RESEARCH METHODS FOR COLLABORATION ENGINEERING: AN ASSESSMENT OF APPLICABILITY USING COLLABORATIVE POLICY-MAKING EXAMPLE

Josephine Nabukenya
Radboud University Nijmegen
josephine@cs.ru.nl

Gert-Jan de Vreede
University of Nebraska at Omaha
Delft University of Technology
gdevreede@mail.unomaha.edu

H. A.. (Erik) Proper
Radboud University Nijmegen
E.Proper@cs.ru.nl

Abstract

Collaboration Engineering (CE) is a new field of research and practice which involves the design of recurring collaboration processes that are meant to cause predictable and success among organizations' recurring mission-critical collaborative tasks. To measure the effectiveness of CE research efforts, we would need to use a research methodology. This article therefore provides an overview of selected research methods, and an assessment of their applicability to CE research using collaborative organizational policy-making processes as the primary example. This article also presents examples of research questions that can be answered in the CE research using the respective research methods.

Key words: Research Methods, Collaboration Engineering

1 INTRODUCTION

Collaboration Engineering (CE) is a new field of research and practice that many organizations have come to appreciate due to its advantage of creating substantial value for organizational stakeholders. De Vreede and Briggs (2005), define *collaboration engineering* as "designing recurring collaboration processes that can be transferred to groups that can be self-sustaining in these processes using collaboration techniques and technology". To design collaboration processes in CE research, collaboration engineers need to follow a five ways model (in our case an engineering approach which is given in this model) suggested by Seligmann et al., (1989) in Briggs et al.,(2006): *way of thinking* where the concepts and theoretical foundations are given; *way of working* describes structured design methods; *way of modeling* describes conventions for representing aspects of the domain and the approach; *way of controlling* describes measures and methods for managing the engineering process; and finally the *way of supporting* describes tools, approaches and techniques to support the designer.

More so, CE research requires that collaboration engineers need to consider how a group will accomplish each task in the collaboration process. A *pattern of collaboration* is therefore used as a means to how a group can move through the phases to attain a goal. Six patterns of collaboration are defined in a way that they are meant to move a group from a starting state to an end state: *Generate* (move from having fewer concepts to having more concepts); *Reduce* (move from having many concepts to having a focus on fewer concepts deemed worthy of further attention); *Clarify* (moving from less to more shared meaning for the concepts under consideration); *Organize* (move from less to more understanding of the relationships among the concepts); *Evaluate*: Move from less to more understanding of the benefit of concepts toward attaining a goal); and *Build consensus* (move from having more disagreement to having less disagreement among stakeholders on proposed courses of action) (Briggs et al., 2006). However, specifications of how a particular pattern of collaboration should be realized when a process is run by the group is not shown. This can be achieved by thinklets. Briggs et al., (2003) define a *thinklet* as "a named, packaged facilitation intervention that creates a predictable, repeatable pattern of collaboration among people working together toward a goal". Thus, for CE research to be effective to organizations, it must be relevant to their needs of practice and also used by its practitioners.

To measure the effectiveness of CE research, we would need to use a methodology. A methodology is a combination of one of more data collection, and analysis methods used to answer a research question. Inspite having several methodologies to conduct research, they may be appropriate in different situations depending on the research question being addressed. The methodologies that can be used in conducting CE research may include but are not limited to: case-study research, action research, survey research, experimental research, grounded theory research, games and simulations, and design research.

In summary, people conduct research in order to increase theoretical knowledge, that is, they want to understand why things happen in a particular area of interest; and also to improve practices in such a way that they expect that research will ultimately result in some useful social outcome. Researchers' methodologies guide them in defining, collecting, organizing, and interpreting their data. For instance, the experimental research is a method in which a researcher manipulates a variable under highly controlled conditions to see if this produces (causes) any changes in a second variable; while a survey research is one where a researcher makes inferences about behavior from data collected via interviews or questionnaires; and a researcher may use a case study for some detailed investigation of a particular phenomenon of interest.

