanding their joint cognitive vision. Angler utilizes divergent and convergent techniques, such as brainstorming and clustering or voting, to guide a diverse set of intelligence professionals in completing a complex knowledge task. The tool helps the group through the process of forming consensus, while preserving and quantifying differing ways of thinking. Angler provides a Web-based collaborative environment that allows users distributed by both time and geography to assemble in teams, with the help of a facilitator.

1. Introduction

Humans tend to bias the analysis of situations based on previous experience and background: when presented with new problems, we act based on how well a heuristic fits the given circumstances (Tversky and Kahneman 1974). Heuer (Heuer 1999) has explored the problem of *cognitive bias* in the context of intelligence analysis: even when one is informed of a bias, surmounting it can be difficult. Angler is a collaborative tool that aims to be a *mental prosthetic* for enhancing problem solving and decision analysis. It is grounded in methods such as *Scenario Based Planning*, or SBP, (Schwartz 1991)[1] that deal with cognitive biases and uncertainty by extracting assumptions held by a group, and expanding the range of deductions created by those assumptions, the *cognitive horizon*. Angler combines divergent-convergent techniques such as brainstorming, clustering, and ranking, allowing outputs of one or more tasks to become the inputs for others. This flexibility makes Angler capable of supporting complex knowledge based practices such as SBP. Angler is a web-application, allowing geographically diverse participants to work asynchronously, an advantage over traditional conference-room brainstorming.

[1] For an interesting application of Scenario Based Planning to military defense policies, see Krepinevich 1996.

2. Angler Workflow

A typical Angler workshop is as follows:

1. A problem, or knowledge need, is identified, and a facilitator creates one or more Angler workshops to support the knowledge tasks, invites participants, and sets up a timeline for task completion.
2. The participants engage in the brainstorming phase.
3. Participants cluster and/or rank results of the brainstorming phase, and a consensus is created.
4. Subsequent brainstorming and clustering phases can be performed, or the facilitator can deem the workshop completed. The contents of the workshop are saved to the Angler corporate memory, and can be converted into a knowledge product.

Brainstorming consists of multiple rounds of idea or concept contributions in the form of small textual descriptions, referred to as *thoughts*. One fundamental difference from a traditional conference-room brainstorming process is incremental disclosure. Initially participants must contribute without seeing others' thoughts, to encourage independent thinking. As a participant contributes thoughts, more thoughts from the other participants are revealed to him/her, to encourage cross-pollination of ideas.

After brainstorming is complete, the facilitator moves the workshop to the clustering phase. Each participant performs his/her own clustering of the thoughts. Normally there are no guidelines on cluster themes, so grouping factors and abstractions can differ. This preserves the diversity of viewpoints and avoids a problem common in traditional brainstorming sessions, dominant personalities drowning out the contributions of others.

To create a consensus from all the clusterings, first let $\boldsymbol{c}$ be a user defined cluster, and t_1 and t_2 thoughts, then:

$$coloc(c, t_1, t_2) = \begin{cases} 1 \text{ if } t_1 \text{ and } t_2 \text{ are in } c \\ 0 \text{ otherwise} \end{cases}$$

p denotes the set of participants and $\mathcal{C}_p$ the set of clusters constructed by participant p. The similarity between two thoughts is defined as:

$$sim(t_1, t_2) = \sum_{p_i \in P} \sum_{c_j \in C_{p_i}} coloc(c_j, t_1, t_2)$$

Based on this combined inter-thought measure, a hierarchical clustering algorithm (Jain and Dubes 1988) is applied to generate a consensus clustering. Each participant can see how his/her clustering differed from the consensus, by seeing his/her original clusters in one color, and showing how they dispersed in the consensus (figure 1).

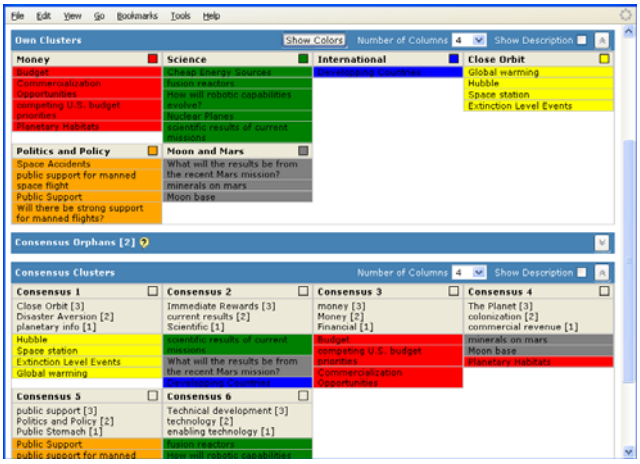

Figure 1

The facilitator is able to view and quantify the differences that exist between the joint clustering and each participant. If necessary, the process can be go through another iteration. At this point, participants will also vote for the names that they believe are most appropriate for the consensus clusters

3. Pakistan Workshop

In the second quarter of 2004, we performed an Angler-based SBP workshop with six experts from academic and defense circles on the topic: *Should another assassination attempt succeed, what should U.S. policy toward Pakistan be in the context of a post-Musharraf Pakistan?* Five of the participants were collocated in Menlo Park, CA (but mostly using Angler to communicate with each other), while one participant was located in Europe. The main findings were:

- Record keeping via Angler's corporate memory was superior to the manual process where most of the information is disseminated verbally.
- The automated consensus clustering techniques produced good results; participants could visually see how their thinking resembled or differed from that of the group consensus.
- The facilitator's view of the workshop status provided insights into participants' thinking, highlighting outliers; information useful to better guide future workshops.
- The need arises for discussion to be integrated into the corporate memory, since an important aspect of the brainstorming sessions is this exchange

Overall, the workshop produced impressive results, in the scenarios that were produced at the end. Analysts who had never participated in collaborative brainstorming before found it to be an stimulating way of expanding their thinking beyond their usual disciplinary and bureaucratic boundaries[2].

4. Future Work

We are working (Murray et al 2005) on building a semantic index of the thoughts created by the participants, utilizing TextPro (Appelt and Martin 1999) to parse the thoughts and mapping them into concepts defined within an ontology. We are exploring the use of the index in performing some kind of automated facilitation and synthetic participation. Since the whole point of brainstorming is feeding off other people ideas, the synthetic contributed only need to thought provoking to be useful.

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[2] One of the participants even indicated that they were going to incorporate brainstorming into their future work