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# An Idea Generation Supporting System based on Anchor and Gestalt Theories

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***Abstract***

*Although information technology applications vary widely, they are rarely used in support of creativity. This study presents an idea generation support system based on anchor and gestalt theories. Some perspectives from these theories are borrowed to build theoretical foundation of the proposed system. Anchor building is important to creative process. Applying stimuli suggested by gestalt theory can drive users to generate fresh ideas. The proposed system is domain-independent and can improve personal creativity.*

## 1. Introduction

Information technology (IT) is indispensable in daily life. Several areas of human performance can be improved by applying IT. Furthermore, IT can be helpful for idea generation. Young [16] and Robbin [10] proposed the use of IT systems for generating new ideas and obtained positive results in studies of IT for creativity support. Proctor [9] suggested the use of computer programs for producing creative thought. Machrone [6] indicated that computer programs can provide "mind maps" or graphical representations for idea generation. Boden [1] proposed that computer software can facilitate the creativity of users by prompting them to search for new ideas. Partridge and Rowe [8] indicated that computers can be enlisted to remove constraints on creativity and stimulate the development of new ideas. Edwards [4] examined the impact of IT on creativity. However, a continuing question is how organizations can institutionalize IT usage to enhance creativity [3,7,12].

Expert systems and decision support systems have been commercially applied. Can these systems support the generation of creative ideas that can enhance organizational development? This paper is organized as follows. First, several related theories are applied to construct a theoretical foundation. An idea-generating system with some rules is then proposed. Finally, an example is used to explain the system operation.

## 2. Theoretical foundation

Some concepts of anchor theory and gestalt theory can be applied to support idea generation.

### 2.1. Anchor theory

An anchor is an object used to attach a ship to the bottom of water at a specific point. The term anchor is also used in fields such as learning, geography and psychology. For example, "anchored instruction" [2] is "situated" learning within the social constructivist paradigm for the purpose of teaching students to understand and solve realistic problems. Anchored instruction is related to the goal-based scenario model and may also resemble problem-based learning. Golledge [5] proposed the "anchor-point theory" based on earlier work by Piaget.

Golledge suggested that landmarks can help users overcome egocentric perspectives. Some landmarks are assumed to be required to anchor. The anchor in spatial learning is a critical role for assisting users in building ground for further links.

Similarly, this study applies the concept of anchor points to aid idea generation during the creative process. The anchors of the proposed system are represented by keywords. In an early stage, an initial anchor would be given to a user to establish a starting point and focus the inquiry. Human-machine interactions can then extend user ideas around the anchor. Additionally, the system can provide additional anchors at the appropriate time.

### 2.2. Gestalt theory

Gestalt psychology is a theory of mind and brain, proposes that the operational principle of the brain is holistic, parallel and analog with self-organizing tendencies. It emphasizes higher-order cognitive processes in the midst of behaviorism [14]. Gestalt theory applies to all aspects of human learning, although it applies most directly to perception and problem-solving. Wertheimer [15] proposed two modes of human thinking: productive and reproductive. Productive thinking solves a problems through insight; reproductive thinking solves problems by referring to previous experience and what is already known.

This study applies some rules of idea-generation techniques which facilitate productive or reproductive thinking of gestalt theory. These rules can initialize something new and break old rules.

### 2.3. Idea-generation approaches

Idea-generation approaches can prompt certain cognitive activities in users. Such techniques reflect beliefs derived from personal experience, popular assumptions, or scientific research. These techniques can mentally discharge, stimulate people to respond, or foster idea generation. VanGundy [13] discussed 105 techniques for structured problem solving. Smith [11] later reported the analytical results of 172 idea-generation methods, which were classified into fifteen categories, such as analytical, search, imagination-based and habit-breaking strategies.

This work presents a “Challenge” rule to stimulate users with habit-breaking strategies via the following three approaches: perspective change, assumptions challenge and negation. Perspective change encourages users to consider problems from different agent perspectives. An assumptions challenge drives users to question beliefs associated with a problem. Negation applies counter-assumptions to problem-relevant beliefs. Another rule proposed in this work is “Jump”, including the “fantasy” technique, which is an imagination-based strategy for encouraging users to conceive of states in which the constraints of reality do not apply. These two rules are applied to implement the concept of gestalt theory.

Besides “Challenge” and “Jump”, this study also implements a “Systematization” rule based on analytical and search strategies. This rule includes several techniques: decomposition, translation, association, and analogy. Decomposition reduces wholes into parts and attributes. Translation converts one kind of thing into another. Association follows associative links among ideas based on a knowledge base. Analogy is the strategy of solving problems by identifying and comparing similar problems and solutions.

