

Using the thinkLet framework to improve distributed collaborative writing

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Abstract

This paper uses the thinkLet framework to advance collaborative writing (CW) processes, facilitation techniques, and writing technologies. Specifically, this paper proposes critical requirements for CW tools, and key CW facilitation considerations in terms of configurations and scripts. Several examples of successful facilitation and CW processes are presented, including case-specific scenarios for group meeting notes, academic articles, and corporate strategy documents. These concepts not only advance facilitation of CW groups, but also can encourage such groups to become more self-sustaining over time.

1.0 Introduction

CW is a social act [1] that involves interpersonal communication, group dynamics, and heavy coordination. Several papers discuss improving CW process support through enhanced collaboration technologies (see [1-9]). This paper adds to this research body by proposing process and facilitation improvements to complement CW technologies; specifically, in terms of the thinkLet framework by Briggs, de Vreede, Nunamaker, and Tobey [10].

Briggs, et al, defined a thinkLet as “the smallest unit of intellectual capital required to create a repeatable, predictable pattern of thinking among people working together toward a goal” [10]. thinkLets contain elemental patterns of thinking, which fall into seven patterns [10]: diverge, converge, organize, elaborate, abstract, evaluate, and move toward consensus. thinkLets are further classified into three fundamental components that are used to create the seven patterns of interaction [10]: (1) **Tool**, (2) **Configuration**, (3) **Script**.

Applying thinkLets to CW, the script along with the tool and configuration, would be altered according to the type of CW document being produced and the needs of the specific group. Thus, addressed as a whole, these three triumvirate thinkLet components can help structure desired patterns of interaction and outcomes for CW. Before investigating how thinkLets can improve CW, this paper elaborates on the key decisions that need to be made in setting up a CW group, in terms of tool, configuration, and script.

2.0 Three components for CW decisions

This section discusses the decisions that must be made in using tools, configuration, and scripts for CW.

2.1 Component 1: Tool requirements

This section discusses requirements for CW tools, but since no current CW tool supports all of the requirements listed in this section, it is important that collaborative writers analyze the tradeoffs of using a tool that lacks support of required features. The features of the chosen CW constrain the thinkLets that are possible. All of the requirements discussed in this section are summarized in **Table 1**, along with the elemental patterns of thinking that each requirement supports.

The first general requirement is that a CW tool must be selected to foster consensus and group awareness, and should have the flexibility to include support of all major CW work modes, strategies, activities, roles, communication, information access, and document control techniques [1]. The required CW **work modes** include face-to-face (F2F) synchronous interaction, asynchronous non-distributed interaction, synchronous distributed interaction, asynchronous distributed interaction, and mixed work modes [8]. CW tool should be flexible in supporting the various major writing strategies, such as sequential single writing; partitioned, parallel writing; and reactive writing [8, 11]. CW tools should also support all the major CW **activities** including: brainstorming, research, planning, outlining, writing, editing, and reviewing / revising [12, 13], and voting. A corollary requirement in supporting the CW activities is that CW tools must support multiple collaboration **roles** [14], such as the roles of writer, consultant, editor, reviewer, scribe, and facilitator.

Because consensus and group awareness are critical in CW [1], successful interpersonal communication is also critical: CW authors must share and freely exchange ideas and criticism and ultimately build consensus, or suffer negative results. Communication requirements for CW can be categorized as: (1) support for planning and discussions (2) socialization support (3) information access support.

Support for planning and discussions: Planning communication support needs to encourage consensus

Table 1: CW tool requirements

Requirement to support	Thinking Patterns *						
	1	2	3	4	5	6	7
F2F work mode	√	√	√	√	√	√	√
Synchronous, distributed work mode	√			√	√	√	
Asynchronous non-distributed work mode	√			√	√	√	
Asynchronous distributed work mode	√			√	√	√	
Sequential writing				√			
Parallel writing				√			
Reactive writing				√			
Brainstorming activity	√			√	√		
Research activity	√		√	√			
Planning activity			√				
Writing activity	√			√			
Voting activity		√				√	√
Editing and reviewing activity		√				√	√
Revising activity		√			√		√
Writer role	√			√			
Consultant role	√	√	√			√	√
Editor and reviewer role		√	√			√	√
Scribe role				√			
Facilitator role			√				√
Flexible communication	√	√	√	√	√	√	√
Planning communication			√				
Negotiation communication		√					√
Anonymous communication	√			√		√	
Chat window	√	√	√	√	√	√	√
Facilitator messaging			√				√
Project scheduling			√				
Project tracking			√				
Telepointers				√			
Flexible information access			√				
Separate document sections			√				
Support multiple activities at once	√		√				
Flexible and adaptable			√				

* (1=diverge, 2=converge, 3=organize, 4=elaborate, 5=abstract, 6=evaluate, 7=build consensus)

in planning, writing, and reviewing. Since, planning typically is not complete before writing commences, CW tools should support communication about planning throughout the writing process [14]. Such communication should include negotiation support to

help resolve conflict over group plans [15], and discussion support for project scheduling, project tracking with courses of action, and goals [13]. Supporting planning communication is crucial in CW because participants often negotiate and re-negotiate plans, outlines, roles, and personal relationships [15]. For example, when brainstorming and planning in CW, participants generally want to have an unrestricted, highly unstructured, free-flow of ideas [16]. Adding synchronous and asynchronous chat window capability, facilitator messaging, and anonymous voting tools can support many of these requirements. Additionally, communication support is provided by making CW tools flexible and adaptable to the variety of needs of CW groups [17]. Negotiation and consensus can be assisted by use of voting tools to help make decisions as a group [18]. Additionally, CW tools should include tele-pointers, which allow users to point to specific pieces of text to clarify discussions [8].

