

## ThinkLets: Achieving Predictable, Repeatable Patterns of Group Interaction with Group Support Systems (GSS)

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### Abstract

*Over the past decade, Group Support Systems (GSS) has shown that, under certain circumstances, teams using GSS can be far more productive than teams who do not use GSS. However, research results are not unequivocal; they have been ambiguous, and sometimes conflicting, which makes it difficult for GSS research to inform GSS practice. One cause of the conflict and ambiguity in GSS research results may be the result of focusing on a less-than-useful level of abstraction: GSS itself. This paper argues that in GSS research, the thinkLet may be a more useful unit of comparison than the GSS. A thinkLet encapsulates three components of a GSS stimulus: The tool, its configuration, and the script. Field experience shows that thinkLets may be used to create repeatable, predictable patterns of thinking among people making an effort toward a goal. To date we have documented about 60 thinkLets that map to seven basic patterns of thinking: Diverge, Converge, Organize, Elaborate, Abstract, Evaluate, and Build Consensus. Each thinkLet creates some unique variation on its basic pattern. By focusing research on thinkLets, rather than GSS, field and laboratory research may be more controllable, more replicable, and better able to inform GSS development and use.*

### 1. Introduction

More than a decade of research has shown that under certain circumstances, teams using Group Support Systems (GSS) can save as much as 50% of their labor hours, and can cut their project cycle times by up to 90% [Grohowski, et al., 1990; Post, 1993; Vreede, forthcoming]. Under the right conditions, teams using GSS for ideation can produce many more ideas, and many more good ideas than teams using pen-and-paper methods

[Gallupe, et al., 1992; Dennis & Valacich, 1993; Valacich et al., 1994]

And yet, in the lab and in the field, GSS results have been mixed and ambiguous. Fjermestad and Hiltz conducted an exhaustive review of 200 published experiments and reported that of the hypotheses posed in these studies, 628 yielded no effect for GSS, 158 found GSS use to be superior to conventional practices in some way, and 164 found GSS use to be inferior to standard practices in some way [Fjermestad & Hiltz, 1998-99]. In a subsequent exhaustive review of published GSS field research, they reported that GSS use made a positive difference in 47 of 54 field studies, but no so in the other 7 cases. [Fjermestad & Hiltz, forthcoming].

Some portion of the ambiguity in GSS research results may be attributed to the inevitable threats to validity that can plague any research – uncontrollable environmental factors, lack of statistical power, and so on. But even accounting for those factors, the results of GSS have been decidedly confused, to the extent that sometimes even the same authors must sometimes report conflicting results [Gallupe, et al, 1992; Pinsonneault et al. 1999].

Conflicting results in GSS research mean that it is difficult for GSS research to inform GSS practice. GSS practitioners must look to research for guidelines on system design and implementation, collaborative process and methodologies, etc. It is not sufficient for researchers to declare that GSS seems to lead to higher productivity. Researchers have a real responsibility to make it clear how to transfer experiences from the research arena into the organizational arena. In this paper we argue that thinkLets may serve to facilitate that transfer, and stimulate the heretofore relatively slow transition of GSS from Academia to the workplace.

Conflicting results may also cast a pall over the academic rigor and reputation of the GSS research

community. Finding a way to resolve these conflicts and to produce predictable, repeatable results could do much to stimulate GSS research, and redeem the reputation of the GSS research community.

In this paper, we argue that one cause of the conflict and ambiguity in GSS research results may be the result of focusing on a less-than-useful level of abstraction: the GSS. GSS as a class of technologies cannot account for the many varied results in the literature. We offer the thinkLet as different focus for GSS research, and argue that studies of thinkLets will produce far more predictable, repeatable results, which may eventually allow GSS to be rolled out to the workplace (or not) with unequivocal empirical support.

This paper defines thinkLets, and describes seven basic thinking patterns for which thinkLets have been documented. It explains the three components of a thinkLet, and discusses the value of thinkLets as a pattern language for reasoning toward a goal. It offers reflections on the implications of thinkLets, and concludes with a call to action for the GSS research community.

