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The Value of a Meta Perspective in Social Innovation

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Abstract: Collective Awareness Platforms (CAP) have been promoted as an enabler of social innovation. A CAP supports the collection of data (quantitative and qualitative, and using all the technical possibilities that are rapidly becoming available, e.g. sensors), the integration of the data, and the presentation of results to the community in order to adapt their behavior or develop new behavior patterns. Typically, a CAP has many stakeholders. To support the development and maintenance of CAPs, we propose the notion of META-CAP, a platform that allows participants to reflect on the CAP from a value and collaboration perspective. The META-CAP architecture described in this paper is evaluated from the perspective of socio-technical design.

Keywords: value modeling, open innovation, collective awareness platform

1. Introduction

All over Europe, we see visionaries, grass-root communities, citizen groups and small enterprises, sometimes in cooperation with local government, developing effective solutions to real societal problems in a process of social innovation [S13]. Examples include local pollution control, energy reduction, or elderly care. As in most innovation ICT plays a key role and this is increasingly being recognized in the field of social innovation as well. In addition to standard web sites and social media recently a new group of ICT tools is being developed: Collective Awareness Platforms (CAPs) [S12, A14]. Essential functional components of a CAP are the collection of data (quantitative and qualitative, and using all the technical possibilities that are rapidly becoming available, e.g. sensors), the integration of the data, and the presentation of results to the community in order to adapt their behavior or support new behavior patterns. The concept is promising for several reasons, not the least that the CAP provides the development of a “shared mental model” and thus fosters cooperative behavior and social motivation.

In our own experience, we have found that social innovation teams are often without any business modeling support, and therefore have a problem in structuring their interactions and building mutual trust. Consequently, many innovation projects are aborted in an early stage or end up in situations where some parties feel abused. Traditionally, conceptual models are used in the Information System domain for communicating between different stakeholders and explicating design choices. Most of these models aim to contribute to the system design. They do not touch the trust issue. What kind of tool support can enhance trust? Legal contracts are sometimes used, but experience also shows that they can take away all trust and kill the collaboration and creativity immediately. Still what legal contracts try to describe – the expectations, the distribution of value, the safeguards – is relevant. Is it possible to model these issues in a non-intrusive way?

Current value modeling approaches have provided several conceptual tools to support the development of business models [A02,G05,V12], and some of them, in particular the Business Model Canvas Method, are widely used in start-up companies. So there is a ground for saying that value modeling is the answer. However, we claim that these approaches fall short at the moment in supporting an analysis of value creation in the following way:

- To assess the sustainable value of network collaboration, the analysis must look beyond economic transactions. The dynamics of intangible benefits, in particular the effects on *knowledge development*, need to be taken into account as well.
- Value is created not so much or not only in economic transactions, but in *collaborative activities*. These activities are by definition not controlled by a single actor. In the approaches mentioned above, this shared control cannot be expressed.
- Value modeling should make clear what *value* is derived from the collaborations and what they require, and should not depend too much on the institutional form of the collaboration, as this is becoming more and more flexible.

In addition, it must be realized that innovation is a process [O14,T99]. Traditional value modeling is focused on the exploitation phase of some new product or service, but this scope is too narrow. To address these shortcomings, earlier we have introduced a new value modeling variant – value encounter modeling [W09]. This modeling approach has been applied in several small-size innovation projects.

In this paper, we bring together the promising area of CAP with the value encounter modeling approach, in two ways. On the one hand, we claim that value encounter modeling can contribute to CAP projects by providing a business modeling approach that has been proven to be suitable for social innovation support. The value encounter modeling provides the participants with a meta-perspective that supports reflection [W12]. On the other hand, value encounter modeling when embedded in a tool can be designed itself as a CAP. A CAP that supports CAP development, hence called META-CAP. The objective of this paper is to introduce the META-CAP as a design artefact. Section 2 provides a background on CAP. Section 3 contains the motivation and description of the META-CAP architecture and Section 4 an evaluation from the perspective of socio-technical design.