Social support: CW tools not only need to support communication about project scheduling and plans [14] but also they need to support social interactions [13]. This can partially be provided by including a messaging system between specific participants [18]. This can also be provided by a global window for perpetual group conversation space [18] such as a multi-threaded chat window.

Information access: CW tools should provide access to relevant group activity information at all times [13]. One approach to this requirement is to allow creation of separate document segments [13], which allows users to access the document sections they are concerned with. Although CW tools should support different document segments, users should still have access to the entire document [13]. CW software should also allow several document access methods according to a user's role and responsibilities, such as write, annotate, and read [13]. Finally, CW software should support different approaches to group access. For example, participants should be able to access a group document concurrently or sequentially [8].

Flexibility: CW systems should not rigidly enforce high levels of structure [19]. CW tools need to support the CW processes while remaining intuitive, so as not to distract from the CW process [3]. For example, users should be allowed to easily create, join, or leave CW sessions at arbitrary times without significant disruption to the CW session [15]. In supporting the major CW activities, CW tools need to ensure seamless transitions between activities, and to allow activities to be chosen in any order [13]. Additionally, CW tools must allow multiple users to perform various writing activities at the same time on the same tool [5]. Additionally, CW tools should support all major methods of document control, including centralized, relay, independent, and shared [13] (see configuration section).

2.2 Component 2: Configuration and CW

This section addresses configuration considerations for CW, particularly focusing on writing modes, roles, writing strategies, and document control modes. These configuration decisions must be setup in the software used, and they must be reflected in team composition and CW process script.

2.2.1 Writing mode: Writing mode involves the choice of whether or not a group works at the same for small to medium-sized groups, because of space and coordination issues. This mode is also useful for teams that have little work history, or when there is a need for place and at the same time.

F2F writing involves the same place and same time, which is only appropriate a richer communication medium.

Asynchronous same place writing is a rare writing scenario that involves writing in the same place and different times. This mode is often only appropriate for small work groups that are involved in job sharing, or for group “war rooms.”

Synchronous distributed writing involves writing at the same time at different places. This mode of writing is an appropriate substitute for F2F writing when groups are geographically separated and it is not feasible for group members to meet in the same location. It should also be used for newly formed groups and/or when rich communication is required.

Finally, **asynchronous distributed** writing is appropriate for any size of group that is working in different locations and is highly autonomous. This may be the only writing mode that can effectively support lengthy and complex writing and review processes, which are commonly found in large organizations.

2.2.2 CW writing strategy: Writing strategy represents an important configuration and script decision that will affect the tools, processes, dynamics employed by a writing group. Some of the common strategies include single-author writing; sequential, single writing, parallel writing, and reactive writing.

Single-author writing should rarely be used in CW writing; only for scenarios where the document is simple, the group involved is small, and little consensus is needed. This form of writing can be useful for simple documents such as group meeting notes.

Sequential, single writing is appropriate for situations where small to large groups are working asynchronously and high levels of control and tracking need to be exerted, yet little time pressure is involved; such as complex legal documents and government documents.

Parallel writing is appropriate when efficiency, involvement, productivity, and time are important considerations in small to large groups.

Finally, **reactive writing** is useful for small to

medium groups that need a lot of creativity and discussion, such as in creative writing efforts and marketing documents.

2.2.3 CW roles: Deciding on CW roles is an important configuration and group setup decision. In terms of configuration, these roles and corresponding rights need to be setup in the chosen software, prior to the CW task; yet, these roles often need to flexibly change over the writing task. An additional complexity with roles is that they often change over time, according to changes in group composition, interpersonal conflict, and the specific writing activity a group is working on. The common CW roles include [3, 5, 13]: **writer** (has authority to write particular sections), **consultant** (provides general feedback on the writing task), **editor** (reviews and edits the entire document), **reviewer** (annotates without the authority to make changes), **scribe** (writes from dictation without input to or ownership of the work), and **facilitator** (sets up the CW meetings, agenda, configuration, and leads a group through the chosen CW script).

2.2.4 Document Control Mode: Several methods are employed to manage control of the text a group is developing. The main document control modes that are used include centralized, relay, independent, and shared.

Centralized control occurs when one person controls the document throughout the writing activity [13]. This form of control is useful to maintain group focus, especially when working toward a strict deadline. Power struggles can emerge, however, if the facilitator is selected from the writing group; especially when he/she is self-selected.