## 2. ThinkLets and Patterns of Thinking

A thinkLet<sup>1</sup> is the smallest unit of intellectual capital required to create one repeatable, predictable pattern of thinking among people working toward a goal. In order to achieve a goal, people must move through a reasoning process. To move through a reasoning process, people must engage in a sequence of basic patterns of thinking. To date, we have identified seven such patterns:

- **Diverge** – move from having fewer concepts to having more concepts
- **Converge** – move from having many concepts to focusing on a few concepts deemed worthy of further attention
- **Organize** – move from less understanding to more understanding of the relationships among concepts
- **Elaborate** – move from having concepts expressed in less detail to having concepts expressed in more detail.
- **Abstract** – move from having concepts expressed in more detail to having concepts expressed in less detail.
- **Evaluate** – move from less understanding of the value of concepts for achieving a goal to more

understanding of the value of concepts for achieving a goal.

- **Build Consensus**<sup>2</sup> – Move from having less agreement among stakeholders to having more agreement among stakeholders.

A thinkLet is a parsimonious prescription for creating some variation on one of these patterns of thinking among people working toward a goal. A thinkLet has three components:

1. **Tool** – The specific version of the specific hardware and software technology used to create a pattern of thinking.
2. **Configuration** – The specifics of how the hardware and software were configured to create a pattern of interaction.
3. **Script** – The sequence of events and instructions given to the group to create the pattern of thinking.

These three components taken together constitute the stimulus that causes the pattern of thinking reported in a GSS research paper. Lacking knowledge of any one of these components, others cannot recreate the stimulus, and so may not be able to reliably recreate the thinking pattern achieved with a GSS. Lacking knowledge of any one of these, a practitioner cannot recreate the stimulus used to produce an effect reported in a research paper.

That each component has an effect on outcomes with GSS can be inferred from the rich body of published GSS literature. Consider each component in turn.

### 2.1 Tool

Many papers on GSS (AKA GDSS, CMC and EMS) draw sweeping conclusions about the effects of the entire category of technology, making such statements as:

*“People using GDSS produce significantly more non-redundant ideas than people using traditional meeting methods.”*

*“Subjects who used EMS generated more ideas of higher quality than did subjects who did not use EMS.”*

*“Teams that used EMS completed their projects in less than half the [labor hours] required by teams that did not use EMS.”*

Such statements turn out to be problematic for those attempting to use or reproduce the published results

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<sup>1</sup> Before it was called, “thinkLet,” this concept had other, less apt labels – Recipe, Technique, Reasoning Module. The term, “thinkLet” was coined by David Tobey in March of 2000 as we struggled for an expressive label. “It’s like an apple,” he said, “but it’s a thinkLet.”

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<sup>2</sup>There are many words in the English Language that mean, “To be in agreement.” However, we have not found a verb that means, “To Move Toward Consensus.” We considered coining such a word -- Consensate, Harminate, Agreeamate—but it seemed likely that such words would obscure, rather than communicate our meaning. If you can think of an appropriate verb for this concept, please notify the authors.

because GSS is not a unitary thing. Any given GSS is not a single tool, but a collection of tools that differ widely from one another. One could not expect to obtain the same results with an electronic brainstorming tool as one obtains with a group outline or an electronic voting tool. Therefore, without knowing which tool a group used, one cannot reproduce the group's results.

Further, GSS's are not a single system, but a category of systems, and the systems in that category differ widely. For example, the electronic brainstorming tool in some systems might require that all users contribute ideas to the same electronic page, while the electronic brainstorming tool in another system might require that all participants contribute to different pages, and that they swap the pages among themselves. The literature is replete with findings that differences among tools can cause differences in results:

- Dennis, et al. [1997] demonstrated that people brainstorming in multiple dialogs tended to outperform people contributing to a single dialog.
- Easton, et al. [1990] found that an electronic conversation tool produced better results than an electronic brainstorming tool for convergent tasks, but the reverse was true for divergent tasks.
- Hollingshead, McGrath, & O'Connor [1993] showed that groups using one version of a CMC outperformed groups using a different version of the same CMC.

Thus, one must conclude that differences in technology can produce differences in outcome, and one must know the exact tool that was used in order to reproduce the results of others. However, just knowing which tool was used is not sufficient to assure replication of results.

## 2.2 Configuration

Some GSS tools have many possible configurations, and different configurations may have different effects on group outcomes. The GroupSystems Electronic Brainstorming Tool, for example, has more than 20 independently configurable features, for a total of 1,048,576 possible combinations. Those features are configurable precisely to allow teams to change their patterns of thinking and interaction. Just one example is the feature that allows teams either to contribute anonymously or to have every contribution tagged with a user's name. There are a host of papers in the GSS literature demonstrating that anonymous groups perform differently than identified groups [Cooper, et al., 1998; Easton, et al., 1990; Jessup, Connolly, and Gallagher, 1990].