2. Collective Awareness Platforms

In this section, we briefly review the notion of Collective Awareness Platform (CAP). CAP is a particular kind of collaborative tool aimed to support social innovation. However, it can also be viewed as a solution pattern for cooperative systems in general. It is a pattern that is particularly suitable in the new era of Smart Computing [B09] and Big Data.

2.1 CAP and data-driven innovation

Collective Awareness Platforms (CAP) were introduced as a concept by Fabrizio Sestini from the EC [S12] and defined as ICT systems leveraging the network effect (collective intelligence [MLD10]) for gathering and making use of open data from a combination of sources including social media, distributed knowledge creation systems and IoT. It has a strong focus on social innovation, sustainability and participatory democracy. As such, CAPs are positioned primarily in the public or semi-public sector. However, the leveraging of collective intelligence has also potential value in industrial domains such as logistics where, for instance, timely performance reports from various sources can lead to re-routing of transportations. It is a bottom-up “grass-root” rather than top-down approach to collaboration. As sharing of data from many heterogeneous and distributed sources becomes easier large-scale collaboration becomes possible; not on the basis of predefined collaboration processes (too slow, too inflexible) but because actors influence each other through the shared data (pooled interdependence). An often mentioned example is the sharing of energy consumption data (anonymised) in a neighbourhood. It has been demonstrated that this can urge consumers to reduce their energy consumption. However, CAP is a new concept. How CAPs will work in the real-world, or under which conditions, it still unknown, as Sestini admits. For project-oriented collaborations with a specific target, time frame and division of labour it seems to be not a good solution.

Collaboration platforms already exist for a long time [M07,M13]. It is widely recognized that collaboration is an important enabler of innovation. Many companies currently struggle with a transition from a traditional in-company way of thinking to a more open mind-set with the realization that by sharing data one does not necessarily risk to lose but rather get an opportunity to win (open innovation, [Ch03]). CAPs may indeed contribute to so-called “data-driven innovation” [J14,LA014]. Several unsolved problems remains though: sharing data can be a sensitive issue and the value of data is hard to establish. The legal and economic concerns of data sharing must be addressed explicitly.

2.2 CAP examples

As an example of an advanced CAP platform we consider the BIVEE project described in [SS14]. BIVEE has used an approach based on semantic technologies to enrich user-generated content with structured data and enable interoperability across applications. The platform covers 3 phases: (a) monitoring and evaluating. Based on sensor data and reconciled using semantic techniques, (b) triggering and developing. Based on the output of the monitoring, in this phase, disruptive interventions are identified, and (c) co-creating, in which ideas are designed and implemented in a collaborative way. One technique used in the second phase is knowledge routing that works as follows (cf. Fig.1). A document is detected, e.g. a web page. Using textual analysis techniques a semantic annotation is produced, which is the basis for a selection on relevance. Relevance is measured with respect to a given domain ontology (or ontologies) and to a user profile (or profiles). A document that is relevant to a user but deals with a lateral domain, may trigger lateral thinking, while a document relevant to the user that is cross-domain may trigger discussions between different participant groups.

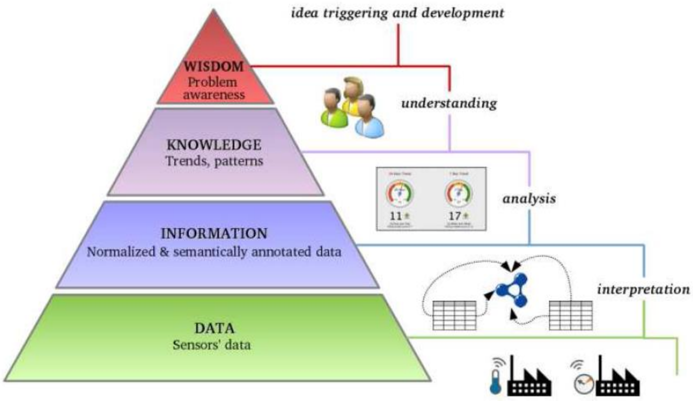

Fig. 1 DIKW framework used in the BIVEE project [SS14]