Relay control occurs when one person at a time is in control, but control changes amongst the group [13]. This democratic technique is less efficient than centralized control, but tends to be useful in groups that have issues with dominant individuals.

Independent control occurs when each team member works on a separate part of the document and maintains control of his/her portion throughout the writing process [13]. Many times this is a negative control tactic in groups that lack agreement; however, this technique is quite useful for groups that work remotely on highly discrete units of work (e.g. book chapters).

Shared control occurs when all team members have simultaneous and equal access and writing privileges throughout the writing activity [13]. This can be a highly effective, non-threatening form of control in groups that work F2F, engage in frequent communication, and have high levels of trust; in remote groups and less functional groups (e.g. groups with high variances in capabilities or participation), this mode leads to conflict.

2.3 Component 3: Script and CW

This section presents the final component of the thinkLet framework: the process script, which will be used to prescribe teaming strategies, facilitation approaches, and CW processes and activities. Scripts are critical in framing CW processes because any team that is left to its own devices will suffer process losses [20]. This section discusses CW script in terms of teaming strategies, facilitation, and CW process choices.

2.3.1. Teaming strategies: In terms of teaming strategies, all group members need to be brought up to speed, helping create a team memory [21]. Team members should participate from the beginning of a group project, so that the experiences of all group members can be included and consensus can more easily develop [22]. Attendance at meetings by group members also contributes to creating team memory by creating common understanding.

An additional consideration to achieve success with a team is to introduce balance or heterogeneity in team composition. Research has shown that heterogeneous teams are often more effective than teams with similar personality types [23]. One potential drawback of heterogeneous teams is that communication can be more difficult with people from different backgrounds and perspectives, and such teams can still suffer from a dominant individual. Technology has been shown to offset these drawbacks.

Furthermore, groups need to include more orientation behaviors, which are facilitative statements that encourage goal achievement by using facts, making helpful suggestions, resolving conflict, or lessening tension [24]. Specifically, clarification and substation statements also contribute to the development of consensus [25]. Some of the methods that have been used to improve orientation and facilitation behaviors, by providing higher levels of structure, include the following: brainstorming [26], Delphi methods [27, 28], Nominal Group Technique (NGT) [28, 29], root cause analysis, stakeholder analysis [7], and team facilitation [30][31][32][33][34][35]. Team facilitation has been shown to be particularly effective.

2.3.2 Facilitation approaches: Facilitation is an objective process by which a team is led through their work processes by a facilitator who intervenes, without decision-making authority, to improve a group's effectiveness. A facilitator is a person, usually from outside the team, who helps a group plan and structure its work throughout its collaboration. One facilitation technique is **process facilitation**, where the facilitator is not concerned with the content a group produces, only that they follow appropriate group processes [33].

Another facilitation approach is **content facilitation**, where the facilitator is concerned with and

involved in the creation of the group's output. Many problems with content facilitation because the facilitator often loses objectivity, and thus, overly influences the results of the group's work [33].

However, even process facilitators with noble intentions may still unintentionally influence group outcomes, because facilitators commonly have hidden agendas or biases that affect group outcome [33]. To overcome this, some of the guidelines a facilitator can follow include [30][34][36]:

- Select, brief, and prepare team members
- Establish facilitative norms and meeting guidelines
- Help a group create common, measurable goals
- Develop a cohesive, safe and open group climate
- Create an open, interactional network of people
- Objectively examine group processes
- Moderate participant interaction
- Interpret non-verbal interaction

Groups that use an objective process facilitator who follows these guidelines can avoid potential limitations of groups by promoting more balanced input, fair division of work, and better conflict resolution. Such groups can also have reduced conformance pressure, cognitive inertia, socializing, domination, and coordination difficulties. GSS groups that use a computer-based facilitator have a much greater likelihood of producing favorable results because GSS helps avoid process losses [37].

2.3.3 CW process choices: A team's chosen CW process needs to be carefully selected to ensure optimal outcomes. Some of the key consideration directly relate to tool and configuration choices, and involve the size of the group, the location of the group, and the ultimate writing goal. This section presents a couple illustrative examples, starting with small CW groups.

Refined CW process: Mittleman and Adkins [4] suggested a refined CW process for small to medium-sized groups, based on their field research, as shown in **Table 2**. Adkins, et al, later clarified that for distributed CW their field research indicated groups should come together for steps 1 and 2, or at least to use conference calls [3]. Interestingly, they felt that many communication barriers between facilitator and participants that developed were a result of lack of understanding of the particular role an individual was playing at a given period of time [3], reinforcing the need to structure roles in CW.

While the CW process shown in **Table 2** is a good start for CW groups, this general process framework needs to be expanded by including group formation, planning, research, and project closure activities, so that a CW group's entire processes are captured. It should also be noted that all of the processes can be highly iterative (e.g. multiple rounds of research and drafting).

