

**Report of the HICSS-39 Workshop on
Collaboration Engineering**
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Foreword

People who collaborate toward important goals often achieve far more as a group than they could as individuals. However, group work is a mixed blessing that brings its own challenges. Research shows that under many circumstances, groups who work with an experienced facilitator supported by collaboration technology are much more productive than teams who do not. However, dedicated facilitators are expensive to sustain in organizations; so many teams that could benefit from facilitation have no access to it.

Collaboration Engineering is an approach to designing and deploying collaboration processes for high value recurring tasks, for practitioners to execute for themselves, without the ongoing intervention of a professional facilitator.

In the workshop, presenters reported on the latest breakthroughs in Collaboration Engineering research. Both in the morning and afternoon we first had presentations of advances and new insights in Collaboration Engineering. After the presentations we had active sessions on a topic related to the presentations. This report presents an overview of the presentations and the sessions.

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Workshop Report

HICSS 39 First Workshop on Collaboration Engineering

Introduction

The HICSS 39 First Workshop on Collaboration Engineering convened at the Hawaii International Conference on System Sciences on January 4, 2004 to reach consensus on the labels and definitions of key terms now being used by the collaboration engineering research community, to report the latest advances in the collaboration engineering research community, and to attempt to solve a heretofore intractable problem: the development of a new collaboration design pattern (thinkLet) for building consensus among geographically-distributed people. The workshop achieved both of these goals.

Background

Collaboration Engineering (CE) is a new approach to designing collaboration processes for high-value recurring tasks, and transferring those designs to practitioners to execute for themselves without the ongoing intervention of a professional facilitator. CE focuses on high-value tasks, because improvements on those tasks can yield the most benefit to an organization. CE focuses on recurring tasks for two reasons: 1) so that an organization can derive ongoing benefit from the investment in CE; and 2) so that it is worth a practitioner's time to learn the process designed by a collaboration engineer. Currently the CE research community uses the Four Ways model of engineering to organize its intellectual content.

- **Way of Thinking** – concepts and theoretical foundations.
- **Way of Working** – Structured design and deployment methodologies
- **Way of Modeling** – conventions for representing aspects of the domain and the approach.
- **Way of Controlling** – measures and methods for managing the engineering process.

For purposes of clarity, the contributions to this workshop are organized under the Four Ways model, rather than being presented in the order they were discussed in the workshop. Contributions were made to three of the four ways: Way of Thinking, Way of Working, and Way of Modeling.

Contributions to Way of Thinking

Definitions of Key CE Terms

Concepts: Gwendolyn Kolfshoten, Robert Briggs, and Gert-Jan de Vreede

Presenter: Gwendolyn Kolfshoten

The workshop began with a proposal for formal definitions of key Collaboration Engineering terms. The field is advancing rapidly, and researchers working in parallel have begun to use different terms for the same concepts. The purpose of this activity was

Table 1 Key Collaboration Engineering Terms and the Definitions Agreed to Participants in the HICSS 39 First Workshop on Collaboration Engineering	
Key Term	Definition
Collaboration Engineering	<i>An approach to designing work practices for high-value recurring collaborative tasks and deploying these work practices by transferring the designs to practitioners to execute for themselves without the ongoing intervention of professional facilitators.</i>
Collaboration	<i>Joint effort toward a group goal</i>
Collaboration Engineer	<i>An individual who uses the tools and methods of Collaboration Engineering to design and deploy collaborative work practices.</i>
Practitioner	<i>A domain expert who learns to execute a particular work practice designed by a collaboration engineer. Practitioners need not have collaboration skills beyond those required to execute their own collaborative work practice.</i>
ThinkLets	<i>A design pattern language for collaborative work practices. A thinkLet is a named, scripted, repeatable activity that yields a known pattern of collaboration among people working together toward a goal.</i>
Goal	<i>A desired state or outcome.</i>
Design (verb)	<i>To create and document a prescription for collaborative practices</i>
CE Design (noun)	<i>Documentation of a prescription for a collaborative work practice. A design documents a structured set of steps for attaining objectives, the information, tools and methods to be used for each step, and the conditions under which each step should be executed.</i>
High Value Task	<i>A task from which an organization derives substantial benefit, or by which it forestalls substantial loss by successful completion.</i>
Recurring Task	<i>A task that must be conducted repeatedly, and can be completed using a similar work practice design each time it is executed.</i>

to arrive at mutually acceptable labels and definitions for terms now in common use in the CE literature. Before the workshop, the moderators of this section communicated with most of the CE researchers currently active to compile the set of concepts and to compare and negotiate labels and definitions. Workshop contributors agreed to most of the definitions as presented, and negotiated definitions for the other terms. Table 1 lists the key terms and definitions.

