CoCl

collaborative support of social competitive intelligence

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Abstract

The aim of the presented work has been to investigate how the existing concept of social CI can be used to support collaborative CI networks. A novel socio-technical solution CoCI consisting of a work method and tool have been designed for a scenario with an internal network of collaborative competitive intelligence (CI). The CoCI work method suggests using agile, freeform collaboration through an informal organizational network. A distinction is made between the roles of network coordinators, contributors, clients and receivers. The work style follows regular temporal iterative loops, or sprints, each one ending in some form of intelligence outcome. The CoCI tool supports collaborative daily work with reading, commenting and classifying incoming material, where the actions of the network members are visible to each other. Furthermore, the CoCI tool supports having meetings using the tool where incoming material from the sprint is reviewed and a report is created. In the evaluation of the tool, the dimensions engagement, collaboration and community had high scores. In contrast, the dimension simplicity was less satisfactory. Four design patterns for social CI could be extracted based on the strong points of the evaluation: social selection, individual/collective box, real-time engagement and collaborative enhancement. The low score on simplicity will be investigated further, but indicates how crucial it is for social features to be intuitive in order to avoid making the overall solution too complex.

Keywords: competitive intelligence, social competitive intelligence, social networking, organizational networks, collaborative work, enterprise social media, social software, enterprise 2.0, wikinomics, information systems, case studies, work systems, socio-technical systems, knowledge management.
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1 Introduction

The use of social software challenges how strategic thinking can be done in an organization by empowering creative independent individuals and their interactions in new ways (Haefliger et al. 2011). In the context of enterprise 2.0 (McAfee 2006) – i.e. using web 2.0 (O’Reilly 2007) in an organization – organizational networks are suggested to be used systematically and as a primary way of collaborating by harnessing the power of social technology. Important notions for such “social” organizational networks are to enable freeform work activities and emergent work structures, similar to how ungoverned social networks are formed and evolve.

Degerstedt (2015) has introduced the concept of social competitive intelligence to describe the phenomena of how social technology can be used to adapt competitive intelligence (CI) processes, methods and tools for needs in the networking organization. CI refers to the systematic process whereby an organization (division, unit or person) gathers, analyzes, and transforms information into actionable intelligence, see e.g. Murphy (2005) and Sharp (2009). The objective of CI is to understand how the surrounding competitive environment will impact an organization – by monitoring events, actors, trends, research breakthroughs, and so forth – in order to be able to make relevant strategic decisions.

Social CI describes how CI can be further developed using the notions of enterprise 2.0 and wikinomics, using systemic principles such as openness, participation, individual freedom, democracy, self-organization, sharing, co-creation (Malone 2004; McAfee 2006; Tapscott & Williams 2008; Li & Bernoff 2011; Bradley & McDonald 2011). In particular, the social CI framework conceptually emphasizes that in order to harness the power of social technology, organizations and companies need to change both technologies as well as work methods, i.e. the problem space for social CI is socio-technical. A subsequent study with multiple cases (Degerstedt 2016) gave a deeper understanding of how collaboration and organizational networking are performed within CI processes today. This study resulted in a base model for social CI, which is the starting point for the current research.

The aim of the presented work is to investigate how social CI can be used to support collaborative CI networks. The research approach is socio-technical with two interdependent goals: a) to develop an easy-to-use work method for social CI that is useful also for smaller and mid-size enterprises
(SMEs), and b) to design a tool for collaborative CI networks. A novel socio-technical solution called CoCI (short for Collaborative CI and pronounced cozy) is proposed and has been evaluated as a part of this work.