Table 2: Appropriate CW processes by [4]

1. *Open discussion:* Develop the objectives and general scope of the document (e.g. brainstorm, categorize, etc.)
2. *Generate document outline:* Develop main sections and subsections that will provide the structure for the document.
3. *Discuss content within outline:* Interactively generate key content for each section within the outline and discuss the content.
4. *Compose by sub-teams:* Review the content entries for a section and organize, edit, and complete the section as a first draft version¹.
5. *Conduct on-line feedback and discussion:* Each team reviews all of the document sections and creates suggestions in the form of annotations.
6. *Review annotations:* Section or document owners accept, reject or merge the suggestions from the annotations.
7. *Conduct verbal walkthrough:* When the draft is considered near-complete, the project team conducts a verbal walkthrough of the entire document, and the section owners make any needed revisions to finalize the document [3].

Additionally, the thinkLet framework can be used to provide more specific ideas in helping a CW group with its activities. For example, in the group formation process a CW group could use an ice breaking thinkLet (i.e. "Two Truths and a Lie") and a group formation thinkLet (i.e. "Synergy Box"). The collaborative tools that can be used for these thinkLets include Chat and Topic Commenter. The primary patterns of thinking for this targeted group process is "organize." In this vein, **Table 3** shows how thinkLets can be applied to all of the processes of CW.

3.0 Examples of specific CW tasks

While expanding the general CW process in light of specific thinkLets is clearly useful, it still can be improved by adjusting thinkLets to document-specific CW goals. The next section illustrates how the thinkLet framework can be used to frame the appropriate choices available for the following types of writing tasks and their task-specific processes: group meeting notes, academic articles with one lead author, and corporate strategy documents. While these writing tasks only represent a sample of the large potential variation of CW tasks, they provide useful illustration

¹ Note: the sub-teams may consist of a few people or in some cases may be only one person; however, field experience has shown a minimum group size of two works the best, because "lone wolf teams" of one can foster individual agendas [3]

of the important choices to be made, which will determine the specific thinkLets that need to be developed and implemented.

3.1 Group meeting notes

This simple scenario assumes a group has just conducted a routine, operationally oriented group meeting in a professional environment, where the outcome of the meeting has little strategic import to the specific firm. In such a scenario the length of the document is usually short, as is the time involved in the task. Likewise, the needs for satisfaction, quality outcomes, learning, quality communication, and strong relationships are low. Even the importance of agreement is minimized, where people do not necessarily need to achieve consensus, but can get by with superficial agreement, because little is at stake. The next sections propose the choices available for this scenario in terms of tool, configuration, and script.

3.1.1 Tool: In this scenario the target group size is typically small. Additionally, because of the simplicity of the target task and use of small groups, use of Microsoft Word with email is an adequate tool choice.

3.1.2 Configuration: Both centralized and relay document control are appropriate choices, while independent and shared control should be avoided, because they add unnecessary complexity in this scenario. Meanwhile, distributed synchronous writing adds unnecessary complication with no added benefits; thus, F2F or distributed asynchronous writing modes should be used. In terms of writing strategy, single-author writing, sequential single writing, and parallel writing are acceptable, while reactive writing is unnecessary. Finally, writing roles in such a scenario should be minimized for simplicity; thus, the roles of writer and one editor should be used, and the editor should also play the role of facilitator.

3.1.3 Script: Because of the simplicity and short-term nature of the task, group formation exercises, planning, brainstorming, and research should not be used. Instead, the group should quickly create a high level outline and immediately draft the appropriate sections. A single editor should do all annotations, revisions, and final formatting. Finally, all group members should give their quick approval / comments on the final draft, where the editor would do any last minute revisions. Because consensus is not at issue, the group does not need to meet for final approval – it can occur through email or other asynchronous means.

3.2 Academic journal articles with one dominant lead writer

In this scenario one dominant author essentially writes most of an academic journal article, while other