2.3 CAP as a pattern

Although the term “Collective Awareness Platform” is recent, the idea of influencing behaviour by sharing data has been around already for some time. We mentioned platforms in a neighbourhood that collect energy consumption data from the inhabitants and publish the data in aggregated form, to increase the energy awareness. Another real example is a website that wants to stimulate elderly people to move, in particular, to bike. People can upload their geo data, so that they can see on their app, during biking, where they could meet another biker. What is new is the technical advancements that make the massive automatic collection of data and their analysis substantially easier and cheaper than in the past. For that reason, the new term CAP is warranted, in our view. The advantage of naming it in such a way is that it allows us to examine the pattern in more detail and to see how it can be combined with other patterns into innovative forms.

A prototypical CAP meets the following conditions:

(i) Behavioural data are collected automatically or semi-automatically from a collection of subjects

(ii) The data are aggregated and analysed

(iii) Results are presented to the subjects with the goal of influencing their behaviour. The influence is based on some form of social influence, rather than hierarchy or market.

Variations of the prototypical pattern lift one or more of these conditions. For instance, a group brainstorm system that meets conditions (ii) and (iii), but the input data is not behavioural and not entered manually. We say that condition (iii) is the most distinctive because any Smart Computing system [B09] meets the first two conditions. We deliberately write "some form of social influence". The energy savings case makes use of *benchmarking*, but this does not play a role, for instance, in the BIVEE case, where the aggregated results are used for *collaborative recommendation*. In other cases, the influence takes the form of a *shared mental model* (global picture). We expect that in the future the various CAP subpatterns can be identified more succinctly.

3. META-CAP

We define a META-CAP to be a tool that enables social innovators to make effective use of the CAP tools that already exist or to develop new ones. A key feature of a META-CAP is the priority it gives to conceptual models [M07,W12]. Conceptual models are popular in ICT and in all design science. The strong points of conceptual models are:

- abstraction. In complex situations, humans with bounded rationality cannot progress without abstraction. In the case of CAP projects, it is important to abstract from specific technology and process details in the first phases.
- communication. A conceptual model, especially with a graphical representation, facilitates sharing of ideas within homogeneous groups and across. This is even more so when the conceptual model is built collaboratively. It stimulates the formulation of a shared mental model.
- reflection. Research in design has found out that conceptual models play an important role in a "build and evaluate" iterative way of working [W12]. This reflection support is even stronger when the models produced are executable in some way, for instance simulation. This provides very rich evaluation possibilities.

Conceptual modeling approaches have also been criticized. The models can be hard to understand for some people. Despite their formal or semi-formal character, they cannot eliminate ambiguity completely, if this is desirable at all. Conceptual modeling is not a priori the best solution in all cases but it is at least worth investigating.

3.2 META-CAP models

Ultimately social innovation projects aim to create value. Hence the highest model level that our META-CAP provides is value (encounter) modeling [A02,G05,W09]. Value modeling helps the innovators to abstract from how value is produced and instead identify what the gains and losses are for whom. Value models include economic models but have a broader scope – not only considering monetary value, but also intangible values, like social esteem, meaningful relationships, and knowledge. Value models are not only relevant for the exploitation but can and should be made for all phases of an innovation project. If some phase is not sustainable – does not provide sufficient value to all stakeholders – the whole project will stop. It should be realized that sustainability is not only needed for projects with a commercial goal, but also for volunteer networks or cooperative enterprises that want to have a durable effect.

