REPROGRAMING ANTHROPOCENE - CROWDSOURCED GOVERNANCE OF TRANS-TECHNICAL SYSTEMS

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ABSTRACT

Anthropocene happens to be the largest socio-material system ever created. Mankind is daily interacting with that system; there are many bonds and loops between the system components. Every innocent step is an interaction, every need / desire or a resource requirement, every wish to redesign even a smallest corner of the planet, or even helping one species to survive, reflects as a loopback to the planet reinforcing in that sense, through that (mostly negative) feedback, the concept of the anthropocene.

Interactions are inevitable - micro-interactions build more observable and articulated actions which “crystallize” into patterns - chains of decisions and actions; we call them trans-technical patterns / bouquets. Finally, trans-technical patterns are loosely coupled into interconnected trans-technical processes.

Those interactions are hard to recognize individually on that rather complex process level, and very often performed in Brownian-motion manner stochastically and by enormous number of actors in the anthropocene making it hard to observe and track. Still, following the principles of the minimal energy paths (as simple as walking across the same stepped through path across park) or following leading social behaviors, patterns got recognized, reinforced and eventually encoded in the embodiment of society, culture, and finally the anthropocene system in whole. We explain how this processes are one the most fundamental mechanisms of running society shaping anthropocene and how by acting on that level we are capable of governing anthropocene.

Recognizing the fact that majority of big systems that humanity relies on (like economy, education, government, education, etc) are governed through cyberinfrastructure, we see how real-world socio-technical process got migrated into the cyberinfrastructure and how power-structures and behaviour patterns are imprinted in it.

Our approaches are aligned with Bela Banathy's "True empowerment" - developing people’s competence to take part directly and authentically in the design of the systems in which they live and work, and on top of that increasing their motivation to take action.

We address motivations issues by incorporating techniques resulting from Self-determination theory and through Social and emotional contagion processes.

We introduce a concept of visual language for modeling those processes, together with an interface for domain-experts, capable of recognizing positive and negative trans-technical patterns, and present framework CollaboFramework for designing systems that follows those principles. We argue that the system design has to adapt toward more flexible loosely-coupled components that are capable of recognizing user interactions and processes and adjusting system experience and behavior to achieve to most efficient results. That framework has to provide a set of system components that will provide mechanism, but also guarantee fulfilling principles. Through this framework we are capable of treating complex trans-technical interactions, political and business rules, power-structures, democracy laws/patterns and reprogramming trans-technical patterns imprinted in fabric of humanity.

We present examples of our framework through the CollaboScience - the infrastructure for collaborative practice of research and examples of extracting insights in ISSS community of practice, followed with three shorter examples of Charirty.Net, DemocracyFramework, CollaboArte.

Keywords: *collective intelligence, modelling, crowdsourced management, trans-technical systems, sustainability*

Introduction

In the age of the Anthropocene, influence of the humankind increases, as well as our responsibilities and irreversibility of wrong decisions. Even further, through changes in ecosystem and the earth in whole, both direct and indirect influences from one community to the other, from a nation to nation, have grown. Accordingly, need for an inter-communities feedback and a control mechanism arises.

Communities become glocal. Accordingly, governing systems should follow the change. At the same time, societies transfer their existence and government more to online scene, so systems governing and monitoring these areas should follow this tendency.

Authors work on a set of mechanisms and tools to support this democratization/distribution of governance and democratization of science that addresses societal issues. We believe that transparency and accountability must be increased and can be achieved through a step toward distributed and crowdsourced governance.

We show how, through serious gaming (playing for good) of these processes, we are aiming to redesign of cultural goals and norms, toward creating a society driven by the care for the others, and to the informed government of anthropocene, in which are included wide, but educated masses, trained through gamified processes and networked according to expertise and interests.

We approach the negotiations issues in distributed anthropocene management, like interests conflicts, by procedural negotiation (between system and users), relying on TTPts (Trans-Technical Patterns). Our environment observes user’s Behavioral/Attitude aspects and Community Topology and Social Dynamics inside the system and according to that, it selects TTPts with the highest probability of acceptance by stakeholders. This techniques also motivates a shift from tactical to strategic/sustainable way of thinking.

Role of CSCW in complex systems

CSCW has an amazingly important task, that is at the same time extremely demanding and wide. At the same time we are “brave” enough to say that CSCW failed. CSCW failed to govern design and development of cyberinfrastructure. It failed to introduce policies that will support healthy development of cyberinfrastructure, supporting both infrastructure and organization needs, but also requirements of each actant (~ actor) in the system and focus on reducing socio-technical gap. Cyberinfrastructure is left to the mercy of non-domain IT experts, investors, business and community that is trying to “reprogram” their patterns to the system capabilities and functionalities.

There are many academic discussions if CSCW is too wide or undirected, and that is essentially the main source of problems. In essence CSCW is focused on any sort of computer supported work ranging from work on farm, hospital, IT company to academic/research work. Even the definition of the term work is heavily discussed (Schmidt, 2011). In the parallel CSCW expands due to the expansion of the work that gets augmented with computer technologies.