Notwithstanding the great potential of CE research in organizational work-practice, there is a need to determine its effectiveness. Our paper therefore focuses on research methodologies that can be used to validate this potential in relation to collaborative organizational policy-making processes as our example.

Below are broad *research questions* in the CE research example that would need to be addressed depending on appropriate methodologies.

- What does it mean for a policy to be 'good' in a collaborative organizational policy-making process (CPMP); in other words, what is a quality PMP; what does it mean for a CPMP effort to have quality; and what are the likely collaboration challenges a group might face while executing the process?
- What assumptions/requirements of CE might follow from PMP; and how might CE aid in supporting to improve the quality of the collaborative PMP effort?

The purpose of this paper is therefore to provide an overview of selected research methods, and to assess their applicability to collaboration engineering (CE) research using collaborative organizational policy-making processes as our primary example. In the remainder of this paper we provide an overview of research methods with strengths and weaknesses of each method; more so, their applicability to CE research using collaborative organizational policy-making processes as an example is also described.

2 RESEARCH METHODS: OVERVIEW AND APPLICABILITY TO COLLABORATION ENGINEERING

In the table below we offer a summary of selected research methods and how they apply to CE research using the CPMP example, more so how these methods supplement each other towards fulfilling a comprehensive CE research.

Summary Table of Research Methods: Applicability to CE using Collaborative PMPs example			
Research Method	**Relevancy to CE**	**Example(s) of CPMP issues**	**Supplement Research Method**
Case Study Research (CSR)	i).Provides detailed contextual views on phenomenon of interest	Improving "*quality*" of organizational policy processes; e.g. we would need descriptions on PMP: *i).characteristics, ii).deliverables, iii).challenges*	i).*Grounded theory* – to build/develop theory from descriptions of phenomena ii).*Survey research method* – to test, for example, constructs defined; and theories developed using CSR ii).*Action research* – theory application and evaluation concurrently (theory testing) from CSR
Action Research (AR)	i).Addresses the "*how to*" research questions ii).Continuous design and evaluation in un-constructed settings iii).Evaluation and improvement of problem-solving techniques or theories during a series of interventions	i).How to test, measure, and evaluate a collaborative organizational policymaking process/theory? ii).How might CE aid in supporting to improve the quality of the collaborative PMP effort?	i).*Grounded theory* – to organize data i.e. coding methods can be used to enrich the theoretical underpinnings of an AR case study. ii).*Case study research* – to provide descriptions of phenomena in an AR iii).*Survey research* – to produce quantitative descriptions on phenomena in an AR iv).*Experimental Research* – to test interventions in AR v). *Design Science Research* – to construct knowledge and artifacts for validation in AR

Grounded Theory Research (GT)	i).Development of a theory that can be used to account for variations in the outcome of interest.	Improving "*satisfaction"* with group processes and product among stakeholders who are developing an organizational policy; e.g. i).Causes of policy stakeholders to feel satisfied	i).*Case study Research* – to provide description of phenomena ii).*Action Research* – to test and validate theory built in GT
Survey Research (SR)	i).Measurement of the success of collaboration process outcomes and process designs … seeks uniformity from the participants in an intervention	i).What is policy-makers' stake on collaborative organizational policy-making? ii).What do stakeholders want to see in a collaborative organizational policy-making process that is different from the traditional one?	i).*Case study research* – to be used together with SR … develops a richer, more detailed, and complete understanding of how and why certain results occur in SR ii).*Application of Naturalistic observation* – to systematically watch and record naturally occurring behavior
Design Science Research (DSR)	i).To construct knowledge and artifacts for collaboration processes designs	i).How to develop and design thinklets that are suitable for transferability of CPMP design to policy practitioners/stakeholders?	i).*Action Research, Survey Research and Experimental Research* – to test, validate and evaluate knowledge and artifacts constructed in DSR