Thus, in order to understand how a group achieved its results, one must know exactly which tool was used, and exactly how that tool was configured. However,

knowing both the tool and its configuration is still not sufficient if the goal is to create a repeatable, predictable pattern of thinking and interaction among the members of a team.

## 2.3 Script

The very same GSS tool configured in the very same way can produce very different patterns of thought, depending on the script in which it is embedded. A script is the sequence of events and prompts given to a group as they use a GSS tool. There are several robust illustrations in the GSS literature of the powerful differences in group dynamics that can be produced by changing a script.

- Shepherd, et al. [1995] used a set of tightly scripted treatments to assess the effects of social comparison on brainstorming productivity. However, in one treatment, one of the three facilitators on the project changed just two phrases in a 10-page script. Instead of saying, "performing above average," he said, "kicking butt." Instead of saying, "performing below average" he said "brain-dead." This slight variation produced laughter among the subjects, which raised the salience of the social comparison, which caused a double-digit improvement in their brainstorming productivity. When the researchers discovered the script anomaly, the facilitators reversed roles. All facilitators were able to produce double-digit improvements by assuming a jocular tone when making the social comparison to the group.
- Connolly, Jessup, and Valacich [1990] demonstrated that using a script with a critical evaluative tone caused anonymous GSS users to produce more ideas of higher quality than did those using a script with a positive evaluative tone.
- Dennis, et al [1996] showed that dividing a compound brainstorming prompt into separate sub-prompts caused a group to produce more ideas of higher quality and creativity.

## 2.4 ThinkLets Summary

Thus, by knowing the tool, the configuration, and the script, one may be able to recreate the stimulus used by others to produce a pattern of thinking. Lacking knowledge of any one of these components, it may not be possible to reproduce results achieved by others with a GSS. The tool, the configuration, and the script constitute the thinkLet.

We have documented and field-tested approximately sixty thinkLets.

### 3. ThinkLets as a Pattern Language

Because field experience suggests that thinkLets tend to create repeatable patterns of thought among people

working toward a goal, and because thinkLets have names, and because the components of a thinkLet may be communicated, thinkLets may serve a useful pattern language for reasoning toward a goal.

**Table 1.**  
**LeafHopper: A Divergence ThinkLet**

**Choose this thinkLet...**

- ... when you know in advance that the team must brainstorm on several topics at once.
- ... when different participants will have different levels of interest or expertise in the different topics.
- ... when it is not important to assure that every participant contributes to every topic.

**Do not choose this thinkLet...**

- ... when it is important to assure that each person addresses each topic.

**Overview**

Participants start with an electronic list of several discussion topics. Each item on the list links to an instance of a simultaneous comment window. Each participant hops among the topics to contribute as dictated by interest and expertise.

*Inputs: A list of topics that must be addressed by the team.*

*Outputs: A set of comments organized by discussion topic*

**How to use LeafHopper**

**Tool**

*GroupSystems Topic Commenter*

**Configuration**

1. Participants may contribute comments under each topic.
2. Participants may not contribute new topics
3. Contributions will be anonymous
4. Create one topic card for each brainstorming question in Topic Commenter or one of the other list/comment tools.

**Script**

5. Explain the topics to the group and verify that the participants understand them
6. Explain the kinds of ideas that the group must contribute
7. Explain how to open the comment window under each discussion item.
8. Say this:
  - a. Start working on the topics in which you have the most interest or the most expertise. Then, if you have time, move to each of the other topics to read and comment on the contributions of others.
  - b. You may not have time to work on every topic, so work first on the topics that are most important to you.

**Insights on LeafHopper**

Sometimes your team must discuss several topics more or less simultaneously. For example, we have a colleague who worked with a series of groups on resolving pollution issues. He discovered that he got significantly more value from a group by posing three simultaneous questions in a LeafHopper...

*What can we do about air pollution?*

*What can we do about water pollution?*

*What can we do about ground pollution?*

...than he got with the FreeBrainstorming thinkLet using one question with three parts...

*What can we do about air, water, and ground pollution?*

He also got more value from the groups by posing the three questions simultaneously than he did by posing them one at a time with a DealersChoice thinkLet. Using Leaf Hopper, people could hop between the questions as they were inspired.