Table 3: thinkLets applied to expanded general CW process

Target script for group processes	thinkLets, executed in the following order	Collaborative Tool used	Primary patterns of thinking used
Group formation	<ul style="list-style-type: none"> •Execute ice breaker (see ² and ³) •Execute group formation and bonding 	<ul style="list-style-type: none"> •Chat •Topic Commenter 	<ul style="list-style-type: none"> •Organize
Planning	<ul style="list-style-type: none"> •Generate statement of purpose •Generate statement of scope •Generate specific objectives •Develop milestones on project plan (see ⁴) •Assign roles and responsibilities •Vote on results (see ³) •Discuss lessons learned 	<ul style="list-style-type: none"> •Chat •Topic Commenter •Group Voter 	<ul style="list-style-type: none"> •Organize •Abstract •Build consensus •Elaborate
Brainstorming	<ul style="list-style-type: none"> •Conduct anonymous brainstorming •Categorize brainstormed output •Prioritize brainstormed output •Decide on brainstormed output to use •Vote on results (see ⁵ and ⁶) 	<ul style="list-style-type: none"> •Brainstormer •Topic Commenter •Categorizer •Alternative Analyzer •Survey •Group Voter 	<ul style="list-style-type: none"> •Diverge •Converge •Build consensus
Outlining	<ul style="list-style-type: none"> •Do group outlining •Vote on outline 	<ul style="list-style-type: none"> •Group outliner •Group Voter 	<ul style="list-style-type: none"> •Elaborate •Build consensus
Research	<ul style="list-style-type: none"> •Do group research •Vote on research 	<ul style="list-style-type: none"> •Group outliner •Group Voter 	<ul style="list-style-type: none"> •Elaborate •Build consensus
Drafting	<ul style="list-style-type: none"> •Do group drafting •Vote on draft •Discuss lessons learned 	<ul style="list-style-type: none"> •GroupWriter •Group Voter •Group Voter •Topic Commenter 	<ul style="list-style-type: none"> •Elaborate •Build consensus
Reviewing	<ul style="list-style-type: none"> •Do group reviewing •Group annotations •Vote on results 	<ul style="list-style-type: none"> •GroupWriter •GroupAnnotations •Group Voter 	<ul style="list-style-type: none"> •Evaluate •Build consensus
Revising	<ul style="list-style-type: none"> •Review, accept, and reject annotations •Group revisions •Decide if more drafting is needed -- vote on results •Review open issues and develop action plan 	<ul style="list-style-type: none"> •GroupWriter •GroupAnnotations •Group Voter •Topic Commenter 	<ul style="list-style-type: none"> •Evaluate •Converge •Build consensus •Organize
Final draft	<ul style="list-style-type: none"> •Read document aloud •Vote on results •Final revisions •Final formatting 	<ul style="list-style-type: none"> •GroupWriter •Group Voter 	<ul style="list-style-type: none"> •Evaluate •Build consensus •Elaborate
Close project	<ul style="list-style-type: none"> •Conduct final discussion •Evaluate entire experience •Review an open issues, decide on action plan 	<ul style="list-style-type: none"> •Group Voter •Topic Commenter 	<ul style="list-style-type: none"> •Elaborate •Evaluate •Build consensus

² **Icebreaking** thinkLets include: If you could be a car...?, Introduction talk cards, Little known fact, M&M questions, Me Box, One thing from wallet/purse, Something in Common Two truths and a lie, Victory, Change three things, Hum a tune, and People Scavenger hunt.

³ **Group formation** thinkLets include: Blind birthday, Group juggle, Human knot, Oreo Twist, and Synergy Box.

⁴ **Planning** thinkLets include: Action Planning, Activity analysis, Assumptions evaluation.

⁵ **Brainstorming** thinkLets can include: Categorizing, Alternative Analysis, Cause-and-effect diagramming, Flowcharting, Root Cause Analysis, Reverse thinking, Force field analysis, Payoff matrixing, Prioritization matrixing, Storyboarding, and Nominal Group.

⁶ The vote-on-result thinkLet is a basic consensus thinkLet to allow a group to anonymously decide where they stand on an issue. Other consensus thinkLets include: Devil's advocate, Fast Focus, Pro's/con's, questioning, trial balloon, what if scenarios, Fist of Five, This or That, Thumb Up or Thumb Down, Happy Face/Sad Face

authors are involved to provide helpful criticism and/or simply as an acknowledgement of their contribution to the underlying research. The length of such an article is moderately long (30-100 pages double space). The time involved in such an effort is lengthy, often at least one year, sometimes as long as four or five years (for highly-involved tier one articles). The lead author solicits ideas from other co-authors and writes virtually all the initial draft by him/herself. Then, the co-authors review the article and provide suggestions to which the lead author responds by creating subsequent drafts. One a draft is submitted to a journal long delays are common, and are created by successive rounds of criticism delivered by blind, peer reviewers appointed by a journal's editor. Often the reviewers make all comments and annotations by hand, and send the results via mail; otherwise, email is typically used.

In this scenario, satisfaction and the importance of strong relationships between group members take a backseat to quality. For example, group members and peer reviewers often provide unfettered, sometimes stinging criticism for the sake of quality improvement. However, satisfaction and relationships need to be moderately sufficient to ensure future working relationships, at least with co-authors. To support the work effort, communication quality must be high, focusing on succinctness and accuracy, and avoiding political complications.

Finally, consensus is not only important with the co-authors, but also it is critical to achieve with the editor and blind reviewers: The process of writing, submitting, and continually revising a journal article can be seen as a process of negotiation and social influence where the authors are trying to convince the reviewers their work is a substantial contribution to science that follows appropriate methodologies, field conventions, and presentation protocols. This process represents much give and take, where analytical approaches are documented, justified, and discussed: Where conflict and discord ensues, results are not published. Based on this scenario discussion, thinkLet considerations are presented as follows:

3.2.1 Tool: Target group size is typically small with these documents. The task is highly complex and lengthy but tends to center around sequential processing, especially in regard to reviewer feedback and re-submission. Use of Microsoft Word™ with email is often thought as adequate, although this tends to negate rich brainstorming and feedback from co-authors. Thus, use of standard groupware would be a significant improvement to increase initial co-author involvement, especially in terms of brainstorming and outlining. The ideal tool for an academic article would involve a CW tool in which not only the co-authors participate, but also the journal editor and blind reviewers use it to provide on-line annotations and

feedback. This integrated use of a CW tool would create efficiencies and faster publication through increasing organization, communication, and timely feedback. Collaboratus represents such a tool (see [1]). Given the current state of academic publishing, this tool strategy is not feasible today; however, this will become an increasing opportunity given the rise of on-line publications and the market pressure to publish research results in technology more quickly.