Online social networking offer new forms where knowledge collaboration can occur in new more fluid ways, both in scope and scale. However, proper work methods are needed to be able to harness its positive potential, which has been previously studied (Faraj, Jarvenpaa & Majchrzak 2011; Bradley & McDonald 2011; Li & Bernoff 2011). For the individual CI expert, a cognitive task analysis can be seen as a double process of information foraging and sensemaking (Pirolli & Card 2005). Based on this model, the CI process can be seen as a process of successive refinements, ranging from exploratory CI monitoring of large information sets to careful CI analysis of selected relevant information objects. The presented research started with a focus on how collaborative information seeking, see e.g. Shah (2014), can be used as a model for collaborative CI monitoring. The overall goal of the research is to gradually deepen the understanding of the collaborative monitoring-analysis process as a whole, which can be viewed from the related perspective also as a process of collaborative information synthesis (Blake & Pratt 2006). More generally, another perspective is to study how different forms of information behavior relate to the collaborative process of CI (Spink & Heinström 2011).

Social software are web-native support tools for group interaction that are fundamentally “decentralized, flexible and extendable” - something that distinguishes it from previous forms of so-called groupware, according to Shirky (2003). In particular, by using the principles of web 2.0, the new social technology becomes data-centric, with rich user experiences and in support of harnessing collective intelligence (O’Reilly 2007). Using web 2.0, information search therefore aims for a rich social user experience (Russell-Rose & Tate 2013). The role of information is changing and also how to interact with and around information, leading to the study of information architecture (Morville & Rosenfeld 2007; Crumlish & Malone 2009) and human-information interaction (Marchionini 2008). Evans & Chi (2010) have integrated results on sensemaking and information behavior in order to describe the patterns of social search, see also discussions of social and collaborative search e.g. (Morris 2013; Pickens & Golovchinsky 2007).

In the context of CI, the existing research on technology is mainly concerned with a single-user, task-oriented view of the CI process, e.g. (Bose 2008). An extensive framework for assessing single-user and task-oriented CI technology has been introduced by Bouthillier & Shearer
In the context of knowledge management, web 2.0 has been studied in terms of tools empowering the knowledge worker (Schneckenberg 2009), but similar studies in the context of CI are lacking. A related study in the context of knowledge management indicates that social media indeed support a combination of the individual, the collective and also the social collaborative dimension in new and useful ways (Razmerita, Kirchner & Nabeth 2014).

1.1 Research method

The presented research has studied social CI as a form of IT-reliant work system (Alter 2002; Alter 2015) and the chosen approach falls under the category of design science research (DSR) (Hevner et al. 2004). The objective of DSR is seeking to create new innovations through analysis, design and realization of new information system solutions. Thus, solving “a herefore unsolved and important business problem”. In particular, the “utility, quality and efficacy” of a proposed solution should therefore always be evaluated. This means that it is important to apply verifiable contributions and rigor during both the development and evaluation of the proposed artifacts. It is also important to understand what role the notion of theory plays in information systems (IS) design science research, which is driven by fitness and utility (rather than truth-seeking) according to Gill & Hevner (2013).

The DSR methodology presented by Peffers et al. (2008) distinguishes between the six activities in a nominal research process. Using these categories, the research method of previous and current research can be described as follows:

1. **Problem identification and motivation**: The current practices of CI use in organizations today have been studied empirically in four case studies (Degerstedt 2016). In particular the role played by collaboration and networking in such processes. From these cases a base model for social CI was created by extracting overall CI process characteristics related to collaborative behavior and organizational networking.

2. **Define the objectives for a solution**: A new notion and a conceptual framework for social CI has been introduced by Degerstedt (2015) in order to describe the phenomenon when CI processes, methods and tools are being further adapted for needs in the networking organization using social technology. Social CI
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describes how CI can be transformed using the notions of enterprise 2.0 and wikinomics (Malone 2004; McAfee 2006; Tapscott & Williams 2008; Li & Bernoff 2011; Bradley & McDonald 2011). Section 2 contains an analysis of potential areas of improvement using social CI, which is based on the case studies of Degerstedt (2016). These areas of improvement, in turn, motivate the suggested solution called CoCI.

3. **Design and development:** In Section 3, a new proposed socio-technical solution is suggested, CoCI, which includes a combination of a novel work method and a new tool that support collaboration of networked-based CI work processes.