With LeafHopper it is not necessarily the case that every participant will see every topic. Sometimes that is exactly why you use it. If, however, you want to assure that every participant contributes to every topic, choose a different thinkLet.

**LeafHopper Example**

We once worked with a commercial software development team that had 12 tricky issues to resolve. They needed input from engineers, customers, product managers, developers, users, and several other success-critical stakeholder groups. They discovered a rare opportunity when all the high-powered stakeholders were to be in the same place at the same time, and managed to schedule a meeting. Then they realized that although they needed input from all the stakeholders, any given stakeholders only had an interest in about 1/3 of the issues. This meant that no matter what topic was being discussed, 2/3 of these high-powered participants would be sitting around bored. It's a bad thing to bore high-powered participants, but unfortunately, the mix of issues and interests was such that they could not simply schedule sub-sessions around each topic. We chose to use a LeafHopper to overcome this problem. The development team posted the issues to the GroupSystems Topic Commenter. They asked the participants to work first on the topics in which they had the most at stake, and on which they had the most expertise. The participants proposed options for resolving each issue, and then argued the pros and cons of the proposals. The whole discussion of 12 topics took just over an hour and a half. In a subsequent discussion, the group reached consensus on seven of the outstanding issues and assign action items for collecting information on the other five. The whole group was fully engaged in the activity throughout the event. Said one participant, "We just did a week's work in three-and-a-half hours."

**What's in a Name?**

A leafhopper is a small insect that is something like a grasshopper or a cricket. It hops from leaf to leaf eating what it wants, then moving on. We named this thinkLet LeafHopper because the team members can jump from topic-to-topic, contributing as they are inspired, then moving on.

Tables 1 and 2 present the documentation for two thinkLets – LeafHopper, a divergence thinkLet; and Rich Relations, an organization thinkLet. Note that the documentation provides:

- A memorable name that evokes the dynamics created by the thinkLet
- Criteria for deciding when and when not to use a thinkLet
- The Tool, Configuration, and Script of the thinkLet
- Insights and guidance based on field experience
- A success story to help clarify the circumstances under which the thinkLet might be useful.
- An explanation of the name, to make it easier to remember both the name and the thinkLet

Even within a given category, different thinkLets produce different variations on the same basic thinking patterns. Consider, for example, Free Brainstorming and Comparative Brainstorming, two thinkLets that use the same tool and configuration, but different scripts to produce different patterns of divergence. Both thinkLets use the GroupSystems Electronic Brainstorming tool in its default configuration, which provides a separate electronic comment page for each participant. Participants may contribute one idea to a page, then they must send the page back to the group. The system randomly brings back a different page that contains ideas contributed by others. Each page gradually accretes a conversation as it moves from person to person.

With Free Brainstorming the participants are told:

*...The system will bring you a new page with ideas contributed by somebody else. You may respond to the ideas of others in one of three ways:*

1. *You may argue with them*
2. *You may elaborate on them by adding detail*
3. *You may ignore them and contribute a completely new idea.*

*As soon as you finish one idea, you will send the page back to the group and get a different page back. The goal is to produce as many different ideas as we can in a short time.*

People respond to this thinkLet by moving quickly to the boundaries of their problem space and producing a number of creative ideas, but the conversation also tends to be filled with noise and digression. The group must then use another thinkLet to sift the gold nuggets from the sand.

With Comparative Brainstorming, the participants know in advance the criteria for judging the quality of good idea. For example, in a competitive manufacturing setting, good solutions might be those that are more

efficient, higher quality, and build customer loyalty. These criteria become prompts in the script, which run something like this:

*...Each of you has a different electronic page in front of you. Everybody please enter the single best solution that occurs to you, then cross your arms and wait for you next instruction.*

*Now swap pages. You should see a page with one idea on it contributed by somebody else.*

*Give me a new solution that will be more likely to cut costs than the idea in front of you.*

*Now swap pages again.*

*Give me a new solution that is likely to result in better customer relationships than either of the two you now see on the screen.*

*Now swap pages.*

*Give me a solution that is more likely to shorten our production cycles than any of the ideas you see...*

People respond to this thinkLet by producing fewer solutions that conform to the known criteria for idea quality. They do not tend to explore the boundaries of their problem space, but they arrive at high quality solutions very quickly, and there is very little noise or digression.