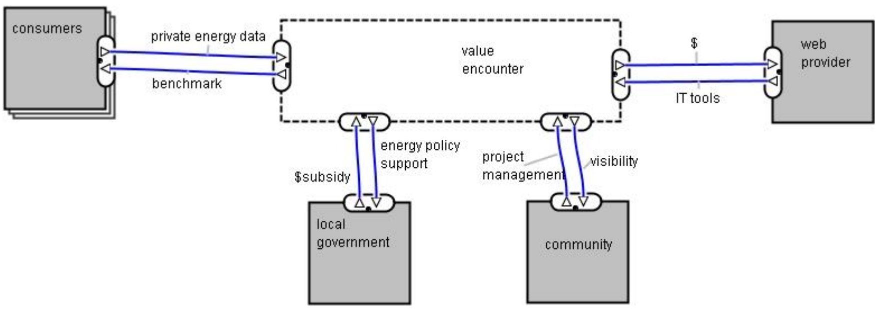

Fig. 2 Example value encounter (energy reduction CAP)

Fig. 2 is a simple example of a value encounter model. The central white box represents the value encounter. The grey boxes represent actors, and the model shows what they expect from the value encounter and what they contribute. The model represents *choices* – for instance, that the energy provider is not included (perhaps because that is too complicated for data protection reasons). The model represents *commitments* – if this model is agreed upon by the participants of an early project meeting, it means that the government commits a subsidy amount, for instance. This is important for the web provider. The commitments raise the mutual trust. The model also gives *prompts* – the value encounter is empty and should be filled by value activities for which the inputs and outputs are already given. The model allows also for other kinds of reflection – for instance, we know that subsidies are temporary, so either the time span of the project becomes a topic of discussion or the value encounter of Fig. 2 is seen as a transitional one to be followed by a situation where subsidy is no longer necessary. Fig. 3 shows a global value encounter model based on this reflection. The white spaces again represent value encounters. The actors involved in each value encounter are not shown. The global model only shows the value encounters and their dependencies. The motivation to distinguish value encounters, e.g. initiation vs. development, is that the group of actors involved is different: local government is involved in the initiation, but not in the development. Note that the value encounter modeling usually starts with a single value encounter, like Fig. 2, and after reflection splits it up in multiple related value encounters, such as shown in the global value encounter model. In Fig. 3 it is assumed that the awareness project stops at some time, and then is followed by a situation that the energy provider monitors the consumption data and makes it available in aggregated format. However, it is only willing to do that when there is a reasonable customer base willing to cooperate, and this is what the awareness project can provide.

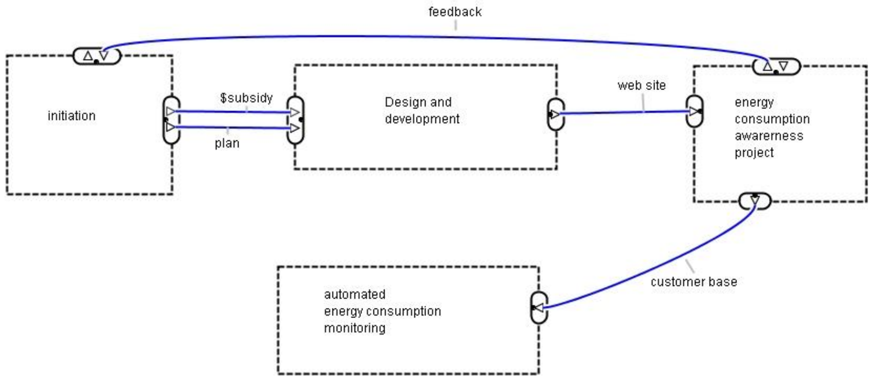

Fig. 3 Global value encounter model

The second modeling level is collaboration modeling. Value is often created in collaboration through co-creation [Ch03,B11]. In the course of time, an innovation project includes several networks or communities, like the developer network and the user network [M13]. These networks have to communicate internally and externally. Collaboration models abstract again from the "how", that is, from the information technology used and also from information content, and focus on commitments and their fulfillments in terms of actions that use and produce value.