The Scope of Collaboration Engineering

Concepts: All attendees

Moderator: Gwen Kolfshoten

The participants in the workshop debated the scope of the emerging discipline of Collaboration Engineering. The following boundaries were proposed and agreed to by participants:

- CE focuses on mental effort rather than physical effort
- CE as CE focuses on high-value tasks, it considers many dimensions of value – social, affective, political, economic, cognitive, and political.
- CE focuses on recurring tasks, but its tools and techniques may be appropriated by facilitators for the design of *ad hoc* tasks.

The group debated whether the design and deployment of training practices would fall under the scope of CE. Examples were given of how CE principles had been applied to learning experiences. Others argued, however, that when CE principles are used for training, CE becomes a “training the trainer” approach, and thus a very indirect approach to goal achievement. Participants agreed that further discussion among the community is required.

The group debated whether it was necessary or useful to try to put boundaries on CE at this time, given that its concepts are not yet fully articulated and its utility is not yet fully understood. The group agreed that boundaries may be useful, but that for the present, we should err on the side of inclusiveness rather than exclusiveness.

Fundamental Patterns of Collaboration

Concepts: Robert Briggs, Gert-Jan de Vreede, Doug Dean

Presenter: Gwendolyn Kolfshoten

Collaboration Engineering researchers initially identified five patterns of collaboration that can emerge as a group works together toward its goals: *Diverge*, *Converge*, *Organize*, *Evaluate*, and *Build Consensus* [Briggs & Vreede, 2005]. Over the past 3 years, experiences in the field and with reviewers revealed that the labels, *Diverge* and *Converge* were badly confounded with other concepts. Many people used those terms when discussing consensus. Further, it became clear from field research that the term, *converge* was actually a combination of two concepts, and that each could occur without the other. Finally, advances on the theoretical foundations of consensus suggested that the standard definition of the *Build Consensus* pattern was flawed. Therefore, after

consultations with others in the CE community, six fundamental patterns have now been defined to replace the original five. They are:

- **Generate:** Move from having fewer to having more concepts in the pool of concepts shared by the group
- **Reduce:** Move from having many concepts to a focus on fewer concepts which have been deemed by the group to be worthy of further attention
- **Clarify:** Move from having less to having more shared understanding of concepts and of the words and phrases used to express them.
- **Organize:** Move from less to more understanding of the relationships among concepts the group is considering
- **Evaluate:** Move from less to more understanding of the value toward goal attainment of concepts under consideration in the group
- **Build consensus:** Move from more to less disagreement with respect to a proposal

Instrumentality Theory of Consensus

Concepts: Robert Briggs, Gwendolyn Kolfshoten, GJ de Vreede

Presenter: Robert Briggs

The workshop heard the first public presentation of Instrumentality Theory, a causal theory of consensus building. The theory defines consensus as *a state in which all stakeholders are willing to commit to a proposal*. This definition frames consensus as a Boolean construct rather than a continuum, which overcomes logical flaws that emerged in earlier theories of consensus, especially Consensus Building Theory (Briggs, Kolfshoten, and Vreede, 2005).

Instrumentality Theory assumes that individuals rank their salient goals based on the utility they ascribe to the desired state or outcome, and the likelihood they assess that a goal may be obtained. The theory proposes that an individual's willingness to commit to a proposal is a function of the perceived instrumentality of the proposal toward attainment of the individual's salient goals.

It posits that perceived instrumentality is based on two judgments: The outcome judgment – the likely results of implementing a proposal; and the instrumentality judgment – the degree to which outcomes would advance individual goals.

The presentation proposed five diagnostics for dissensus (a state where one or more members of a group are not willing to commit to a proposal): Mutually exclusive goals, Differences of meaning, differences of mental models, differences of information, and differences of taste. The presentation concluded by using the propositions of the theory to derive strategies for resolving diagnosed causes for dissensus.

Contributions to Way of Working

ThinkLets for Distributed Consensus Building.