Thus, when time is of the essence and the criteria for a good outcome are known, one might choose Comparative Brainstorming, but when creativity is more important than speed, one might choose Free Brainstorming. Each of these two thinkLets creates its own variation of the divergence pattern; each has its own personality.

A thinkLet called Point-Counterpoint uses yet another script based on the same tool and configuration to create a consensus-building pattern instead of a divergence pattern. It can be used to help break an impasse in a badly conflicted or polarized group. It runs something like this:

*...Each of you has a different electronic page in front of you. Everybody please enter your single strongest argument in favor of your position, then cross your arms and wait for your next instruction.*

*Now swap pages. You should see a page on the screen with an argument contributed by some other person.*

*Whatever the argument you see on your screen, demolish it. Make as strong an argument against it as you can, whether you agree with it or not.*

*Now swap pages.*

*You should now see two arguments on the screen: one that argues very strongly in favor of some position, and a mutually exclusive argument that counters the first. Your task is to*

*write an argument that bridges those two mutually exclusive positions.*

*Now swap pages. Let's talk about what you see on your screens.*

Often when people participate in a Point-Counterpoint, their initial arguments are diverse, starting from many different premises. Likewise, the counter arguments also tend to be diverse. However, when they begin to grapple with bridging arguments, it is not uncommon for many participants to find the same bridging argument.

The mechanics of the three preceding thinkLets are similar, but the pattern of thinking produced by each is unique. When one becomes familiar with the thinkLets

and their effects on thinking patterns, one can speak of large, subtle, and powerful GSS process design issues using very few words. For example, we developed an action planning methodology that took more than 100 pages to document in detail. A cheat-sheet summary of the process took 8 pages. However, one familiar the thinkLets involved could recreate the same action planning process on the basis of the following paragraph:

*We will start with a Free Brainstorm on the question, "What are the issues upon which this group must take action?" We'll FastFocus a list of Issues for Action, then we'll prioritize them with a StrawPoll. We Crowbar the polling results to surface un-challenged assumptions and unshared information. Then, we'll Could-Be-Should-*

## Table2. RichRelations: An Organization ThinkLet

Contributed by Bill Becker, U.S. Department of Defense

### Choose this thinkLet...

- ... to create a set of categories for organizing brainstorming comments
- ... after any divergence thinkLet and before a thinkLet where ideas will be sorted into categories.

### Do not choose this thinkLet...

- ... to converge on key issues. This thinkLet helps people organize many brainstorming comments into categories, but it does not cause them to converge on a few ideas that are worthy of further attention

### Overview

Participants browse their brainstorming comments and find two items that are related in some way. They articulate the relationship between the two items, and if the group agrees, that relationship becomes the name of a category.

**Inputs:** Comments from a brainstorming activity

**Outputs:** A set of category names for summarizing or organizing the contents of a brainstorming activity

### How to Use Rich Relations

#### Tool:

1. GroupSystems Categorizer

#### Configuration:

1. Post the brainstorming comments as list items in one bucket (category) of the Categorizer tool.
2. Display the bucket (category) column
3. Prepare to add a new bucket (category).

#### Script:

1. Say this:
  - a. *"Please read through the comments on your screen. If you find two more comments that are related in some way, tell me how they are related."*
2. Add a new bucket (category) with the relationship as a label.
3. Continue the process until participants can find no more relationships.

### Insights on RichRelations

This little thinkLet is nearly self-working magic. People just pipe up with useful category names with very little additional prompting. If you ever find yourself with too many category names for comfort, no problem. Just do a RichRelations on the buckets themselves: *"Please find two or more buckets that are related in some way, and tell me their relationship."* The team will propose a new category that will subsume the originals. Voila! Your list of categories is shorter. In practice,

### RichRelations Example

Many stakeholders in the U.S. Department of Defense were asked to brainstorm ideas for a new, unified system for managing hazardous waste. The stakeholders worked in groups of about 20 people. Each group brainstormed features and functions for the new system, then used RichRelations, followed by an organizing thinkLet, to classify their contributions before evaluating them.

### What's in a Name?

This thinkLet is called RichRelations because when one person strikes it rich, say, by winning the lottery, other people suddenly find it important to explain their familial ties to their newly rich relation. In like fashion, with this thinkLet people explain familial ties among rich ideas.