Collaboration modeling makes use of collaboration patterns, in the sense of "relatively stable solutions to recurring problems at the right level of abstraction, making them concrete enough to be useful in a particular case, while also sufficiently abstract to be reusable across cases" [M13]. A classical collaboration pattern is the workflow transaction in DEMO [D06] based on the LAP workflow loops (Fig. 4, nest page). The transaction consists of request/commitment (O-phase), execution (E-phase) and reporting/closing (R-phase).

Socio-technical design patterns go beyond the more technical-oriented design patterns in Software Engineering and Human-Computer Interaction. Collaboration patterns help innovation groups in finding effective ways of working together given the goals they want to achieve. Lessons learned can be laid down and made transferable by means of patterns as well. Fig. 5 (next page) is taken from [PF07] where collaboration patterns are described as part of a collaboration ontology. It is assumed that the patterns are also defined on different levels of abstraction.

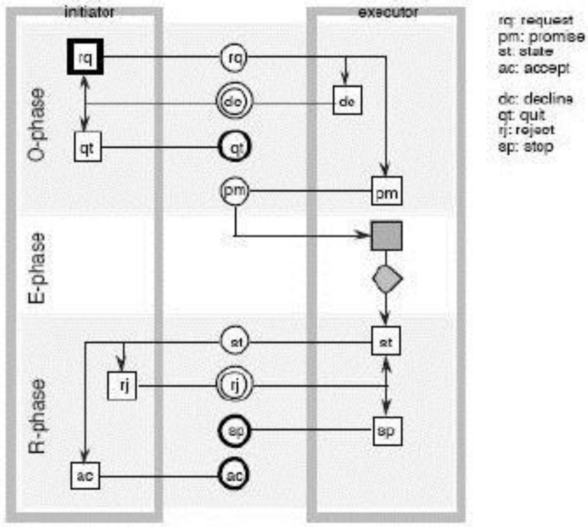

Fig. 4 Example collaboration pattern: the standard transaction pattern [D06]

Last but not least, collaboration patterns can be related to tools that have proven to be useful for support the specific kind of collaboration. In the case of CAP projects, at least two groups of tools should be distinguished: CAP tools that are used by a user community (where the collaboration pattern corresponds to some innovative social practice) and tools used by a developer community in the development of CAP tools. Sometimes, a tool can be in both groups. For instance, an argumentation support tool like COHERE [BS08] can be used in an e-democracy setting to bring together arguments from a large group of stakeholders, but it may be used also in a development group that aims to develop a new CAP tool and wants future users to participate in the design. Via the collaboration modeling and the link between collaboration patterns and tools (described in a CAP registry), META-CAP also supports CAP tool selection.

It has been recognized for quite some time that ICT is a powerful tool for collaboration. There is a whole research area, CSCW, devoted to this. Virtual communities are critically dependent on online collaboration. A lot is possible nowadays just using standard social media technology. However, these tools are not sufficient when communities want to get at a higher level of collaboration, such as producing a report together, or a fair democratic decision making process [M07]. Fortunately, more advanced tools have become available. Without trying to be complete we mention COHERE (see above); Mindmeister, a mindmapping tool and crowdsourcing platform; Edgesense, a CATALYST tool for social network analytics; and SciCafe2.0, for crowdsourcing and knowledge management. Apart from these tools, there are many traditional methods that support specific types of collaborative work, such as brainstorming, project management and collaborative design.

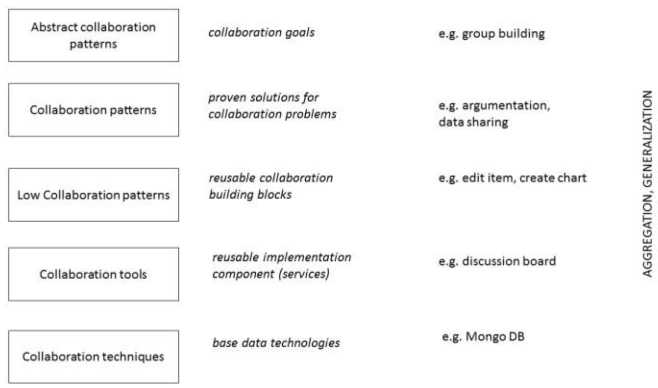

Fig. 5 Collaboration stack [PF07], slightly adapted

Social innovation is a process in which new ideas are generated that not only meet social or economic needs, but also create new social relationships and collaborations [M10]. Balancing creativity with rationale is essential in order to ensure that those new ideas get generated and processed by the right combinations of stakeholders as effectively and efficiently as possible [M13]. It has been found that collaboration patterns can help community members specify customized systems that capture their unique requirements, while reusing lessons learnt by other communities.