3 Case Study Research Methodology (CSR): Overview and Applicability to CE

Case study research (CSR) is defined by Yin (2003), as "an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident". It can be characterized as qualitative and observatory, using predefined research questions (Yin 2003 and 1989). In addition, it can, also be explanatory, exploratory, or descriptive, focusing on natural phenomenon in order to build or test theories (Benbasat et al. 1987; Galliers 1991; Hartely 1994; Yin 2003). According to Pare (2004), CSR is useful: when a phenomenon is broad and complex; where the existing body of knowledge is insufficient to permit the posing of causal questions; when a holistic, in-depth investigation is needed; and when a phenomenon cannot be studied outside the context in which it occurs (Benbasat et al., 1987; Feagin et al., 1991; Yin, 2003). CSR **strengths** are:

- To provide descriptions of phenomena, develop theory, and test theory
- To provide evidence for hypothesis generation and for exploration of areas where existing knowledge is limited

Its **limitations** include:

- It is difficult to design and scope a CSR project in order to ensure that the research question (or questions) can be appropriately and adequately answered; data collection for CSR can be time-consuming and tedious; it often results in the accumulation of large amounts of data
- The availability of suitable case study sites may be restricted, as business and other organizations are not always willing to participate in CSR; the reporting of CSR can also be difficult: the rigor of the process used to arrive at the results and the validity of the findings and conclusions reached need to be established; CSR has often been considered to be lacking rigor

Applicability to CE: CSR is very useful when CE researchers want to get a detailed contextual view of the phenomenon of interest; for instance, if he/she wanted to improve qualities of policy-making processes, he/she would need to carry out an in-depth investigation to get better understanding of this

domain. The CE researcher would therefore employ CSR to address the following collaborative organizational policy-making processes research questions:

- What are the key: characteristics, deliverables, and challenges of a PMP; and success criteria to its implementation?
- What is a good Policy, and what does it mean for a Policy to be good in a collaborative PMP?
- What is a quality PMP, and what does it mean for a collaborative PMP effort to have quality?

Because of its limitations, it would be advantageous for the CE researcher to supplement CSR with other research methods in order to be more effective. These may include but not limited to:

- Grounded theory can be used to build/develop theory;
- CSR can be combined with other research methods in studies where there is more than one research aim. For example, the use of CSR to first define constructs and develop theory which can subsequently be tested using survey research methods; and
- Action research can be used for theory application and evaluation concurrently since CSR does not provide for theory testing.

4 Action Research Methodology (AR): Overview and Applicability to CE

Action Research (AR) is an inquiry into how people design and implement action in relation to each other (Argyris et al. 1985). It is committed to the production of new knowledge through the seeking of solutions or improvements to 'real life' practical problem situations (Avison et al. 1999). Eden and Huxham (1996), state that action research refers to research which, broadly, results from an involvement by the investigator with members of an organization over a matter which is of genuine concern to them and in which there is an intent by the organization's members to take action based on the intervention'. According to Hult and Lennung's (1980) definition, four major characteristics of AR are distinguishable: it aims at an increased understanding of an immediate social situation, with emphasis on the complex and multivariate nature of this social setting in the IS domain; it assists in practical problem solving and expands scientific knowledge – this goal extends into two important process characteristics: first, there are highly interpretive assumptions being made about observation; second, the researcher intervenes in the problem setting; it is performed collaboratively and enhances the competencies of the respective actors … a process of participatory observation is implied by this goal; it is primarily applicable for the understanding of change processes in social systems. It can be characterized as diagnostic, problem focused, action-oriented, collaborative, situational, cyclical, ethically based, experimental, scientific, naturalistic, normative, re-educative, emancipatory, case-oriented, stresses group dynamic, balances research and social action, incorporates local knowledge, multidisciplinary, and contributes to human systems development (Susman and Evered 1978, Argyris et al 1985, Eden and Huxham 1996). Action research **strengths** include:

- It blends theory and practice – it attempts to solve real-world problems of concern for organizational participants, and uses reflection on this problem solving activity and process to generate new insights and knowledge
- It is guided by a conceptual or theoretical framework – the theory guides problem identification and diagnosis, and action planning
- Key outcomes for the AR intervention would involve improvement in practice and learning – about the problem context, about the theory guiding the intervention, and about the nature of intervening in problem situations
- It involves the most direct form of observation; it captures reality in greater detail; Subjects forget that they are indeed the subject of the research
- It permits theory application and evaluation concurrently

AR **weaknesses** include:

- With AR, it is difficult, if not impossible, to make causal connections and explanations
- In AR, particularly with single-iterations of AR, it is difficult to generalize results
- The lack of impartiality of the action researcher may lead to researcher bias
- It is difficult, if not impossible, to replicate the action research study, and hence, to replicate its findings

Applicability to CE: Action research is useful to the collaboration engineering approach by addressing the "*how to*" research questions. Secondly, the continuous design and evaluation of the collaboration processes designed may not be easy to study in constructed settings. More so, AR allows the CE researchers to evaluate and improve their problem-solving techniques or theories during a series of interventions. In general, AR permits better understanding of the research problem; participants are able to give immediate feedback to researcher; permits accumulative knowledge because of its iterative and cyclical nature; and it is an applied research method that can be tested in the field. For instance, in collaborative policy-making processes research, the CE researcher would use AR to address the following 'how to' research questions:

- How to test, measure, and evaluate a collaborative organizational policymaking process/theory?
- How might Collaboration Engineering (CE) aid in supporting to improve the quality of the collaborative PMP effort; and how might we change the organizational culture towards CE for Policymaking?

Because of its weaknesses, a CE researcher would need to supplement AR with other research methods among which include:

- Grounded theory can be used to organize data i.e. coding methods can be used to enrich the theoretical underpinnings of an action research case study.
- Case study research can be used to do an in-depth investigation i.e. provide descriptions of phenomena.
- Survey research can be used to produce quantitative descriptions on phenomena.
- Experimental Research can be used to test interventions in action research.

5 Grounded Theory Research Methodology (GTR): Overview and Applicability to CE

Grounded Theory (GT) is an inductive, theory discovery methodology that allows the researcher to develop a theoretical account of the general features of a topic while simultaneously grounding the account in empirical observations or data (Glaser and Strauss, 1967). GT aims to develop a theory from data rather than to gather data in order to test a theory or hypothesis, i.e. qualitative methods are used to obtain data about a phenomenon and that a theory emerges from the data. GT is a methodology for arriving at a grounded theory from data. The theory is grounded in the reality as represented in the data. There should be a continuous interplay between data collection and analysis (Glaser and Strauss, 1967; Strauss and Corbin, 1990). Strauss and Corbin (1990), state that well performed GT meets all the requirements of good science i.e. significance, theory-observation, compatibility, generalizability, reproducibility, precision, rigor, and verification. Grounded theory **strengths** include:

- It supports theoretical emergence i.e. can be used to generate theory where little is already known, or to provide a fresh slant on existing knowledge.
- It demonstrates how to develop context-based, process-oriented descriptions and explanations of a phenomenon.
- It allows for multiple data sources such as interviews, observation of behavior, and published reports.

The **weaknesses** of GT are:

- Danger of placing too much emphasis on identifying codes as the exclusive feature of the process without theoretically coding, i.e. explaining how codes relate to each other
- GT also involves the search for negative cases which may be time-consuming and may involve rethinking tentative conclusions
- Because of the nature of the method, it often takes the research in a number of different directions before a plausible theory starts to emerge

Applicability to CE: Grounded theory helps CE researchers to develop a theory that can be used to account for variations in the outcome of interest. For instance, if a CE researcher or designer wanted to improve satisfaction with group processes and product among stakeholders who are developing an organizational policy, he/she would need to address questions such as what causes policy-making stakeholders to feel satisfied; from which he/she would develop a theory to explain satisfaction. Using our example of collaborative organizational policy-making research, the CE researcher would use GT to address questions such as:

- What are the factors that influence successful CPMP execution?
- What makes people agree on a policy? (Or what are the key factors behind determining a good policy?
- What causes policy makers to be productive? (Or what makes policymakers productive?)
- What causes policymakers to be satisfied with the policy outcome and the process by which the outcomes are attained? (Or what makes policymakers satisfied with the policy outcome and the process by which the outcome were attained?)
- What causes completeness of an organizational policy-making process?
- What makes a quality policy and organizational policy-process design?