In the parallel boundary related domains of online-social presence and interactions happens to be relevant to CSCW, same as massive online games, like The World of Warcraft (Nardi 2006). If we take the mentioned game as an example we can strongly argue if the CSCW should recognize games as the part of their research interest. The reason for researching games is that many of phenomena recognized in 'non-work' environment (entertaining, etc, …) are relevant for and existing in the working environment. Most of those phenomena are important and relevant for working scenarios, but in the working environment more deeply hidden under the surface or not suitable for analysis like "character sharing" (Wong 2009).

One can argue that CSCW should just "borrow" scientific observations from fields that should primarily deal with recognized non-working phenomenas. Although that might be true at the some extent, it is surely possible to argue that research under CSCW-lenses perspective can bring additional and strongly relevant insights to the phenomena and brings understanding to CSCW-related work. Finally, our belief is that that sort of research needs to be organized as academic transdisciplinary work in order to keep state-of-the-art and high quality of results.

In order to cope with the variety of domains of research CSCW through its history have tried to to refer to plethora of boundary relevant research domains, methodologies and theories (fieldwork, qualitative and quantitative research, ethnography, workflows, social science, socio-technical theory, active theory, just naming few).

From our rather limited understanding of the CSCW state-of-the-art, it seems that CSCW has two (of our interest, among many) different roles - 1) understanding phenomena of cscw (referring to the type of work CSCW as Science interested in), and 2) influencing cscw and design of computer systems guided with CSCW findings and foundation.

For the first role, CSCW as Science, got "equipped" with many expertises mostly borrowed from the social science and it seems to be efficient in understanding cscw working patterns. Through that understanding CSCW researchers are capable of suggesting positive and negative patterns in cscw and how to potentially avoid them.

However the second CSCW role of our interest, influencing cscw and computer systems design is highly underdeveloped and unpracticed. There are examples of ongoing collaborations on development of computer systems between system developers and CSCW researchers, but it seems mainly through special research grants or academic approach to system development, mostly system prototypes.

However, the most appreciated scenario - where CS researchers and especially IT developers are drawn by CSCW experience and guidances is still not on the horizon.

Workflow "Theory" and its integration with CSSW and non-CSCW theories

Workflow (Bowers 1995) concept describes relationships between task that relates with execution of a particular (part of) work. It can also describe roles and communication between actants performing tasks aligned with roles.

In its nature it is rather easy to see that CSCW inherently depends on concepts like workflows. The reason for that is that workflow is one of mechanisms capable of supporting coordination and articulation mechanisms that are required for anyone more complex or responsible work, especially in the case of collaborative work, and even more when it is dislocated form of work.

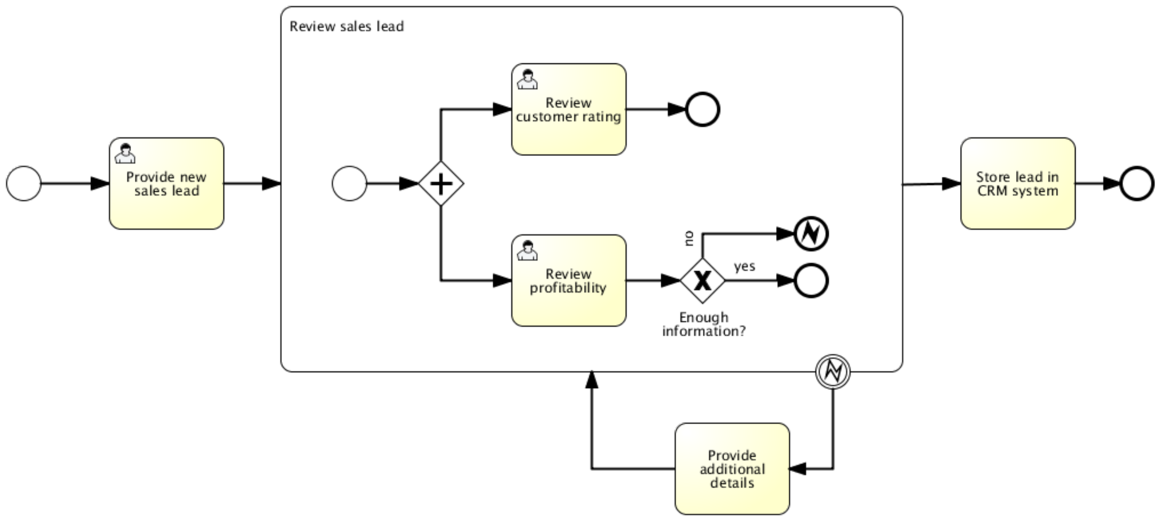

Figure 1. Example of a workflow presented in BPMN modeling language[1]

Workflow as a mechanism presents a form of dialogue between different roles performing work tasks both horizontal (either pipelining tasks or handshaking with other actants) and vertical (reporting results and issuing new work requirements). Opposite to our common understanding of dialogue, we refer here to more structured forms of dialogue that got popularized with (Bohm, David. 2013) and then later with more complex dialogue grammars like the "dialogue mapping" methodology (Conklin, 2006). In that way dialogue still keeps it piedestal as a fundamental mechanism of building and communication across common space, but in the new constellation it promises more efficient system value generations, and faster convergence.