4. **Demonstration:** The new solution has been developed using a design case, that is a fictive abstraction using the base model for social CI of Degerstedt (2016). Using the design case, a conceptual model of the CoCI work method has been formulated and an initial design prototype for the CoCI tool has been designed.

5. **Evaluation:** The initial design prototype of the CoCI tool has been evaluated with regard to four dimensions related to socio-technical values of social CI (Degerstedt 2015).

6. **Communication:** The results have been analyzed and four design patterns of social CI have been extracted. The design patterns are motivated by the strong points of the evaluation.

1.2 Basic notions

A suitable terminology is introduced to better understand and operationalize the principles of social CI. The socio-technical system of social CI is analyzed from the perspective of the work system theory (WST) (Alter 2002; Alter 2015). At the core, social CI relies on particular forms of organizational networks as a way to form loose governance of work Podolny & Page (1998). An organizational network\(^1\) can be defined as an organizational form of a social network of actors that pursue repeated, enduring exchange relations with one another and, at the same time, lack a legitimate organizational authority to arbitrate and resolve disputes that may arise during the exchange (Podolny & Page 1998). Moreover, due to the loose character of organizational networks, it is also useful to understand social CI in terms of social network theory, cf. Kadushin (2012). The following

\(^1\) Podolny & Page (1998) use the notion of network forms of organizations, but here the term organizational network is preferred instead.
notion is introduced to describe the characteristics of work practices for social CI.

Definition 1: Network-based work practices\(^2\) are understood as work practices (in a work system) that utilize some form of organizational network.

McAfee (2009) defines Enterprise 2.0 as the use of emergent social software platforms (ESSPs) by an organization in pursuit of its goals. ESSPs are characterized as follows: platforms mean “digital environments in which contributions and interactions are globally visible and persistent over time” (McAfee 2009); emergent means “that the software is freeform and contains mechanism like links and tags to let the patterns and structure inherent in people’s interaction become visible over time” (McAfee 2009); by freeform\(^3\) is meant software that is most or all of the following: optional, free of imposed structure such as workflow or decision, right allocations, egalitarian i.e. indifferent to credentials, titles and other forms of “rank”, and accepting of any type of data (McAfee 2009). The notion of enterprise social media (ESM) is a similar notion to ESSPs, which are defined as web-based platforms that allow workers to (1) communicate messages with specific coworkers or broadcast messages to everyone in the organization; (2) explicitly indicate or implicitly reveal particular coworkers as communication partners; (3) post, edit, and sort text and files linked to themselves or others; and (4) view the messages, connections, text, and files communicated, posted, edited and sorted by anyone else in the organization at any time of their choosing (Leonardi, Huysman & Steinfield 2013). These ESSPs/ESMs are also called social software (Shirky 2003).

For social CI, the technological platform can be seen as either ESSPs or ESMs, with one important addition. Namely, it is required that the technology supports not only social interaction but also the task execution of the CI work process, which is given by the intelligence cycle. The following notion is introduced to describe the characteristics of the technology for social CI.

Definition 2: By network-based work technology, is understood enterprise social media following the principles of ESSP/ESM with integrated support also for task-oriented collaborative work.

\(^2\) The notion of network-based work practices can be abbreviated to network-based work, when it is more appropriate.

\(^3\) In the context of social CI, the notion of freeform is used not only for software but as a socio-technical notion that can refer also to the work activities as freeform, when the activities follow the requirements of McAfee (2009).
Using the introduced terminology, social CI can thus be understood as a systematic way to utilize (potentially new forms of) network-based work technology to decentralize the CI process by introducing new forms of network-based work practices, relying on a socio-technical approach.