*Be each Issue in order of priority with the Could-Be question, "What could we do to resolve this issue?" and a Should-Be that produces action items with the following elements: Action, Leader, Deliverable, Deadline, Deliver-To, Measures of Merit.*

#### 4. Reflections on ThinkLets

Although the thinkLet as an identifiable concept is fairly new to the GSS research community, the thinkLets themselves have been around for a long time as tacit knowledge in the minds of GSS researchers and facilitators. Indeed, all of the GSS facilitators whom we have interviewed have had a dozen or so favored thinkLets in their repertoires, reliable ways to create predictable patterns in the groups with which they work. Sometimes they had names for their thinkLets, other times they simply executed them without explaining them, even to themselves. We have elicited thinkLets from facilitators with questions like,

*What do you do when you've got a group that's badly polarized, and they just can't move forward?*

*What do you do when you want to encourage people to break out of old thinking ruts to find new ideas?*

By formalizing the thinkLets concept, and by naming and documenting the thinkLets, the GSS research community may be able to:

- Create a common pool of useful thinkLets from what are now isolated puddles of valuable intellectual capital.
- Theorize about the underlying propositions of cause-and-effect that play out during goal attainment in an effort to explain why the known thinkLets work as they do.
- Provide a solid basis for analysis and comparison of field and laboratory studies GSS research. Field studies become far more controllable if their GSS interventions are scripted and documented, and if measures are taken to determine whether the expected patterns of thinking do, in fact, emerge in GSS intervention. Laboratory studies become far more replicable when all components of the thinkLet stimulus are controlled and reported.
- Design new, more efficient and effective thinkLets based on theoretical foundations and empirical results of thinkLet-based studies.
- Produce new technologies even better suited to creating, sustaining, and then changing patterns of thinking among people working toward a goal.

Four pilot tests with small groups of inexperienced trainees suggest that people who are not facilitators can become effective users of GSS far faster if they learn thinkLets than if they just learn how to run the

technology. With most software applications, the important outputs appear on the screen – a document, a spreadsheet, etc. With a GSS, the outputs that appear on the screen are secondary to the patterns of thinking created in the minds of the participants. With a GSS, a beginner can learn all there is to know about how to make things happen on the screen, and still have no idea about how to use the GSS to move people toward a goal. By focusing beginners on patterns of thinking from the outset, they appear to have a better grasp of the possibilities a GSS presents. They can create useful patterns of thought without having to learn more than is necessary about the details of the technology.

#### 5. Limitations of ThinkLets Research to Date

A thinkLet is by no means a bulletproof, mechanistic guarantee of repeatable results. As demonstrated in Shepherd, et al (1995), the script component is subtle, and may be difficult to convey. Even with identical scripts, different people may produce different outcomes. (Consider, for example, the effect of casting the actor, Woody Alan, instead of Sean Connery, in the role of James Bond.) There is robust empirical and anecdotal evidence that differences among facilitators can cause differences in outcomes (Dickson, et al., 1996). Nonetheless, a thinkLet provides at least a good approximation, and hundreds of field trials suggest that they can, indeed be used to produce repeatable, reliable results with GSS.

However, good thinkLets still do not guarantee success. There are many other factors that influence GSS outcomes. Fjermestad and Hiltz (1998-99, forthcoming) identified more than 100 independent variables that seem to have an impact on GSS outcomes. Many of these variables addressed some aspect of goal congruence – the degree to which the declared goal of the group is consistent with the private interests of its members. Others addressed issues ranging from the domain expertise of the participants to information access, to the configuration of the physical workplace. None of these things can be captured in advance as a component of a thinkLet. Nonetheless, when wielded with intelligence and discernment, all other things being equal, thinkLets appear to create predictable pattern of interaction.

Although a thinkLet may create a predictable thinking pattern, the user of a thinkLet must assure that the pattern it creates will, in fact, be useful for the task at hand. A divergence thinkLet may block the success people who need and want to converge.

## 6. ThinkLets as a Cornerstone for Repeatable Methodologies

A thinkLet isn't a methodology. A thinkLet is a way to create a pattern of thinking; a methodology is a step-by-step way to accomplish a mission critical task like strategic planning or requirements negotiation. In the end, a thinkLet only matters if it can make a difference on some important task.

Just because we can predictably create a pattern of thinking doesn't mean we can create a successful methodology. Much work remains to be done to learn how thinkLets can be combined to create predictable, repeatable success on mission critical tasks.