As one might notice, we avoided using word worker or person, or even actor, but we rather did go with the term actant. In this way we started building a more solid connections between theories - in this case ANT (Actor Network Theory).

In order to more efficiently utilize workflows we need to present them in a more formal form - the best candidate are Petri Nets (Desel, 2005). Petri Nets allows us to formalize workflows and mathematically treat them which eventually can help us in finding out critical spots, places for optimizing the work(flow) bottlenecks, or places in the workflow where we have conflicts etc. If we introduce a temporal aspect and data collected from real-time workflow execution, we are capable of drawing conclusion on workflow performances, recognize which parts of the workflow are overloaded, or opposite, which ultimately can bring increase of company revenue or employ satisfaction.

If we are interested in manual analysis or modeling of workflows (which is in system modeling terminology bettern known as BPM - Business Process Modeling) with wider range of stakeholders then a visual modeling expressions like standardized BPMN descriptive language and executive BPEL language (although BPMN itself, recently proved ability to get executed). In that way we can model workflow through visual interface (Figure 1), elaborate it and through new integration of social technologies and modeling tools (Keith 2012) we can bring workflow modeling to the level of global awareness and engage all stakeholders and make them contributing the model, interactions, suggest issues with putting workflow in the practice, etc. This truly helps with democratically solving issues with politics of design and it

[1] Retrieved from: "Why Use BPMN over Flowcharts | MCF Tech Solutions." 2014. 20 May. 2015 <http://www.mcftech.com/use-bpmn-flowcharts/>

is a very efficient way of practicing participatory design (Kensing 1998). This form of practicing participatory design fits best in the process known as "Social enactment" (Fraternali 2011).

Workflows can be augmented even more with integrating ANT (Actor Network Theory) principles. One can imagine scenario where workflow or real-life observations inform managers that particular tasks are especially inefficient. In that scenario, managers can analyze actor network and discover the root of problem - which can be problem with dislocation, or need for additional mediators, or need for additional awareness (connection) between unaware actors, etc.

On the other hand, Activity Theory (AT) can bring more meaning and explanation behind tasks, actions happening though the process of practicing workflow. Sometimes that is a necessary ingredient in truly understanding of complex socio-technical interactions no matter how "microscopic" can they seem from the bigger picture of a corporation, but through the accumulation of similar effect or happening at the critical point, those effects can happen to have a dramatic consequences.

Fjeld, Morten, et al. (2002) presented a methodology of designing groupware guided by AT ending up with advices for future developers. It is not hard to imagine real systems that are actively design guided by abovementioned principles of workflows, ANT, AT, … theories. In practice there is even more dramatic evolutionary step in the groupware development providing groupwares that are guided by workflows in the real-time. Those systems are mostly built on the top of BPEL formulated workflows, and recently even with the help of BPMN models.

Effects that those systems bring are tremendous. This design approach offers plasticity to those systems, capable of more rapidly and responsively transforming to community needs, they can act as personalized solutions. However even more fascinating opportunity is to capture actants actions through the system and workflow execution. Firstly, we are able to recognize problems workflow issues in the almost real-time manner. Secondly system is capable of doing some of those tasks automatically.

There are already known methods for automatic capturing of business processes (i.e. workflows) that, after most likely necessary reification, would be possible to analyze by domain experts and recognize crucial parts even without initial effort of creating workflows. In addition system would be capable building relations between workflow areas and critical performance spots recognized through previously collected actants' real-time actions.

One strategy that is very much aligned with the ANT theory is Social Network Analysis (SNA). SNA is a very efficient strategy for supporting ANT theory with real data, or proving ANT analysts with real-life insights and scenarios. SNA is mostly used for the post-mortem community/system analysis or at least non real-time analysis. In this scenario CSCW practitioners would be able to recognize positive and negative patterns happening in the system and train the system how to recognize them and eventually how to react on them, either in assertion mode or reactive mode. In the reactive mode, system would be capable of having particular level of independence and actively changing system configuration - actions of flow between them (workflow), Interessement (ANT), society's structure (ST), dynamic translations (AT (Bardram 1998).

Needs for the Continuous Dialogue

Nikola Tesla could be recognized as a holistic scientist believing in circular nature of everything that is intended to sustain. There are many conceptual followers (and truly precestors) to that idea, but two relevant “incarnations” of interest for us are concept of sustainability and lean development through cycles.

Lean concept of development is just a successful exemplar of cyclic working pattern that stands for repetitive cycles of actions where each action creates particular result/value. In that sense it is more reasonable to recognize the pattern in 3D representation, introducing system value as a third axis. In that case cyclic pattern becomes a spiral working pattern.

That 3rd dimension is an important ideogrammatic concept that we will continue utilizing in our following discussion and examples.

Inspired with David Bohm's concept of dialogue as much wider and more important concept that is imprinted in human semiotic interpretation we use concept dialogue in a much wider form as well.