3.2.2 Configuration: Only centralized document control is appropriate since the lead author will want to maintain control of his/her work. Likewise, the most appropriate and efficient writing modes are distributed asynchronous and distributed synchronous writing, since the lead author will perform most of the writing and the co-authors often work at different institutions. The advantage distributed asynchronous writing has over synchronous distributed writing is that it can be more efficient and easier to coordinate. Turning to writing strategy, sequential single author writing is acceptable. Parallel writing likely would not be used in this scenario, as the main author will not want to give up his/her control. Finally, writing roles in such a scenario can include writer (the lead author and the one to many co-authors), editor and facilitator (both taken on by the lead author), and reviewers. The reviewers are two-fold, both consultants and co-authors who merely give feedback while the lead author is creating the document, and the journal article reviewers.

3.2.3 Script: Given the tool and configuration requirements, this section presents the CW process and task elements that should be addressed in the CW script. Because the lead author conducts most of the intellectual work, group formation exercises are rarely needed. However, group members still should ideally be involved in up-front planning and brainstorming. The research, outlining, and drafting tasks represent substantial tasks for the lead author where he/she should try to maximize input from group members if possible.

Typically, in this scenario the main involvement of co-authors is to act as reviewers, before the draft is submitted to a journal. Thus, there should be at least a couple cycles of reviews / annotations to which the lead author responds with appropriate revisions. Once the paper is submitted to a journal, the review cycle becomes intensive yet full of time delays; typically blind reviewers provide in-depth critical comments, but at their leisure. When the feedback is received, the lead author responds to all criticism as appropriate, and only involves co-authors where a second opinion is needed. Thus, authors in this scenario may want to consider having a scribe input all the reviewers' comments into a CW tool, so that the lead author can more easily involve co-authors in the review process (i.e. getting their feedback on how to respond to particular criticisms) and to better track the often contradictory criticisms of the

reviewers.

Barring outright rejection of the article, the lead author needs to respond to every criticism, either justifying the approach taken or amending the approach taken to follow the advice of the criticism. Some authors will decide to “bow out” somewhere in this cycle because they cannot reasonably justify or amend the approach taken, or they do not want to expend the effort to do so. This is where increasing buy-in and feedback of co-authors, and even new rounds of brainstorming can be crucial in decreasing the vicious, unproductive cycle of submitting articles to journals only to withdraw the work after several months of intensive review and rewriting.

3.3 Corporate strategy / vision document

The corporate strategy/vision document scenario represents one of the most intensive collaboration exercises available in the corporate world. Such an effort is expensive, risky, and involves many stakeholders. A corporate strategy document is typically created when new leadership assumes control of a firm that is struggling, or during new venture formation, or as part of a merger and acquisition. The stakeholders that are involved in corporate strategy/vision documents typically include the board of directors, executive management, operational management, union representatives, selected “line employees” that are subject-matter experts, and even key clients. Few firms have the internal wherewithal to facilitate such an endeavor; thus, an army of highly paid, highly skilled strategy consultants, industry specialists, subject-matter experts, and facilitators are typically brought in from firms such as McKinsey, Monitor, Baan, Ernst and Young, etc. Since strategy documents have high-risk creativity, involvement, and quality results are preeminent over other outcomes. Thus, participants are often sequestered to a separate location (e.g. hotel) and conduct the work until it is complete.

3.3.1 Tool: This scenario involves large groups working under extreme time pressure. Thus, the only tools that are appropriate include Groupware and CW tools. The ability for simultaneous editing and reviewing makes CW tools the preeminent choice as they can increase efficiency and quality of coordination; as such CW tools can provide increased strategic advantage, in terms of time to implementation and innovation. Additionally, while these tasks are usually conducted by key stakeholders in one physical location, using a CW tool can allow the inclusion of physically distributed stakeholders.

3.3.2 Configuration: Because of the time intensity of this task the only appropriate document control is centralized control, by an objective, outside facilitator.

The complexity of the task calls for combinations of F2F and distributed work to be used. Often, large F2F sessions using technology in a massive meeting hall need to be conducted to promote unity and buy-in; however, the use of “divide and conquer” task groups in smaller rooms and teams is also necessary for efficiency and problem solving. Because of the high number of stakeholders involved, the only appropriate writing strategy is parallel entry (sequential is unworkable). Finally, not only will all CW roles be used by the various participants and specialists, the participants will need to be organized into sub-groups, which will often work on a particular intellectual and/or writing task together. Multiple editors and facilitators will be used to represent different group and industry needs, and to work on multiple sections simultaneously. Meanwhile, all the editors and group leaders must work in concert with the centralized control provided by the lead facilitator.

3.3.3 Script: Given the intensity of this environment, tempers and tensions can flare, causing counter-productive problems; thus, group formation exercises are a must. Such exercises should last several hours, if not several days, in order to help erase artificial barriers and status differences between participants. These exercises should include group problem solving exercises and even “ropes” courses to provide a sense of team and an early taste of success.