2. Potential areas of improvement using social CI

In Degerstedt (2016), four organizations have been examined as exploratory case studies in order to better understand the issues at hand for social CI. The cases have been used to form a base model for social CI by extracting relevant characteristics related to collaboration and organizational networking. The base model uses the eight main factors of the CoSpaces Collaborative Working Model (CCWM) for the analysis (Patel, Pettitt & Wilson 2012). Using the base model, potential areas of improvement using social CI have been identified for five of these CCWM factors. An overview of the areas is shown in Table 1. These areas identify potentially valuable characteristics of the proposed solution called CoCI, which is described in the next section of this report.

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Factors</th>
<th>Potential areas of improvement considered in the current version of CoCI</th>
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</thead>
<tbody>
<tr>
<td>Structure</td>
<td>Context</td>
<td>• CI community development</td>
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<td></td>
<td></td>
<td>• Freeform CI/KM</td>
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<td></td>
<td>Teams</td>
<td>• Network-centric work model for CI</td>
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<td></td>
<td></td>
<td>• Network-based methodology for CI</td>
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<td></td>
<td>Tasks</td>
<td>• Rapid, cyclic and informal work styles using a network-based model</td>
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<td></td>
<td></td>
<td>• Collaborative writing and editing</td>
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<tr>
<td>Behavior</td>
<td>Individuals</td>
<td>• Using network roles as a basis of the CI work model</td>
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<td></td>
<td></td>
<td>• Develop better support for the CI contributor role</td>
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<tr>
<td>Technology</td>
<td>Support</td>
<td>• Socio-technical support of decentralized work styles for CI</td>
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<tr>
<td></td>
<td></td>
<td>• Stimulate discussion and collaborative analysis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Handle overload through socio-technical collaboration</td>
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<tr>
<td></td>
<td></td>
<td>• Socio-technical support of peer-review activities</td>
</tr>
</tbody>
</table>

Table 1. In the table the potential areas of improvement are structured using on the one hand the Structure-Behavior-Technology (SBT) dimensions of social CI (Degerstedt 2015), and on the other hand five selected factors (of eight) from the CCWM (Patel, Pettitt & Wilson 2012). The potential areas of improvement form focal areas that have been used during the design of the CoCI work method and tool.
The potential area of improvement can be described as follows:

Context
• **CI community development**: When network-based work practices are introduced in a work process it is important and natural to start viewing the process as a community. This means that, from a social perspective, the view of CI becomes similar to other knowledge communities which have been studied in the field of knowledge management such as communities of practice (Wenger 1998).
• **Freeform CI/KM**: Network-based work practices are a way to introduce more decentralization and freeform work into the CI process. This also mean that social CI would potentially become more closely integrated with other forms of knowledge management at the operative and tactical level of work in the organization, and thus also naturally support a larger group of employees. This can additionally mean that the clients are no longer stable functional units or top management, but instead temporally constrained impermanent teams which mean a larger focus on freeform queries.⁴

Teams
• **Network-centric work model for CI**: To further develop the use of existing CI networks using methods and techniques from social CI seems to be an important candidate for how teamwork can be naturally transformed in the direction of network-based work. The CI network can potentially become a core activity of the CI team.
• **Network-based methodology for CI**: A potential area for improvement is to develop a practical methodology concerning work methods and tools for social CI.

Tasks
• **Rapid, cyclic and informal work styles using a network-based model**: A potential area for improvement is to look at how an informal network-based agile work method supporting cyclic team work can be formulated and used in a systematic way. In particular, the use of methodology similar to agile software development methods (e.g. Scrum) fits with quick cyclic loops and is a potential way to introduce increased decentralization and freeform work styles. The work has a “quick and dirty” character where the

⁴ The notion of freeform queries is preferred here over “ad hoc” since “ad hoc” does not emphasize the importance of these queries enough in the context of a decentralized organization. In general, the notion of freeform has been introduced in the characterization of the ESSPs by McAfee (2006).
daily work forms a quick “basic daily loop” similar to how a news desk operates, which was observed in the case studies of Degerstedt (2016).