Dialogue itself has to be structural, motivated, without frictions and with progress, and most importantly it has to be productive (to progress along the third axis) in order to make any sense. As we can immediately see, dialogue productiveness has to have a system value along which we would be able to measure its progress. It also requires mechanisms for expressing missing artefacts, issues.

One of interesting approaches to structured dialogue is Domain mapping which offers mechanism / ontology for mapping structured dialogue at co-located meetings/dialogues in organizations, communities of practices, etc.

There are enormous number of ontologies in the era of semantic-web, standards, cross-standards, versions, etc. However, the important distinction is a fact that most of ontologies are payload for communicating and storing artefacts of particular type (notes, in music, recipies, actions and decisions in business processes), but are not imprinted in HCI (human-computer interaction) as a “language” of expressing.

Therefore, instead of calling those standards ontologies, we like to call them grammars. This brings us two benefits; closer to human perception and closer to dialogue.

Research in human capacity in adopting grammar rules has shown that there is surprisingly limited number of grammar rules that system designers can bring into the system. One of solutions we known in coupling with this problem are visual language

Visual Language of Collective Intelligence

Over last few decades of groupware R&D, we are facing rises and fails of visual languages together with hopes and promises that they bring with them. Let’s just mention few of them: UML - is a de facto standard in modeling modular systems providing different diagram types for various aspects of systems, BPMN - a language for business process modeling and notation is a language that represents different aspect of business processes, ArchiMate - a language similar to BPMN but with an important focus toward recognizing organization, entities and processes as a correlated unity, stressing more the importance of relationships and supporting holistic approach.

Although just a “subtle” difference between BPMN and requirements presented in our work, there is a fundamental difference in requirement needs. BPMN is designed keeping in mind a vision of programming-in-the-big - an idea of creating a language for orchestrating and coordinating complex socio-technical systems from the perspective of system designers designing workflows containing set of actions, decisions and events. Actions and decisions are performed by system actants. This approach carries two important premises: 1) domain experts usually know workflow/processes necessary to get executed and 2) actants are merely reduced to executors (although they have their own freedom and creativity in a way of performing actions and making decisions along the workflow).

There are a few missing components/foci

- observing actant behavior and aggregating their behavior
- heavy interaction and mutual influence
- actants have intellectual/creative freedom
- there is no system-observation feedback to the top trans-technical models
- probabilistic (integrated in formal logic and separately)
- relationships between actants
- structural system-value production
    - only messages production/consumption

CollaboFramework - Collectively Intelligent Trans-Technical Systems

The inherent requirement in building Collectively Intelligent Trans-Technical Systems (CITTS) is to bridge the socio-technical gap (Figure 2) and allow regular users or at least domain-experts to "programme" system behavior.

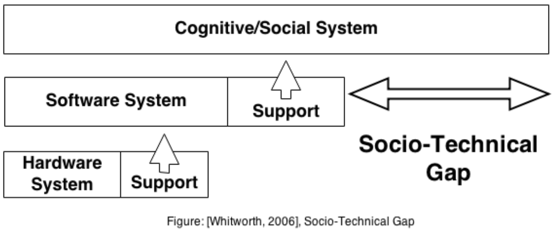

Figure 2: Socio-technical gap

The fundamental nature of CITTS system is user possibility to design dialog between system users. The fundamental component of CITTS is a live knowledge that we tentatively call ***DataTalks***. Its main characteristic is that, opposite to conventional data models, DataTalks data model is not understood and manipulated only by lower-level system layers, but it is exposed to the user-level and comprehensible to users (or at least to domain-experts).

DataTalks component represents one of the fundamental components of CITTS systems. At Figure 3 we see proposed CITTS components.

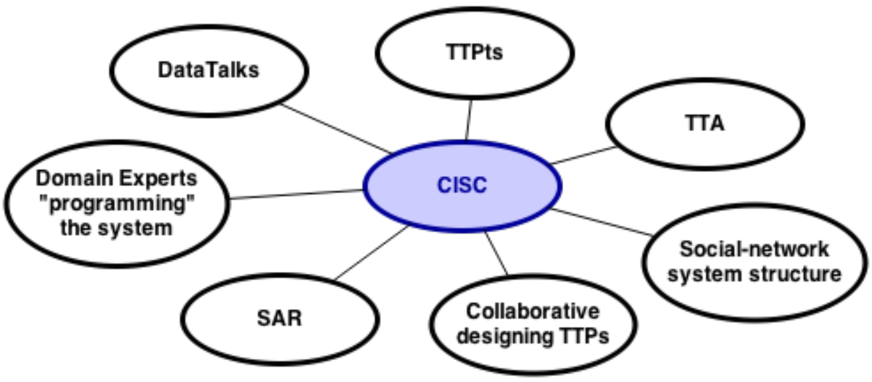

Figure 3: CITTS components

DataTalks	live data storage
TTPts (Trans-Technical Patterns)	chunks of Trans-technical-process (extension of social process)
TTA (Trans-technical Architecture) or **TTS-LA** (Trans-Tecnhical System Layered Architecture	Architecture of systems supporting CICSs (Figure 9)
Social-network system structure	System has to summarize and expose users and user-interactions with each others and system components as social-network
Collaborative designing TTPs	Users/domain-experts can design and negotiate on system trans-technical processes.
SAR (Social Activity Recommender)	Proactive component that is responsible in guiding user toward more efficient or sustainable system
Domain Experts "programming" system	Possibility of exposing system behaviors, procedures and insights to domain experts that are capable to detect irregularities and change system behavior in order to fix those irregularities

Table 1: CITTS components description

DataTalks

DataTalks represents a live data storage that is exposed to user-level and interpretable by behavioral-procedures (TTPts) that are user-level accessible and modifiable.