Since grounded theory does not test theory, a CE researcher would employ Case Study and Action research methods for an effective CE research outcome.

6 Survey Research Methodology (SR): Overview and Applicability to CE

Survey research (SR) refers to surveys that are conducted to advance scientific knowledge. Surveys conducted for research purposes have three distinct characteristics: first, the purpose of survey is to produce quantitative descriptions of some aspects of the study population; second, the main way of collecting information is by asking people structured and predefined questions…their answers, which might refer to themselves or some other unit of analysis, constitute the data to be analyzed; third, information is generally collected about only a fraction of the study population—a sample—but it is collected in such a way as to be able to generalize the findings to the population. SR involves examination of a phenomenon in a wide variety of natural settings. The researcher has very clearly defined independent and dependent variables and a specific model of the expected relationships which is tested against observations of the phenomenon. SR is most useful when: the central questions of interest about the phenomena are "what is happening?", and "how and why it is happening?" SR is especially well-suited for answering questions about what, how much and how many, and to a greater extent than is commonly understood, questions about how and why; control of the independent and dependent variables is not possible or not desirable; the phenomena of interest must be studied in its natural setting; the phenomena of interest occur in current time or the recent past. SR can be used for exploration, description, or explanation purposes. The purpose of survey research in exploration is to become more familiar with a topic and tries to out preliminary concepts about it; the purpose of survey research in *description* is to find out what situations, events, attitudes or opinions are occurring in a population; and the purpose of survey research in *explanation* is to test theory and causal relations (Pinsonneault and Kraemer, 1993). In summary, the basic idea behind survey methodology is to measure variables by asking people questions

and then to examine relationships among variables. In most instances, surveys attempt to capture attitude or patterns of past behavior. The **strengths** of survey research include among others:

- Surveys are relatively inexpensive (especially self-administered surveys)
- Surveys are useful in describing the characteristics of a large population
- They can be administered from remote locations using mail, email, or telephone
- Consequently, very large samples are feasible, making the results statistically significant even when analyzing multiple variables
- Many questions can be asked about a given topic giving considerable flexibility to the analysis
- Standardized questions make measurement more precise by enforcing uniform definitions upon the participants

SR also suffers from **limitations**:

- Reactivity – respondents tend to give socially desirable responses that make them look good or seem to be what the researcher is looking for
- Sampling frame – it is difficult to access the proper number and type of people who are needed for a representative sample of the target population
- Non-response rate – a lot of people won't participate in surveys, or drop out
- Measurement Error – surveys are often full of systematic biases, and/or loaded questions.
- It is a single method design where multiple methods are needed
- Over reliance on cross-sectional surveys where longitudinal surveys are really needed
- You can make inferences, but not at the level of cause-and-effect (SR is not sufficient to determine the direction of causality)

Applicability to CE: SR can be used by CE researchers to make measurement of the success of collaboration process outcomes and process designs more precise by seeking uniformity from the participants in an intervention. CE researchers may ask many questions about a given collaboration process context to be able to achieve considerable flexibility to the analysis of the intervention results. In collaborative policy-making processes research, a CE researcher would use SR to address such questions:

- What is policy-makers' stake on collaborative organizational policy-making?
- What do stakeholders want to see in a collaborative organizational policy-making process that is different from the traditional one?