- **Collaborative writing and editing**: Decentralized work styles related to collaborative writing, e.g. Wikipedia or Google docs, can potentially be used as a source of inspiration for how to find, aggregate information and finally how to generate the CI deliverables. It is also interesting to look at how such CI deliverables are integrated with other social software resources, both external and internal for the organization, which can moreover potentially be influenced by how web tools for collaborative writing handles this (such as Google docs).

**Individuals**

- **Using network roles as a basis of the CI work model**: Three types of activities were identified as particularly relevant for network-based CI work from the studied cases 1–3: CI (network) coordination, CI contribution and CI use. In the case studies of Degerstedt (2016), only the two first activities have been examined in some detail. A potential area for improvement is to use such network roles as a way to structure network-based CI work.

- **Develop improved support for the CI contributor role**: A potential area for improvement is to develop better support for the CI contributor role and potentially also for a systematic distribution and utilization of freeform CI throughout the whole organization. The CI contributor can be viewed as “the new CI analyst”, if social CI is used with its full power in an organization. The interviewed persons that held the position of CI contributor (case 2–3) mentioned particularly the following important aspects of the role:
  
  - The importance of a smooth integration of CI work with other roles and daily work (explicitly discussed in case 3)
  - The importance of the social processes and to meet and discuss with people both within and outside the organization (case 2 and 3)
  - The value of simple and engaging methods and tools (inferred from comments in case 2, explicitly discussed in case 3)
  - The importance of a clear purpose of their CI work (explicitly discussed in case 3)
  - The value of clear feedback of the value of their work (explicitly discussed in case 3)
Support

- **Socio-technical support of decentralized work styles for CI**: A potential area for improvement to develop better support for freeform CI in a decentralized organization, using network-based work technology for social CI.

- **Stimulate discussion, collaborative analysis and collaborative decision support**: A potential area of improvement is to use network-based work technology to further strengthen the support for discussion, collaborative analysis and collaborative decision support by augmenting new functionality as a complement to the basic notion of a shared knowledge repository.

- **Handle overload through socio-technical collaboration**: A potential area of improvement is to use a collaborative and socio-technical approach to handle the mixture of manual judgments, variability of information visibility (sometimes too much – sometimes too little) and information overload in general.

- **Socio-technical support of peer-review activities**: A potential area for improvement is to develop socio-technical support for peer-reviewing as a way to evaluate and ensure quality of CI network activities and CI deliverables.

3. CoCI – collaborative support of social CI

The suggested CoCI solution is a *socio-technical solution*, which means that it combines both a proposal for a new network-based work method and a support tool for that work method. The chosen research approach when developing CoCI is inherently iterative, since work method and tool are designed simultaneously. The iterations become stages where the suggested solutions should be evaluated. In the presented initial stage, a design case has been constructed which combines features from the case studies of Degerstedt (2016). The design case constitutes a “shared organizational context” which is used to explicitly relate the design of the work method with the design of the tool.

3.1. Design Case

To be able to explore a method and a tool for achieving collaborative competitive intelligence, a fictitious case has been developed based on previous research. The fictitious company WeTeach is a corporate education company that teaches in several industrial areas. In particular, WeTeach has
courses for organizations in the food sector. The company wants to engage in competitive intelligence (CI) work and explores the possibility to form an internal CI network. Initially, this network has fifteen members of whom two are coordinators and two members are expert educators in the food area in particular. The CI network has a fixed recurring assignment to deliver results to the various management functions at WeTeach. In particular, the CI network reports to a strategic group of senior educators that is responsible for assessment and continuous development of the course portfolio.

The CI network work model is timeboxed on several levels with corresponding results. The basic monitoring cycle is carried out on a daily basis, and for each day information objects are reviewed, tagged, commented and marked as interesting/not interesting for further analysis by the network members. On a weekly basis the daily monitored objects are further analyzed and refined. Finally, on a monthly basis a report is created and presented for management. The network members can choose exactly what tasks they work on, and by using the tool their results are transparent so other members in the network can see. The coordinators are surveying the work, but should only intervene when problem occurs. Typically, the members form their own personal monitoring profiles that reflect their roles as experts in the organization, which frequently overlap between each other. For example, an expert in the food area can also be interested in sustainability, which may also interest a person working with education in business development.