At the Figure 4, we see key elements of DataTalks architecture.

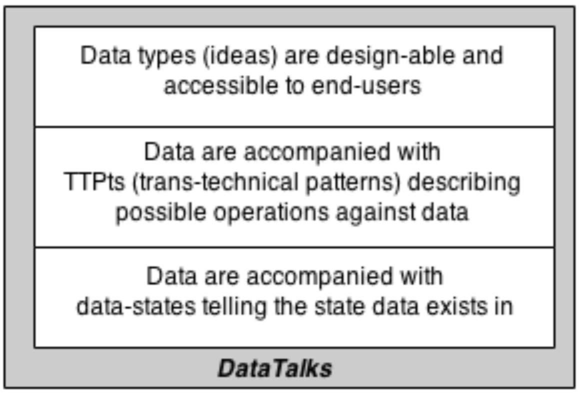

Figure 4: DataTalks architecture

TTPt

TTPt support in DataTalks mean support for describing procedures necessary for changing data/knowledge embedded in CITTS system.

It is important to stress that not all data types or actions are covered/guarded by TTPts, neither whole activity set is available (exposed) to user-level. Only procedures of interest are captured/described with TTPts. That surely require possibility of enumerating actions contained in TTPts. Luckily, activity enumeration support is inherent nature of TTA / TTS-LA.

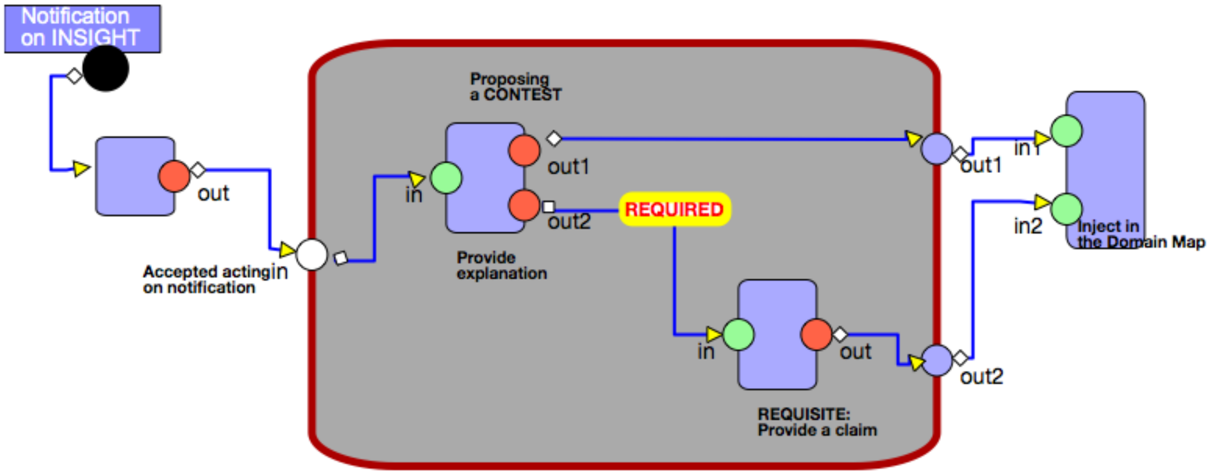

Figure 5: DataTalks TTPt example

State-scheme

State-scheme accompanies DataTalk ideas explaining DataTalk data states. Data state is changed through TTPts associated with data. It is worth of noting that not all data sub-values / states are presented at this level. This would be both expensive to implement/support but also it would over-load user-level.

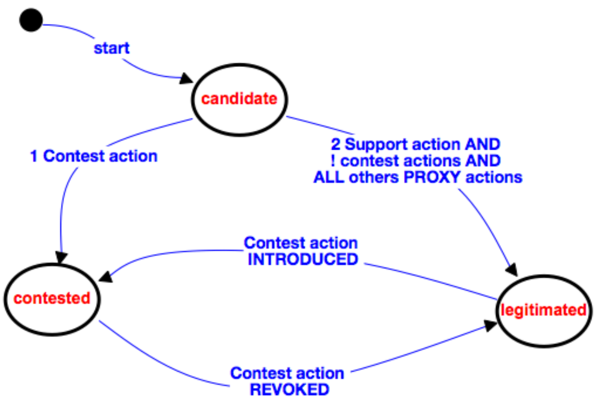

Figure 6: Insight idea state-schema

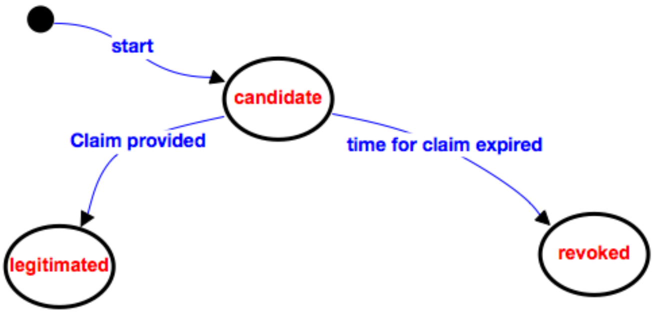

Figure 7: Contest idea state-schema

TTPts

TTPts is a bridge between **instructive** nature of business processes (expressed through BPMN (*Business Process Model and Notation*)) and **descriptive** nature of social processes.