Concepts: All attendees

Moderator: Robert Briggs

Taking into account the propositions of Instrumentality Theory and the challenges faced by geographically distributed groups, workshop participants attempted to derive a thinkLet for consensus building among distributed group members. The ensuing discussion showed that consensus-building was a more-complex concept than had been previously considered. The result of this effort was a sequencing of patterns, each of which could be implemented with some selection of thinkLets, rather than a single thinkLet. The proposed patterns were:

- Generate judgments of likely outcomes if the proposal were implemented in the form of comments .
- Converge on a non-redundant list of likely outcomes
- Identify and discuss mutually exclusive outcome judgments.
- Evaluate the individual instrumentality of likely outcomes
- Advocate for or against the proposal
- Evaluate the degree to which individuals are willing to commit to the proposal
- If consensus has not been achieved, Invoke the five diagnostics for dissensus.

Several key concepts and questions emerged from this discussion. Those points are summarized below:

- *To what extent do individual traits influence consensus building?* Some may be more comfortable with change than others. Some may have more political investment in the current situation, while others may be more heavily invested in the proposed change.
- *How can the group clearly demonstrate that there is a lack of consensus?* If, as the theory proposes, consensus is a Boolean state, then a quick straw poll could establish whether consensus exists.
- *Is it possible to create a feeling or illusion of consensus when none exists?* Yes. For example, by presenting the proposal somewhat differently to each stakeholder. Thus, they believe they are agreeing to the same thing, but in fact, they are not.
- *Is it ethical to create an illusion of consensus when none exists?* Possibly. It may be worth exploring this topic more fully in another venue.

An analysis of the role of the facilitator and alternative scenarios for collaboration support

Concepts: Linda.A. Macaulay, Aref. Alabdulkarim, Gwendolyn Kolfshoten

Presenter: Gwendolyn Kolfshoten.

There is increasing recognition of the importance of collaboration in today's global economy where individuals and organizations need to form alliances to optimize their potential to compete. Group working is on the increase both within organizations and across organizational boundaries. The goal of effective collaboration has been addressed by many researchers and in this paper we focus on one 'traditional' approach; that of employing a professional facilitator. We identify two key problems associated with this approach, first the lack of sufficient numbers of skilled facilitators worldwide and second

the expense of bringing together people who are geographically dispersed into one meeting place. The paper provides a description of the role of facilitator and presents a classification of current literature on the subject. Three scenarios are presented, each of which offers solutions to the above problems. Scenario one is Collaboration Engineering whose focus is on deskilling the role of the facilitator by providing support for the collaboration process. Scenario two is distributed facilitation whose focus is on supporting the role while both the facilitator and the meeting participants are geographically dispersed. Finally, scenario three is the agent facilitator whereby the role is completely automated using an intelligent software agent. For each scenario we discuss what can be done by way of facilitation support and identify where difficulties arise. The overall analysis leads to the conclusion that there is a need for greater understanding of the social aspects of facilitation such that appropriate patterns can be developed and hence further support be provided.

A gaming Laboratory to Study Distributed Collaboration Processes

Concepts: H. Tarmizi, L. Steinhauer, M. Payne, C. Noteboom, C. Zhang, G.J. de Vreede, and I. Zigurs

Presenter: Gert-Jan de Vreede

Collaboration in distributed, asynchronous settings presents additional complexities for teams and researchers compared to face-to-face settings. Current advances in Collaboration Engineering offer promising guidelines for successful team efforts, yet the application of these techniques in distributed arenas has not been studied much. The purpose of our research is to create an environment that allows teams of researchers to study virtual collaboration processes and test repeatable process structures for distributed collaboration. This environment has been implemented as a multi-actor gaming simulation that offers complexity and versatility to study a range of virtual collaboration issues with sufficient levels of realism. This paper presents the design of the gaming laboratory in terms of the game setting, the roles, the scenario, the technological implementation, and the experimental processes and procedures. Finally, we highlight the experiences and lessons learned from using the environment in a series of pilots and one study.

A Structured Methodology for the Design of Collaboration Processes

Concepts: G.L. Kolfshoten, G.J. de Vreede, A. Chakrapani, and P. Koneri

Presenter: Gwendolyn Kolfshoten

This presentation described a structured methodology for collaboration process design for collaboration engineers. It described each step, and specified the deliverables for each step. Then reported results from using the methodology in the field. Figure 1 summarizes the approach along with the inputs and outputs of each step.