The design case also includes use scenarios and personas, which are omitted here due to their level of detail. However, they are visible in the description of the CoCI tool below.

3.2. The CoCI work method

The CoCI work method supports freeform, non-hierarchical networks in collaboration and task-solving. The method is based on ideas such as voluntariness and emergence, both in terms of how networks are formed and in terms of how work activities are organized. The idea is to support the network without prescribing a priori dictated work structures. In practice, this means that participation is voluntary, roles are variable/not set/changing and support-structures are non-forcing and customizable. Network participants can be seen to have different roles. Two fundamental roles are coordinators and contributors. Coordinators are distinguished by their experience and knowledge. They are skilled in CI work and have an interest in driving the network forward and organizing the CI work process. The
contributors on the other hand are typically specialists in their respective field and contribute by taking part in the CI network. Two other roles, albeit not actively participating in CI work, are the CI client and the CI receiver. The CI client has an interest in what the CI network should focus on, and the CI receiver has an interest in the outcome of the CI work process and is a receiver of CI deliverables.

Just as the CI network is loosely coupled and emergent, so is the CoCI work method. The work model of the method is non-forcing and provides support for doing collaborative CI work without predefining tasks for the network participants. The work method is an agile process, dividing the work into temporal loops, and these iterative steps lead to a competitive intelligence deliverable/deliverables. The iterations are nested, e.g. daily, weekly, and monthly and so forth. In principle, any actor in the network can participate in any activity of any iteration. However, the coordinators or other senior members will typically have leading roles during later stages concerning the final CI deliverables, but exact forms can also be decided by the network members. The CI work process is seen as two dependent activities, monitoring and analysis, which are repeated in each iteration. In shorter iterations the focus is typically on monitoring, and in the longer more low-intensity iterations the focus is typically on analysis. Figure 1 shows an overview of the proposed work method.

![The CoCI work method](image)

Figure 1: A graphical overview of the CoCI work method. The pictures show how the CoCI work method supports an iterative work style, a network-based process and views the CI process as a twofold activity of monitoring and analysis.
3.3. The CoCI Tool

The CoCI tool has been designed jointly and for use with the CoCI work method, i.e. to support freeform network-based work activities and collaborative collective intelligence. The current design prototype of the tool has been created for the WeTeach design case. Using the prototype, work is done on a temporal basis, as suggested in the CoCI work method. In the case of WeTeach, work is executed on a daily, weekly and monthly basis. Every day, the actor goes through the information stream coming into the system, and tags, sorts and selects different information objects. On a weekly basis there is a meeting in the system where the actors collectively go through the selection and make a refinement of the selection. On a monthly basis, a report is created, based on the weekly selection made by the network. The monthly report is sent out to key people, i.e. stakeholders within the company.

Using the prototype supports the actors to judge the relevance of the incoming information, sort and tag, analyze and in the end results in a monthly report. There is a generated stream of information objects coming into the system, which are annotated by topical metadata before it enters the tool. This stream is filtered for the organization and for the actor’s interests and preferences. The prototype allows members of the CI network to select, tag and sort information objects, and makes refined analysis and develops an analysis deliverable. Figure 2 shows a snapshot of the current design prototype.
Figure 2: A snapshot of the CoCI tool in the form of a wireframe design prototype (with a user interface in Swedish). The prototype shows a selection of information objects for the WeTeach company in a scenario (the daily view – in this case Monday, 8th February) that has been used in the evaluation of the tool. The image depicts a view with the incoming stream of information objects (the larger main screen), and the view used for weekly meeting with a dashboard under construction and the week’s top information objects (left). Special focus (the smaller highlighted boxes) is placed on the collaborative aspects of the tool, i.e. the collaborative box, the collaborative selection and the network presence in the system.