The fundamental idea and goals behind TTPts are to

1. Enable designing system procedures by domain-experts (by manually describing TTPts of interest)
2. Enable system to discover patterns in user behavior and interaction with other users or system components and describe those patterns through TTPts
3. support system with using recognized / created TTPts in order to sustain system

SAR

SAR (Social Activity Recommender) is a CITTS component responsible with proactive behavior, for suggesting actions to user, inhibiting or promoting user actions. Through the set of modules for observing, predicting and intervening SAR aims to protect system-values and keep the system sustainable.

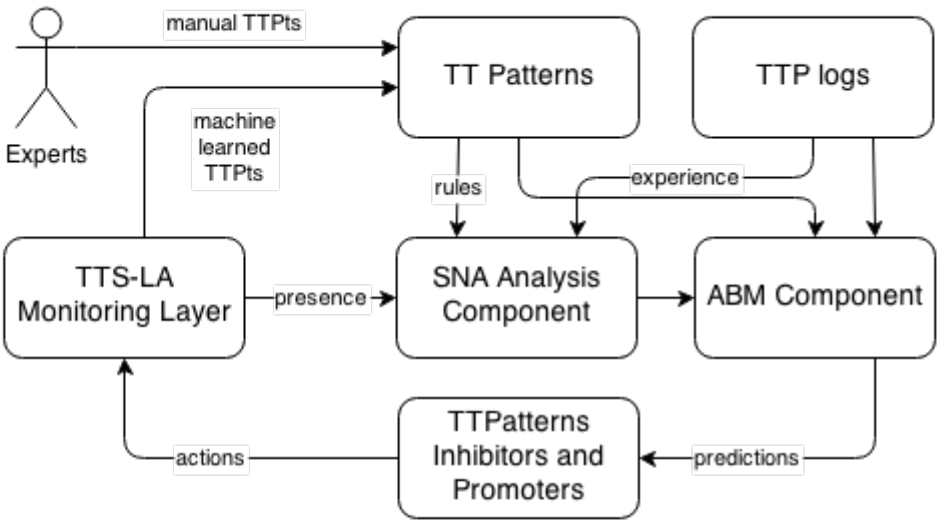

Figure 8: SAR

TTS-LA architecture of CITTS

At the Figure 9 we see a proposal of TTS-LA architecture of CITTS necessary for supporting CITTS required features. L1, L2, and adapters are necessary in the case of heterogeneous system that is bridging multiple vendors with different implementations of underlying structure of CITTS system.