For a CE researcher to achieve effective results from a survey research, it would be advantageous to supplement it with any of the following research methods:

- Case study research should be used together with SR in order to develop a richer, more detailed, and complete understanding of how and why certain results occur.
- Application of Naturalistic observation – it involves the systematic watching and recording of naturally occurring behavior. Since the subjects do not even know they are being studied, the researcher can be confident that the behaviors are natural, but does not have much control over what happens.

7 Design Science Research Methodology (DSR): Overview and Applicability to CE

Design Research (DSR) involves the analysis of the use and performance of designed artifacts to understand, explain and to improve on the behavior of aspects of information systems. Such artifacts include but are not limited to: algorithms, human/computer interfaces and system design methodologies or languages (Orlikowski and Lacono, 2001). The function of Design Science is solving problems by introducing into the environment new artifacts (Fuller 1992). Design research is divided into two parts: research and design. Kuhn (1996), and Lakatos (1978), define *research* as an activity that contributes to

the *understanding* of a *phenomenon*. In the case of design research, all or part of the phenomenon may be created as opposed to naturally occurring. The *phenomenon* is typically a set of behaviors of some entity (ies) that is found interesting by the researcher or by a group –a research community. *Understanding* in most western research communities is *knowledge* that allows prediction of the behavior of some aspect of the phenomenon. The set of activities a research community considers appropriate to the production of understanding (knowledge) are its research methods or techniques. *Design* means to invent and bring into being (Webster's dictionary and thesaurus, 1992). Design deals with something new that does not exist in nature. Basically, Design is concerned with achieving purposeful behavior or goals; this means that as a science, it has two fundamental processes: construction and evaluation: *Construction* is a creative, problem solving process whereby artifacts are produced for intended purposes; and *Evaluation* is an assessment process whereby the efficacy of produced artifacts is determined (March and Smith 1995). DSR has its **strengths** among which include:

- It focuses on the creation of artifacts aimed at achieving purposeful goals and improving human and organizational processes
- Design Science seeks to understand and improve both the artifacts themselves and the processes by which they are created
- The creative development and use of new formalisms, representations, techniques, or tools for the construction of artifacts
- The use of other research methods (e.g., experimental, observational) for evaluation of the artifacts created

Design Science however has the **weakness** of lacking consensus as to the precise objective – and therefore the desired outputs – of designed research; also the knowledge and artifacts constructed can not be evaluated in DSR.

Applicability to CE: Design Science research can be used by CE researchers to construct knowledge and artifacts for the collaboration processes designs. For example in a CE research, if the collaboration engineers would wish to design collaboration processes that are transferable to practitioners, then this would require development and design in addition to existing thinklets that are supportive in transferring a collaboration process to practitioners of which they can execute themselves. In the CPMP research, the CE researcher would use DSR to address questions such as:

- How to develop and design thinklets that are suitable for transferability of CPMP design to policy practitioners/stakeholders?
- What design assumptions/requirements of CE might follow from PMP?
- How do existing thinklets support the designing of collaborative PMPs (CPMP)?

We should note that the design process requires clear iteration between construction and evaluation. This means that the quality and efficacy of a design artifact must be demonstrated by well-executed evaluation methods. Therefore a CE researcher would benefit from the Design Science research by supplementing it with the following evaluation methods:

- Case Study can be used to study artifact in depth
- Field study can be used to monitor use of artifact
- Experiment research can be used to study artifact in a controlled environment for its qualities
- Action research can be used to validate and evaluate the performance of the artifact for its qualities in an intervention.

8 CONCLUSION

The assessment of the research methods offered in this paper has been derived from the existing literature on general research methods. Based on this assessment, we offer their relevancy to the Collaboration

Engineering (CE) research community, and particularly their applicability to collaborative organizational policy-making processes. While sufficient benefits of a selected number of research methods to CE research have been offered, additional research on how other methods not represented in this work can benefit (relevancy) the CE research community should be done. Research methods such as Experimental research, Simulation and games research, to mention but a few should be assessed to derive their benefit to the CE research community. Additional research is also required to empirically validate the relevancy of these research methodologies.

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