## 3. System Architecture

Fig. 1 shows the proposed system architecture for idea generation, which is divided into two layers: the database layer and the system layer. According to the stimulus-response model of behaviorism, a stimulus encourages response. Therefore, in proposed architecture, some stimuli are given through human-machine interactions to encourage subjects to expand their thinking.

The following scenario illustrates the function of the proposed system. Assume the problem is website development. The following issues must be addressed: the type of website; the services provided; the necessary techniques and tools; the revenue model; the service fee. The proposed system would provide stimuli to assist users in solving the problem.

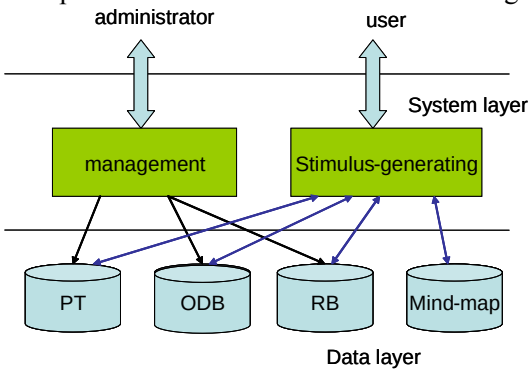


Figure 1. Proposed system architecture

### 3.1 Database Layer

The database layer includes an ontological base for storing domain knowledge (ODB), a rule base (RB) with pre-defined rules for providing stimuli, a problem template (PT) for storing the models related to specific problems, and mind-map data consisting of user's mind maps and thinking tracks while generating ideas. The ODB and PT are independent of the specific domain. Users can switch between domains as necessary.

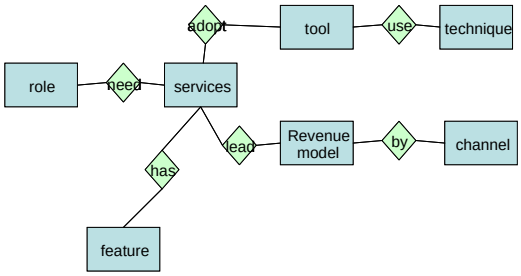


Figure 2. PT

The ODB and PT are essential and necessary to support user idea generation. The ontology structure of the ODB includes three elements: concepts, attributes and relations. The relations between concepts can be classified as independent, intersection and inheritance. This example includes role ontology, service ontology, revenue ontology and channel ontology. The PT stores models related to specific problems. The entity-relationship diagram can be used as a template for describing the platform of interest. In this scenario, the main considerations are

who (what role) needs services, what services are provided, what tools or techniques are adopted, what revenue is available and what channel is used (Fig. 2).

A mind map is a diagram of words, ideas, tasks, or other items linked to and arranged around a central key-word or idea. A mind map can be used to generate, visualize, structure and classify ideas and can provide an aid for studying, organizing, problem solving, decision making and writing.

The RB stores pre-defined rules for giving stimuli. The rules are "Challenge", "Jump" and "Systematization". To implement these rules, this study adopts several idea-generation techniques such as assumptions challenge, negation, perspective change, fantasy, decomposition, translation, association and analogy. These techniques are used to provide the user with appropriate stimuli related to the problem. The available rules and approaches are illustrated here.

Three approaches assumptions challenge, negation and perspective change are implemented for the rule "Challenge". Assumptions challenge questions the beliefs of users. For example, users would generally consider service fees when planning web operations. However, the system might ask whether services could be offered free to users. Negation provides the opposite idea to users. For example, the system might ask a user focusing on male web visitors whether female visitors should be considered. Perspective change is the modifying of background of problems. For example, regarding a service (e.g., GPS tool) originally provided for mobile users, the system might ask whether it could be made available to stationary users.

Fantasy is a "Jump" rule. In some cases, imagination is very useful. This technique provides some unthinkable stimuli. For example, web users are usually assumedly as human, but the system might ask if users could be animals. Another example might be to consider paying users to request services since most websites charge.

Four techniques decomposition, translation, association and analogy are implemented for the rule "Systematization". Decomposition reduces wholes into parts and attributes. When considering the roles of web users, the system requests users to describe the attributes of their roles, such as gender, age, identity, etc. Translation converts one thing into another. For example, cash might be converted to credit charge. The system might suggest VISA instead of cash. Analogy is the search for ones similar to parts of the problem situation.

### 3.2 System Layer

The system layer includes two modules. The first is the management module, which includes ODB management, PT management and RB management. The OBD stores domain knowledge with ontology. Thus ODB management allows read, insert, delete and update domain knowledge. Some models with specific problems are stored in PT. The PT management also provides a channel for maintaining problem templates. If new rules must be implemented by idea-generation techniques, RB could be modified by RB management. The second module, stimulus-generating module, is the core module for generating stimuli to assist users in thinking about a specific problem. This module has two parts: stimulus-generation and mind-map access. Stimulus-generation is responsible for giving users appropriate stimuli according to RB. The functions of mind-map access are modifying and tracking user' mind maps.