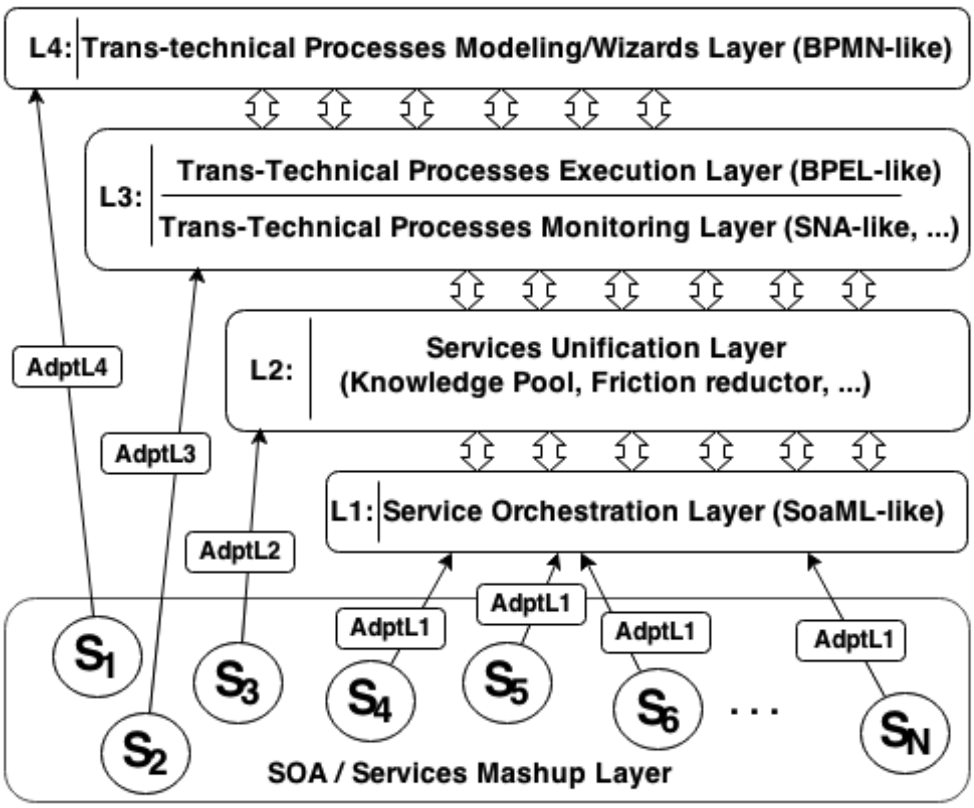

Figure 9: TTA / TTS-LA

TTP Monitoring Layer (L3) in TTA helps capturing user actions inside the system in form similar to Figure 10. This representation is similar to ***UML Communication diagram***[2].

2 http://creately.com/blog/diagrams/uml-diagram-types-examples/#CommDiagram
http://www.uml-diagrams.org/index-examples.html
http://creately.com/examples/UML-Diagrams

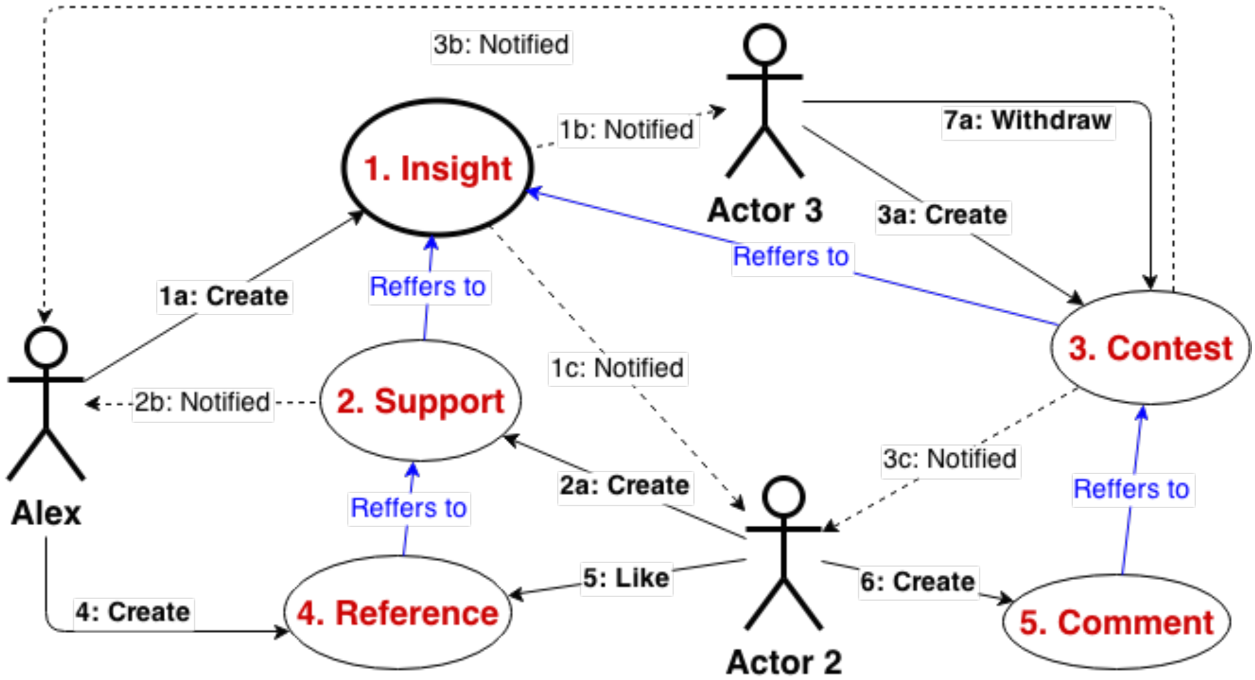

Figure 10: Trans-technical process - insight example

Concrete explanation of the figure 10 we will have in the chapter covering ISSS Insights example after presenting CollaboScience as both collective intelligence example and platform and presenting CharityNet as an example of crowdsourced management and intelligence of crowd.

CollaboScience Platform

We suggest CollaboScience, a platform and a paradigm for practicing collaborative scientific research and dialogue, as a starting point for discussing and negotiating anthropocene governance approaches, leading from collaboration to co-creation/action.

CollaboScience addresses problems of dislocation, by bringing experts distributed both across globe and time. We are providing a set of methodologies and tools that help coordination of dislocated dialogue and mapping it into collective memory and mind. The scientific dialogue will be broadcasted in live (real-time) and available to wide audience for interaction.