In the tool, the metaphor of a daily box is used, where actors select information objects to be placed in a box each day. The actors in the CI network have their own individual view and a collaborative view. When an actor selects an object it is placed in the daily box. The actors work and sort information objects in individual and collaborative (views of) the daily box. In the individual (view of the) daily box, the actor can remove uninteresting information objects, select interesting and relevant ones, and tag and comment on the selections. All of the selected information objects from all actors are shown in the collaborative (view of the) daily box. It is possible to step back through a calendar selection to browse boxes for each day. In this way the tool supports both a workflow both of individual work and the group. Actors are explicitly represented in the system through avatars, which are used both to show who is active in the system and to show who is the creator of actions in the system, such as selections and comments.

The prototype includes dashboards that cluster and highlight important information objects over time. For example, the top chosen information objects for each day are shown on such a dashboard. Furthermore, the actors can see what the group decided was most interesting that day, what actors selected which information object and browse backwards. There is also a dashboard that depicts trends in information objects. The dashboards help to place the information objects, annotations and comments in a wider context than just days or weeks.

In the WeTeach case, the actors sift through the incoming stream each day and decide on relevant information objects for the company. Every week there is a meeting using the tool where a second refined analysis of the week’s events is carried out. The meeting is opened in the tool by a coordinator and is open for a specified period of time, using a weekly board. The network gets together and goes through the daily selection, making a second refinement. The weekly board supports a deeper analysis. Every board is specific to a week and is automatically saved in the system.
actors can go back and browse older weekly boards, and the boards are the basis for the monthly report.

These functionalities of the CoCI tool are never forced on the network participators, but constitute freeform work support for collaborative competitive intelligence. The network and the participants within the network are free to skip tasks and decide on the order of work as they please, as the tool should not and does not dictate the organization of work.

3.4. Evaluation

In this initial stage of research, the primary focus has been placed on the design prototype and evaluating single actors given a particular task and a fictitious collaborative situation. Seven persons with no or little experience of CI were interviewed, four women and three men. The lack of experience of CI was essential since the test was aimed at the role of the CI contributor.

The tool was evaluated through user studies carried out on a paper prototype. Each participant was given an introduction to CI, information about the fictitious design case WeTeach and introduced to the paper prototype. After the introduction the participant was given tasks to solve using the tool. At the end of the test the participant filled out a survey with a grading exercise and one freeform question. The participants graded the tool using four factors (using a scale 1-5, with 5 as most positive): simplicity, engagement, collaboration and community. The three factors engagement, collaboration and community are derived from the socio-technical value map for social CI, introduced in Degerstedt (2015). The overall importance of simplicity has been indicated in two surveys, 2014 and 2015, concerning the challenges of CI tools in general, and social CI in particular (publication forthcoming).

The answers to the grading question are shown in Table 2. On average the participants gave the tool high scores on engagement, collaboration and community. The lowest scores on these factors were score 3. Comments from persons giving score 3 was for example that they requested more support for communication and direct communication with other users, and that they lacked comments on the information objects (the function was present in the prototype, but they did not find it).
Simplicity was the lowest score of the four factors. These responses indicate that more effort should be put on simplifying the tool. One aspect of the perceived complexity was that participants were initially confused when introduced to the user interface, i.e. the initial threshold was too high. The user interface required too much explanation and was consequently not considered to be intuitive. Furthermore, the tool was experienced as cluttered according to comments from the participants. The interface was also seen as too heavy on information and functionality, which can be interpreted as giving the participants the sense of information overload.

The single most important point taken from the evaluation is that the tool needs to be simplified and made clearer so it does not stand in the way of functionality.