Fig. 3 shows the SGA (Stimulus Given Algorithm) in stimulus-generation.

**{Step 1: System initializes a question from PT to user.**

**Step 2: User chooses one or some answers through interface.**

**Step 3: System generates questions based on RB, ODB and user's choices to user.**

**Step 4: Build user's mind map.**

**Step 5: Repeat Step 3 to Step 4 until model constrains are satisfied.**

**Step 6: End }**

Figure 3. SGA Algorithm

The procedure for the above is as follows. According to anchor theory, the system chooses a starting point as an anchor. For example, the first question could be derived from the "role" in PT. By doing so, it could be selected as an anchor point to start the idea generation process. The anchor point could be chosen differently. The system provides multiple functions for selecting initial points, such as pre-defined or random settings. The stimulus generation module attempts to stimulate the user according to his (her) former answers, ODB, and RB. The stimuli (questions) are produced by the Challenge, Jump, or Systematization rules in RB. During the user interaction process, the system adopts a three-stage selection strategy for providing stimuli. At the early phase of idea-generation, the most important task is building an anchor. The major portion of stimuli is Systematization. Some parts of Challenge type are also used. After an anchor is built, the Challenge and Systematization roles are exchanged. Challenge becomes the primary strategy, and Systematization becomes secondary. When a new anchor is needed, the Jump rule is applied.

The system repeats steps 3 and 4 until the model constraints are satisfied. Each run generates additional questions using the above mentioned techniques, such as assumptions challenge, negation, perspective change, fantasy, decomposition, translation, association, and analogy. The entire procedure requires continuous interaction between user and system. The system continuously provides the user with brainstorming stimuli to inspire creative thinking. The model constraint(s) are derived from PT. For example, the system could force users to review and reconsider all elements of the model. Besides the scenario described here, different constraints can be used for different problems.

## 4. Illustrative Scenario

A possible scenario is given here for illustrative purposes. Assume a planner α initializes a new web construction program. The proposed system could be helpful for conceptualizing the program before writing the actual website proposal. Before using the system, the PT and ODB of the system should be well-defined. A template for website construction is included in the PT. Some ontologies, such as role, service, tool, channel, etc, are also stored in the ODB.

Firstly, the system randomly selects an entity "service" from the template as the starting point. According to service ontology, the system asks α to consider the kind of service he wants to provide, and α chooses "communication". The system then asks what communication method (real-time or delay) is needed. The reply is "real-time". The system continues to interact with the user with questions related to this anchor point until most aspects of the situation are clarified.

After an anchor is grounded in early phase, the system would provide other stimuli mainly by applying the Challenge rule. The system would question the user about delay type. Assuming the user does not change the delay type, the system would suggest "2-way" instead of "1-way". The user might then adopt this new idea and develop something new. By interacting with the system using Challenge rule, α can methodically clarify each aspect of the service. The system then guides the user to transfer to a new entity role, in which more stimuli are given and more ideas are produced.

The system also suggests that the user consider other possibilities such as not charging for a service or perhaps providing a service for animals. The purpose of such questions is to prompt the user to brainstorm new ideas. After all entities in the template are discussed, α should have clear picture about the proposal.

## 5. Discussion and Conclusions

This work presents a novel system architecture for idea-generation. According to stimulus-response theory from behavioral psychology, appropriate stimuli can lead user to generate new ideas. Thus, the system interacts with users by dialogue and records their mind maps. The process of generating ideas follows a three-stage selection model based on anchor theory. In the early phase the key task is building an anchor with high Systematization and low Challenge. After an anchor is built, the status of Challenge and Systematization are exchanged and the Jump rule becomes important. The Challenge and Jump rules borrow from the gestalt theory and techniques such as assumptions challenge, fantasy, etc. The PT is used to model the problem, and the ODB is essential material for providing stimuli. The proposed system is independent of a specific domain. The PT and ODB content could be replaced with different domains.

This study makes three contributions to the field. First, a system architecture for idea-generation is proposed according to the stimulus-response model of behaviorism, anchor theory and gestalt theory. Second, the system is domain-independent, and the PT and ODB content are replaceable. Third, the proposed rules are realized by applying several techniques.

Future works may examine additional stimuli-generating rules or techniques and other selection strategies for building anchors, etc. In this study, the three-stage selection model adopted from anchor theory is the key process. However, the creative process of idea generation is still unclear. Applying other theories or perspectives may yield new rules and selection algorithms.

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