3.1 META-CAP principles

The META-CAP tool enables value modeling, collaboration modeling, and CAP tool selection and configuration in an *evolutionary*, *executable* and *value-sensitive* way. *Evolutionary* means that models are being built right from the beginning and get refined in each iteration. If we consider the well-known NESTA social innovation process phase model [M10], then we see that it starts with the phases prompts, proposals and prototypes, followed by sustaining, scaling and systemic change. In a naïve interpretation of this model, it is only in the fourth phase that the innovators start thinking about the business model. Unfortunately, experience shows that this is often too late. Trust is enhanced when participants can express and lay down their expectations about value delivery right from the start. With an evolutionary method, the participants are prompted to develop the value model and the idea concurrently. During the process, it will be extended and adapted. The value model not only considers the exploitation, but also the intended use context. The value (again, taken in a broad sense) that users create in a future situation should exceed the value they create in the current situation, and that not only for some stakeholders but for all. If this is only the case after a systemic change, this new "system" should be modelled as well. Not only the value aspect and the context aspect but also the technology and legal aspect (e.g. management of sensitive data) should be considered right from the start, and worked out in parallel in later cycles.

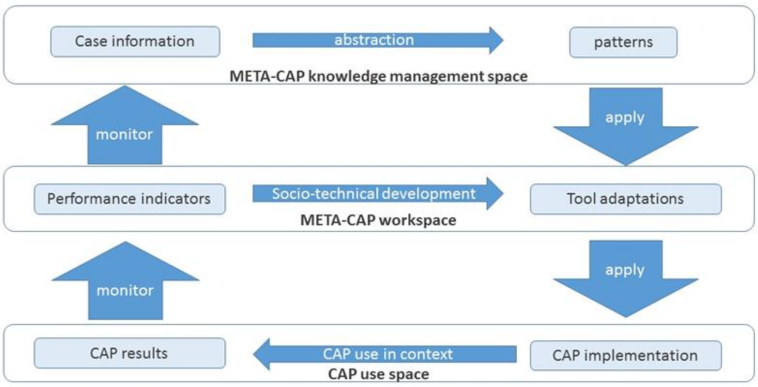

Fig. 6 META-CAP to support evolutionary development of CAPs and knowledge management

Evolutionary also means that META-CAP takes a long-term view on the innovation project, and on the CAP use. Once a CAP is developed, it is monitored (Fig. 6) so that it can be adapted or extended following the community needs. The development process itself is the object of continuous monitoring and improvement in a second-order management loop, in particular, by abstracting from the cases to new or refined collaboration patterns, and in turn using these patterns to select and configure the CAP.

Executable means that the models are actively used. We envision the META-CAP platform as an online tool that is available to participants collectively in meetings and off-line to each one individually. The models are stored and archived. They can also play a role in configuring the platform. For instance, once the group has defined a value model for the developers' network, a collaboration space is created to which the parties or roles modeled are given access with some basic communication tools. Depending on the collaboration model they develop, more tools are added and installed. This executability is an important distinction between META-CAP and the way value modeling methods is done traditionally, where models are made for discussion and analysis only

Value-sensitive design means that design decisions are related systematically to values [P13]. For instance, the decision of the META-CAP users to select a collaboration pattern for team formation can be positively related to the value "gender balance" if the pattern explicitly includes a rule about the number of females. Value-sensitive design is coherent with the META-CAP focus on value modeling and with the end goals of social innovation. It does support the design decision process and also traceability.