Likewise the planning and research should be highly structured, although these should generally be delegated to subject matter experts and outside facilitators, in order to not overwhelm the corporate team. Moreover, since creativity, buy-in, and quality are critical to corporate strategy tasks, multiple brainstorming sessions using various brainstorming techniques should often be used. For efficiency purposes, group outlining, drafting, and reviewing need to be conducted by most of the stakeholders and will involve multiple iterations. As significant issues are always encountered at unexpected junctures, facilitators need to employ several spontaneous, anonymous brainstorming and voting sessions to improve solutions and consensus.

Finally, when the facilitators and lead stakeholders perceive the strategy document is ready for final approval, all stakeholders must be brought together again in a large F2F meeting, where the document is orally read, final comments are given, and the entire group votes on its approval. When the stakeholders approve the final document, a small team of specialists will do the final document formatting, paying particular attention to grammar, graphics, and appearance quality. At this point, the document is typically published for internal stakeholders and selected external stakeholders.

4.0 Conclusion

The purpose of this paper was to use thinkLet framework to advance CW processes, facilitation, and technology. Using this framework, this paper proposed critical requirements for CW tools, and important facilitation considerations in terms of CW configurations and scripts. Several examples of successful facilitation and CW processes were used from past research, and case-specific scenarios for group meeting notes, academic articles, and corporate strategy documents were given. Clearly, the thinkLet structure provides an excellent framework in which to pose CW improvements. The framework reveals the underlying complexity of seemingly straightforward CW processes and decisions. The next important step in using this framework for improving CW is to conduct laboratory experiments and field research to verify and improve the recommendations made. Ultimately these advances can be used not just to improve professional facilitation with CW groups, but also to enable CW groups to become more self-sustaining.

References

- [1]P. B. Lowry, Q. E. Booker, and J. F. J. Nunamaker, "Synchronous, distributed collaborative writing using Collaboratus," presented at 35th Annual Hawai'i International Conference On System Sciences (HICSS), Hawaii, 2002.
- [2]P. B. Lowry, J. Lee, and J. F. J. Nunamaker, "Users experiences in collaborative writing using Collaboratus," presented at 35th Annual Hawai'i International Conference On System Sciences (HICSS), Hawaii, 2002.
- [3]M. Adkins, J. Q. Reinig, J. Kruse, and D. Mittleman, "GSS Collaboration in Document Development: Using GroupWriter to Improve the Process," presented at Proceedings of the 32nd Annual Hawaii International Conference on System Sciences, Hawaii, 1999.
- [4]D. Mittleman and M. Adkins, "Using GroupSystems to improve the process of group document writing," presented at Seventh Annual GroupSystems Users Conference, Tucson, AZ, 1996.
- [5]R. M. Baecker, D. Nastos, I. R. Posner, and K. L. Mawby, "The user-centered iterative design of collaborative writing software," presented at ACM Conference on Human factors in computing systems, Amsterdam The Netherlands, 1993.
- [6]A. C. Easton, N. S. Eickelmann, and M. E. Flatley, "Effects of an electronic meeting system group writing tool on the quality of written documents," *Journal of Business Communication*, vol. 31, pp. 27-40, 1994.
- [7]J. S. Olson, G. M. Olson, M. Storosten, and M. Carter, "Groupwork close-up - a comparison of the group design process with and without a simple-group editor," *ACM Transactions on Information Systems*, vol. 11, pp. 321-348, 1993.
- [8]C. A. Ellis, S. J. Gibbs, and G. L. Rein, "Groupware: Some Issues and Experiences," *Communications of the ACM*, vol. 34, pp. 39-58, 1991.
- [9]M. Horton, P. Rogers, L. Austin, D. Brimm, and M. McCormick, "The impact of face-to-face technology on group writing," presented at 24th Annual Hawaii International Conference on Systems Sciences, Hawaii, 1991.
- [10]R. O. Briggs, G. J. de Vreede, J. F. J. Nunamaker, and D. Tobey, "ThinkLets: Achieving predictable, repeatable patterns of group interaction with Group Support Systems (GSS)," presented at 34th Annual Hawaii Conference on Systems Sciences, Maui, Hawaii, 2001.
- [11]M. Sharples, J. Goodlet, E. Beck, C. Wood, S. Easterbrook, and L. Plowman, *Research issues in the study of computer supported collaborative writing*, 1993.
- [12]M. Horton, P. Rogers, L. Austin, and M. McCormick, "Exploring the impact of face-to-face collaborative technology on group writing," *Journal of Management Information Systems*, vol. 8, pp. 27-48, 1991.
- [13]I. R. Posner and R. M. Baecker, "How people write together," presented at 25th Hawaii International Conference on System Sciences, Hawaii, 1992.
- [14]C. M. Neuwirth, D. S. Kaufer, R. Chandhok, and J. H. Morris, "Issues in the design of computer-support for co-authoring and commenting," presented at Third Conference on Computer-Supported Cooperative Work (CSCW '90), Los Angeles, CA, 1990.
- [15]E. Beck, "A Survey of Experiences of Collaborative Writing," in *Computer Supported Collaborative Writing*, M. Sharples, Ed. Berlin: Springer Verlag, 1993, pp. 87-112.
- [16]R. E. Kraut, J. Galegher, and C. Egido, "Relationships and tasks in scientific research collaboration," *Human-Computer Interaction*, vol. 3, pp. 31-58, 1988.
- [17]C. M. Neuwirth, D. S. Kaufer, R. Chandhok, and J. H. Morris, "Computer support for distributed collaborative writing defining parameters of interaction," presented at Conference on Computer supported cooperative work, Chapel Hill, NC, 1994.
- [18]V. C. Miles, J. C. McCarthy, A. J. Dix, M. D. Harrison, and A. F. Monk, "Reviewing Designs for a Synchronous-Asynchronous Group Editing Environment," in *Computer Supported Collaborative Writing*, M. Sharples, Ed.: Springer-Verlag, 1993, pp. 137-160.
- [19]T. D. Erickson, "Interfaces for cooperative work: An eclectic look at CSCW '88," *SIGCHI Bulletin*, vol. 21, pp. 56-64, 1989.
- [20]J. Fjermestad and R. H. Starr, "An assessment of group support systems experiment research: Methodology and results," *JMIS*, vol. 15, pp. 7-149, 1999.
- [21]D. B. Walz, J. J. Elam, and B. Curtis, "Inside a software design team: Knowledge acquisition, sharing, and integration," *Communications of the ACM*, vol. 36, pp. 62-77, 1993.
- [22]D. R. Seibold, R. A. Meyers, and Sunwolf, "Communication and influence in group decision making," in *Communication and group decision making*, R. Y. Hirokawa and M. S. Poole, Eds., 2nd ed. Thousand Oaks: Sage, 1996.
- [23]K. M. K. a. R. P. Bostrom, "Personality Characteristics of MIS Project Teams: An Empirical Study and Action-Research Design," *Management Information Systems Quarterly*, vol. 6, pp. 43-60, 1982.
- [24]D. S. Gouran, "Variables related to consensus in group discussions of questions of policy," *Speech Monographs*, vol. 36, pp. 387-391, 1969.