The presentation also included a demonstration of the first prototype of Computer Supported Collaboration Engineering (CACE) software, which supports a collaboration engineer in selecting among thinkLets and structuring them into a collaboration process design.

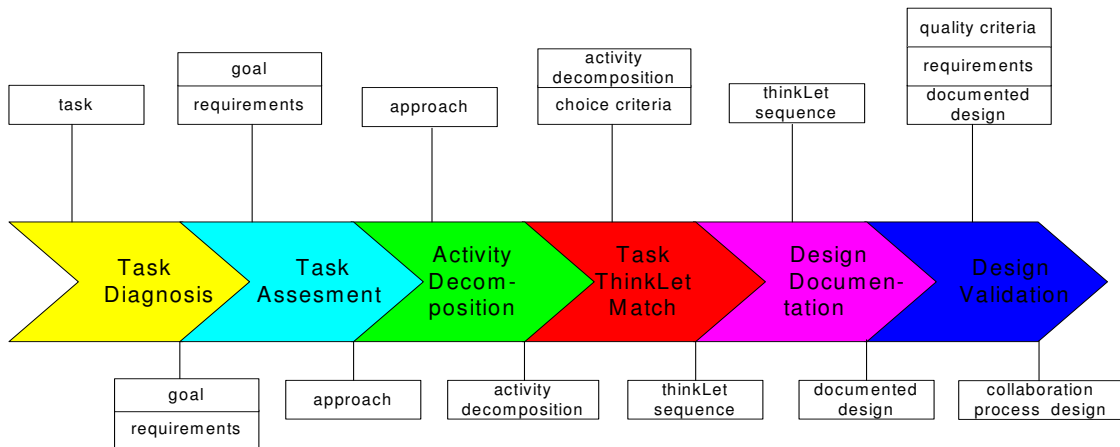


Figure 1. A structured methodology for Collaboration Engineering

The discussions of this presentation included the following key points:

- The structured methodology is exciting because it is the first formalization of a way-to-work that includes inputs and deliverables for each step
- The methodology has a distinctive waterfall appearance, yet other design disciplines have already demonstrated that a waterfall approach is fraught with risks. It is therefore important to look into design literature to develop a way of representing the process to more clearly visualize its accommodation of iteration and interdependency among the different steps is more visible. The spiral model of Boehm may be a starting point for this exploration. Doing so might make it easier for the methodology to grow in sophistication as the scale of CE projects grows.

Contributions to Way of Modeling

Advances of the Syntax Facilitation Process Model

Concepts: G.L. Kolfshoten, G.J. de Vreede, A. Chakrapani, and P. Koneri

Presenter: Gwendolyn Kolfshoten

The workshop included the first public presentation of an extended syntax for the Facilitation Process Model (FPM), which is used to document the process flow, and critical elements in this flow, of a collaboration process design. A FPM focuses attention on the logic of the flow of the process from activity to activity. The FPM should be self-explanatory. The elements of the model are:

1. The sequence of activities
2. Decisions, criteria for the decisions and alternative paths of the process
3. The pattern of collaboration that will occur from the activity and the result
4. Transitions of data when needed
5. The time for each step
6. Step number