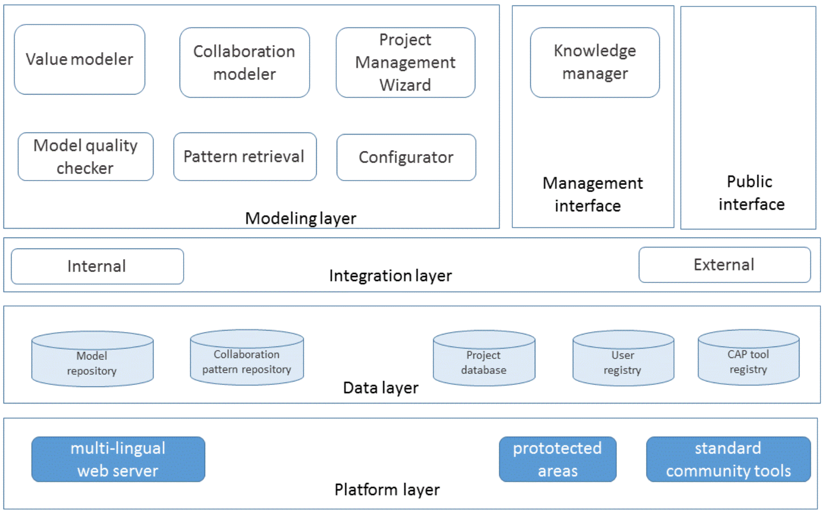

Fig. 7 Architecture of the META-CAP tool

3.2 META-CAP architecture

Figure 7 depicts an architecture for a META-CAP tool. At the bottom level, the platform layer provides basic web community support. META-CAP must be multilingual to make it easily accessible for diverse user groups and provide protected areas for each project. The data layer contains at least some standard functions (such as a project database and user registry), a CAP tool registry, the collaboration pattern library and the model repository. For the project-specific information, the database is non-tamperable using versioning so that the database can function as a safe and reliable archive. This is very important for enhancing trust. The integration layer makes it possible to integrate external tools and configure the internal tools into the project workspace.

Apart from the general META-CAP interface, that provides functions such as the creation of a new project, we distinguish a modeling layer that contains the value modeler and collaboration modeler, with graphical and form-based interfaces. The project management wizard supports the project team in the steps they are recommended to take and provides an overview of all project information.In the background, the modeling layer contains a *model quality checker* that gives warnings and recommendations. For instance, a value model that does not provide positive value to all participants, is not sustainable. *Pattern retrieval* provides an intelligent interface to the collaboration pattern library. The *configurator* makes models executable by adapting the project workspace according to the model. This may imply the deployment of an external tool. The system includes a *Knowledge manager* that supports the monitoring of projects for abstraction and improvement of the collaboration patterns

3.3 Methodological support

The envisioned META-CAP platform provides methodological support. Two levels of support can be distinguished: on an intra-project level (for some innovation team) and on an inter-project level (for some governmental agency or organization that supports many projects), and two support objects: knowledge management and innovation management. Knowledge management support is relevant on both levels, and can be built in into the Knowledge Manager (wizard style).

Collaboration patterns are the main vehicles here. The collaboration patterns concern both the innovation teams and the intended CAP user communities. Innovation management support is particularly relevant on the intra-project level, to help the team in taking the steps needed for some phase. The methodology makes heavy use of value modeling, and includes value encounter templates for different SI phases (initialization, development, exploitation etc.). The Value modeler incorporates the methodological support by means of wizards and the Model Quality checker.

4. Evaluation

Socio-technical systems design is an approach to design that consider human, social and organizational factors as well as technical factors in the design of organizational systems. A CAP is typically a socio-technical system [BS11]. To what extent does the META-CAP support socio-technical design?