- [25] R. S. DeStephen, "High and low consensus groups: A content and relational interaction analysis," *Small Group Behavior*, vol. 14, pp. 143-162, 1983.
- [26] A. F. Osborn, *Applied Imagination: Principles and Procedures of Creative Thinking*, 2nd ed. NY, NY: Scribners, 1957.
- [27] H. Lindstone and H. Turroff, *The Delphi Method: Technology and Applications*. Reading, MA: Addison-Wesley, 1975.
- [28] A. Delbecq, V. d. V. A., and D. Gustafson, *Group Techniques for Program Planning: A Guide to Nominal Group Technique and Delphi Processes*. Middleton, WI: Green Briar Press, 1975.
- [29] A. H. Van de Ven and A. L. Delbecq, "Nominal versus interacting group processes for committee decision-making effectiveness," *Academy of Management Journal*, vol. 14, pp. 203-212, 1971.
- [30] L. F. Anderson and S. E. Robertson, "Group Facilitation, Functions and Skills," *Small Group Behavior*, vol. 16, pp. 139-156, 1985.
- [31] J. F. George, A. R. Dennis, and J. F. Nunamaker, "An experimental investigation of facilitation in an EMS decision room," *Group Decision and Negotiation*, vol. 1, pp. 57-70, 1992.
- [32] B. Wheeler and J. Valacich, "Facilitation, GSS, and Training as Sources of Process Restrictiveness and Guidance for Structure Group Decision Making: An Empirical Assessment," *Information Systems Research*, vol. 7, pp. 429-450, 1996.
- [33] T. L. Griffith, M. A. Fuller, and G. B. Northcraft, "Facilitator Influence in Group Support Systems: Intended and Unintended Effects," *Information Systems Research*, vol. 9, pp. 20-34, 1998.
- [34] N. Romano, J. F. J. Nunamaker, R. Briggs, and D. Mittleman, "Distributed GSS facilitation and participation: Field action research," presented at thirty-second Annual Hawaii International Conference on System Sciences, Hawaii, 1999.
- [35] M. J. McQuaid, R. O. Briggs, D. Gillman, R. Hauck, C. Lin, D. D. Mittleman, J. F. Nunamaker, M. Ramsey, and N. Romano, "Tools for distributed facilitation," presented at The 33rd Annual Hawaii International Conference on System Sciences, Hawaii, 2000.
- [36] J. F. Nunamaker, R. O. Briggs, D. D. Mittleman, D. R. Vogel, and P. A. Balthazard, "Lessons from a Dozen Years of Group Support Systems Research: A Discussion of Lab and Field Findings.," *Journal of Management Information Systems*, vol. 13, pp. 163-207, 1997.
- [37] H. Lewe, "Computer support and facilitated structure in meetings: An empirical comparison of their impact," presented at Twenty-Ninth Annual Hawaii International Conference on System Sciences, 1996.