7. Activity name
8. ThinkLet name

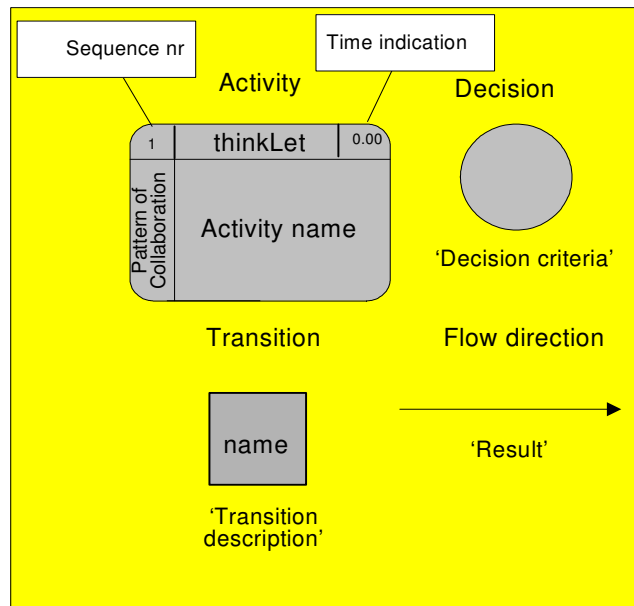
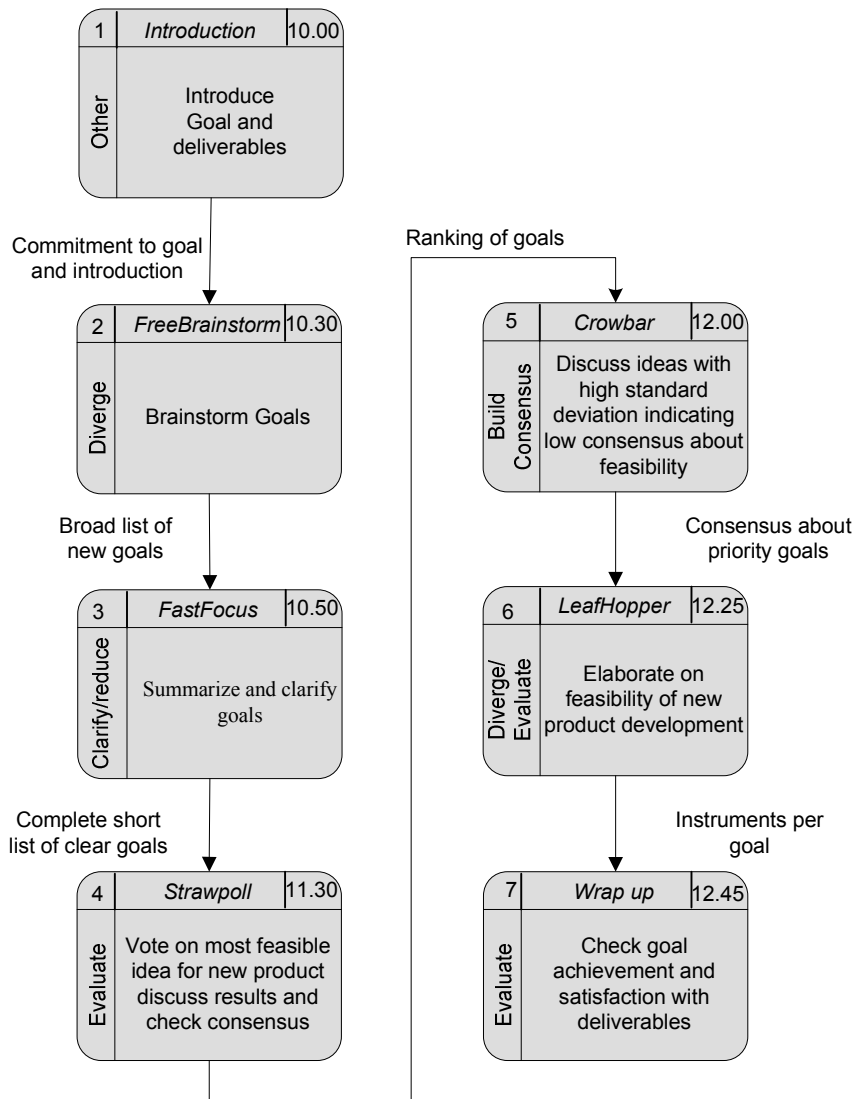


Figure 2. The Symbols of the Facilitation Process Model

A FPM uses four symbols (see fig. 1) to document the flow of a process from thinkLet to thinkLet. This modeling convention represents each activity in a process as a rectangle with rounded corners that has been divided into five fields. In the left upper field, the sequence nr is indicated, corresponding with the agenda. The largest field contains a descriptive name for the activity that conveys what the team is supposed to do. The field on the left names the primary pattern to be instantiated in the activity. The thinkLet name for the instantiation appears across the top, and in the right upper corner the time for the step is indicated. Transitions are represented as a square on a flow arrow, and described. Decision points in transitions are represented as circles and the decision with criteria is indicated below. Outcomes or deliverables might be part of the decision and other ways are input for the next activity. An example is given below.

- A sequence number in the upper left corner of the activity symbol
- An indication of either the projected start-time or expected duration of an activity recorded in the upper right corner of the activity symbol
- A transition description symbol for named transitions.
- The addition of the “result” label to a flow arrow indicating which deliverables from an antecedent activity will be required at the start of a subsequent activity.

The figure below illustrates the use of the extended syntax to document the design for a process review methodology.



Workshop discussed the implications of the extensions to the syntax, and concluded that they would contribute significantly to the clarity and utility of the design artifact.