Since its inception in the '70s several socio-technical design methods have been developed but their uptake has been disappointing [BS11], for which several reasons can be given. According to [M06], humanistic ideas will always keep their relevance. [BS11] more pragmatically argues that we still see many IT projects fail "because they do not recognize the social and organizational complexity of the environment in which the systems are deployed". Introducing an Information System involves both technical development and organizational change, and the link between these two is often too weak. To overcome this problem, [BS11] pleads for constructive engagement and sensitization. To what extent does the META-CAP support these elements?

Constructive engagement means that the socio-technical aspect is integrated in the technical development and change management processes. It means (more) attention to the problem definition in the requirement collection phase. It also means, according to Baxter, that during the construction process technical and social aspects are considered together, and that there is evaluation. Having a META-CAP that supports the CAP construction clearly fosters constructive engagement, and radicalizes the notion of evaluation. Rather than saying that after the project is finished, some evaluation must be done, META-CAP asks from the participants to define their value indicators in an early stage, and ensures that procedures are in place to adapt the system on the basis of continuous value monitoring (evolutionary principle).

Sensitization means that (all) stakeholders are made aware of the social implications of design choices and the different, often conflicting, perspectives that have to be reconciled. There are several ways to do sensitization, e.g. using workplace vignettes. We claim that the META-CAP is also a sensitization instrument, as it pushes the stakeholders to express their expectations in terms of value and gives them an instrument to see whether these expectations will be met. Admittedly, the value perspective includes some abstraction. It is not a good instrument to analyze how work procedures are changed. However, it may be that one of the problems of socio-technical design is that it has focused too much on this operational level. Resistance to change is not only because people do not want to change but also because people fear the consequences in terms of loss of value.

Other ways in which META-CAP address the socio-technical research challenges expressed in [BS11] are: the use of modeling and abstraction; the use of learning and organizational memory systems (not isolated, but integrated so that they are actually used); knowledge transfer between organizations; tool support.

Traditionally, an important concern for socio-technical system design was the problem of dull “inhuman” routine work created by industrialization and automation. In the current Smart Computing era, much of this routine work is disappearing because it is taken over by sensors, effectors and robots. Information overload is a growing problem, but is mitigated by new intelligent techniques (e.g. information fusion, visualization). However, in the background, there have always been social problems of power differences and exploitation. These social problems are obscured if the focus is on the technology only. They are not solved just by a tool, but a reflective, participatory and value-sensitive design approach can help.

The META-CAP approach does not need to be confined to CAP development but can be generalized. Our claim is that any application that involves multiple stakeholders – any socio-technical system, we could say – will profit from a META approach.

5. Conclusion

In this paper, we have described the idea of a META-CAP as a tool that can support CAP systems in their development and evolution. In contrast to current business model or value modeling approaches, such as BMO and e3value, META-CAP not only gives modeling support in the early phases for models that are thrown away in the next step of the development cycle, but a mechanism for continuous reflection. We conjecture that a META-CAP solution pattern is applicable in a wide range of multi-stakeholder information systems.

The further development and evaluation of META-CAP gives rise to many research questions. What value does the META-CAP actually add and under which conditions? What is a good representation for collaboration patterns? A specific research question to be addressed relates to CAP platforms [S12, A14]. What kind of collaboration patterns are possible that make effective use of collective awareness (cf.

[MLD10]? In what sense do these patterns differ from collaborations without collective awareness? How to make males perform as well as females in collective intelligence?

The power of social innovation has been recognized by government agencies and researchers for quite some time. The Open Book of Social Innovation [M10] represents a milestone in the maturing of the field. Many examples of successful projects contributing to important social goals such as sustainable growth, gender balance, and security are now available. At the same time, many projects also fail or run against economic and legal barriers (e.g. [S13]). The challenge for the social innovation field is to go beyond the development of creative ideas [H14]. Ideas must lead to implementation and change. It must be realized that social innovation is a socio-technical process that requires both technology (sometimes technology not existing yet) and social change, not isolated but within a concrete economic and legal context [W12] The META-CAP architecture suggests a tool and methodological support that can bring innovation groups to a higher level of efficiency and effectiveness.

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