4. Design patterns for social CI

In order to be able to extract results that can be treated as “final”, even though the CoCI solution will evolve further, some form of result extraction technique is required. The approach taken here is to use the notion of design patterns (Kolfschoten et al. 2010; Crumlish & Malone 2009; Alexander, Ishikawa & Silverstein 1977). Using design patterns, “partial solutions” that have been successfully verified in the evaluation can be extracted from the overall socio-technical solution. As the iterative approach continues, these design patterns can be collected and form a pattern language for the suggested CoCI solution.

In this iteration four design patterns have been extracted: social selection, individual/collective box, real-time engagement and collaborative enhancement, described in detail in Table 2.
<table>
<thead>
<tr>
<th>Name Values</th>
<th>Icon</th>
<th>Need</th>
<th>Solution</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Social Selection</strong></td>
<td><img src="image" alt="Select" /></td>
<td>Actors need to communicate what information objects they find relevant and why. The actors learn from sharing selections.</td>
<td>Making the selection of information objects done by others transparent for the actors. At the same time supports an independent work style.</td>
<td>In the CoCI tool the number of selections of information objects is always shown, as well as who has selected them. Comments and tags from actors allow them to motivate in brief terms.</td>
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<tr>
<td><strong>Individual/Collective Box</strong></td>
<td><img src="image" alt="Collection" /></td>
<td>On the one hand, actors should be able to work separately with monitoring and analysis, focusing on their interest and when they have time. On the other hand, they should be able to divide work, share and view the results with others.</td>
<td>Collective collection of information objects (in a “box”). The actors’ items can be viewed either separately or collectively, as a crowd. Different work approaches are possible – on an individual level, on a collective level or combine both and switch between them.</td>
<td>In the CoCI tool the box metaphor is used for sorting and saving information objects. The individual box is useful during individual work. The collective box aggregates the selections of all actors that can be used as decision basis for further analysis.</td>
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<td><strong>Real-time Engagement</strong></td>
<td><img src="image" alt="Active" /></td>
<td>The quality of knowledge work such as monitoring and analysis gains from an lifeful inspiring environment and community.</td>
<td>Allow for actions during monitoring and analysis to be visible to the actors in real-time. Display who does what at what time. Use of digital avatars give a sense of lifefulness and indicates what work is carried out in real-time.</td>
<td>In the CoCI tool presence is marked by the avatars. The avatars are used both to signal presence in the system, and to denote who is doing what in real-time.</td>
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<td><strong>Collaborative enhancement</strong></td>
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<td>Actors need to collaborate directly at certain points during enhancement of the monitoring and analysis process. The coordinators need feedback and opinions to support final judgments.</td>
<td>Support the ability to periodically meet physically and/or virtually. Support of collaborative work with clustering, refinement and in-depth analysis of aggregated material.</td>
<td>The CoCI tool has support of periodic meetings, e.g. each week, where the collective box is evaluated and its relevance determined. During the meeting a result dashboard is collaboratively created where selected items are posted and further commented on.</td>
</tr>
</tbody>
</table>

Table 3: Four design patterns of social CI that have been extracted from the initial iteration of CoCI work method and tool.
5. Summary

In the report, a novel work method and work tool for collaborative social CI have been introduced, called CoCI. It builds on the concept of social CI, which seeks to explore how social technology can be used to support network-based CI work processes. In CoCI, the notions of social CI have been applied to freeform collaborative networks, to explore how such internal organizational networks can be supported in the context of CI. The new proposed socio-technical design has its foundation in the identification of a series of potential areas of improvement for social CI. The evaluation of the CoCI tool using collaborative task scenarios indicates that the approach is indeed perceived as engaging and supporting community and collaboration. Four design patterns for social CI have been identified that extract the insights from the strong parts of the design, according to the evaluation.

For the subsequent research iteration of the CoCI solution, the plan is to first improve the tool prototype and then perform a group experiment using the proposed network-based work method.

References


Russell-Rose, T., & Tate, T. (2013). Designing the search experience: The information architecture of discovery. Morgan Kaufmann.