The law of Requisite Variety (Ashby, 195) says that a control system will fail unless it can accommodate the amount of variance in the system it purports to control. ThinkLets may be thought of as a control system for patterns of reasoning, and a methodology may be considered a control system for accomplishing a mission critical task. The GSS community faces an interesting challenge to determine the extent to which thinkLets and methodologies built of thinkLets can be packaged and delivered as technology solutions. It is clear that some simple thinkLets have powerful, repeatable effects. Field experience shows that some compound thinkLets can also produce repeatable success. For example, a combination of the Free Brainstorming, FastFocus, and Crowbar thinkLets seems to cause people to surface and challenge assumptions that they had not previously examined. But how far can these predictable thinkLets be combined before the resulting system becomes unstable because they do not accommodate the Law of Requisite Variety? Only experience and research will show.

In order to accomplish a goal, people may move through a series of thinkLets. As people conclude one thinkLet and prepare for another, a number of issues must be addressed. Taken together, these issues may be called a transition. Transition issues may include but are probably not limited to:

- Assuring all participants are in synch with the change in process.
- Copying, moving, archiving, finding, and/or transforming data, information, and knowledge.
- Reconfiguring or switching technologies
- Reconfiguring the physical environment

In the study of how repeatable thinkLets can be mapped into successful methodologies, transition issues may not be trivial. Transitions may require a level of research comparable to that which must be devoted to the thinkLets themselves if GSS researchers are to move GSS, thinkLets, and GSS-supported methodologies into the workplace.

## 7. Call to Action

Many existing thinkLets are still embedded in the tacit knowledge of expert GSS users, and as such are unavailable to the GSS community. Much work lies ahead to retrieve, document, and publish these thinkLets so they may become part of the GSS research and practice canon.

Today's thinkLets are parsimonious prescriptions, derived and tested in the field. However, a prescription implies some underlying cause-and-effect phenomenon. To date, however, little theoretically rigorous study of the cognitive, social, political, and other principals underlying thinkLets has been done. Much research must still be done to explain why these prescriptions work as they do.

Experience in the field shows that certain thinkLets work well time and time again. But little is yet known about which details of a given thinkLet might be causal, and which might be mere superstition. Only rigorous theoretically driven empirical research can tease out an answer to that question.

Many of the classic GSS research papers do not report procedures in sufficient detail to allow a reader to infer the thinkLet that gave rise to the effects. Much of that research should now be revisited and replicated with clearly scripted thinkLets, so we may learn what it is we should have learned from those ground-breaking studies.

Much of the existing GSS literature focuses on divergence – moving from fewer concepts to more concepts. With a few notable exceptions, little has been done to explore ways to effectively and predictably address the other six basic patterns of thinking – converge, organize, elaborate, abstract, evaluate, and build consensus. ThinkLets may provide a way for researchers to come to grips with those patterns as well.

The seven basic thinking patterns have all been defined in terms of movement and change – from fewer ideas to more ideas; from less detail to greater detail; from less agreement to more agreement, and so on. This framing of the categories points the way for empirical measures of thinkLet efficacy. If a thinkLet is to cause convergence, one can measure the degree to which and the speed with which people were able to focus their attention on ideas worthy of further attention. If a thinkLet is to cause the building of consensus, one can use coefficients of concordance to measure the degree of consensus in a group. By focusing on measuring the kind of movement change a thinkLet is meant to induce, researchers can grapple with some important constructs that may have previously been hard to pin down.

## 8. Conclusions

Because a thinkLet encapsulates the components of a stimulus used to create a single repeatable, predictable pattern of thinking among people working toward a goal,



in GSS research, the thinkLet may be a more useful unit of comparison than the GSS. By focusing on thinkLets instead technologies, GSS researchers may be able to produce more replicable results, and may be able to broaden the scope of GSS research beyond its current focus on divergence, to embrace convergence, organization, elaboration, and so on.

A focus on the thinkLet, rather than on the GSS technology may lead eventually to a fundamental shift in the structure and purpose of the GSS. A GSS is commonly perceived as a collection of useful software tools for groups making a concerted effort. No existing GSS yet supports directly the capture and delivery of all three components of a thinkLet for the purpose of creating a repeatable pattern of thinking.

The thinkLets described in this paper are small but important examples of the many that are yet to be discovered, documented, published, and tested. Because thinkLets demonstrably create repeatable patterns of thinking, they may provide a window to the cognitive, social, and other mechanisms that come into play as people work toward their goals.

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