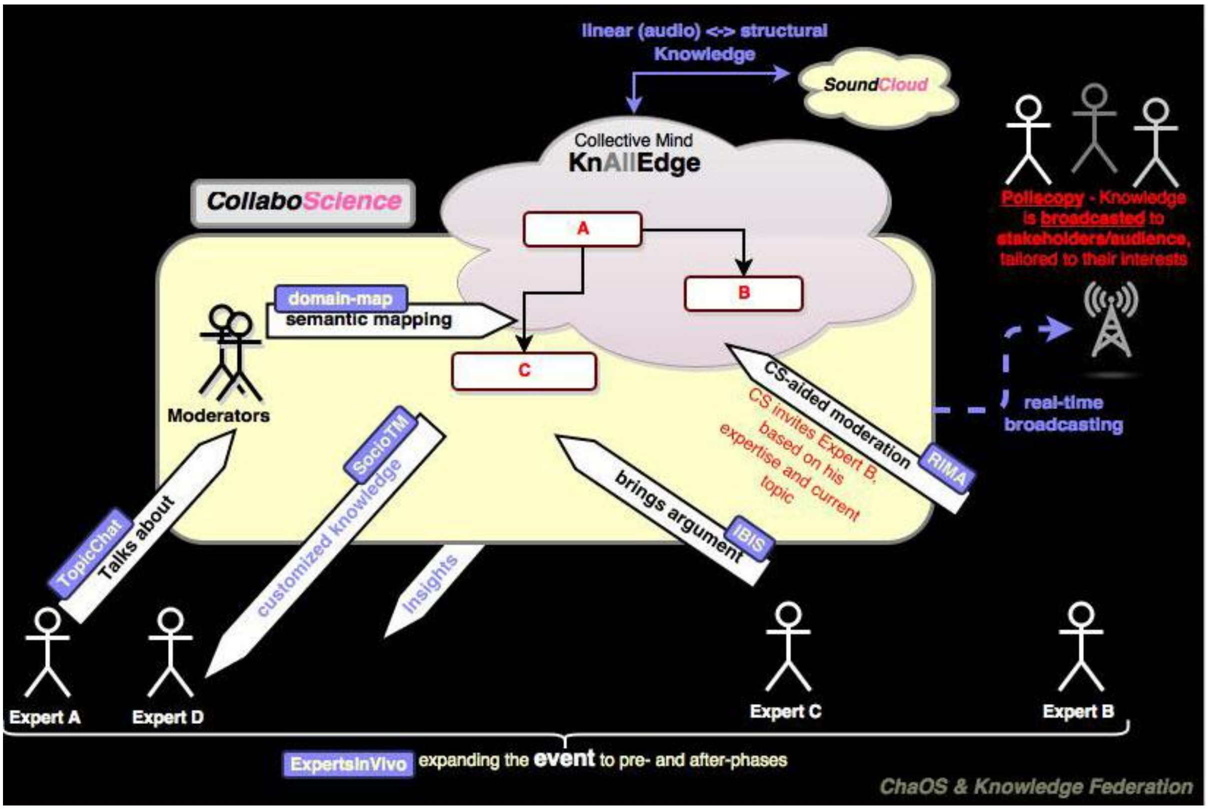

Figure 11. CollaboScience - Diagram

Methodologies

Dislocated Collaborative Dialogue. We address the problem of dislocation - participants being broadly distributed both across space and time. We are providing a set of mechanisms and tools that help coordination of dislocated dialogue

Knowledge Mapping (Collective Memory). Providing Collective Memory through Knowledge mapping is a fundamental prerequisite of any collective dialogue that has a purpose of building common reusable space of understanding

Dialogue Mapping (IBIS). Dialogue has to be both mapped and moderated. Dialogue Mapping is a technique that provides dialogue with robust grammar of rules and actions and it is proven to provide a dialogue convergence.

RIMA - Resource and Interests Mapping App. Enables personalized (interest-based) knowledge perception and activities. Enables dialogue moderations based on participants' expertises

Proactive System - Guiding Healthy Dialogues. Dynamic & Transparent Dialogue - gained through statistics and behavioral monitoring. Keypoint dialogue - provides streamlining and respect to other participants (dialogue tokens).

Toolkit integrated in CollaboScience

- **Collective Mind Framework**: DataTalks, Poliscopy, Collective Mind functions[a]
- **Collective Mind Designer:** an interactive designer for **open-design CI** (Collective Intelligence) systems
- **KnAllEdge:** general knowledge mapping (topics, relations, …), broadcasts knowledge and dialogue

- **RIMA:** enables personalized (interest-based) knowledge perception and activities, enables dialogue moderations based on participants' expertises
- **Domain-map (object)**
- **ExpertsInVivo**: supports 3-phased events concept
- **Value-Matrix (object)**: sustainable and semantic system of values for global entities and actors
- **Socio-TM:** knowledge transformation based on attitude, context, and behavior
- **IBIS:** dialogue-mapping, robust dialogue grammar
- **DebateGraph:** co-located dialogue mapping
- **Insights maker:** transforms knowledge volume into simple insights (community agreed), long-creative leaps
- **Audio conferencing tools**
- **TopicChat**
- **Knalledge <-> Sound Mapping**
- **TopicQuest**

Crowdsourced Management. CharityNet as an example

Our research is focused on increasing of transparency and accountability, through support of distributed and crowdsourced governance. We believe that anthropocene governance should follow this approach. Through serious gaming (playing for good) of these processes, we are aiming to redesign of cultural goals and norms, toward creating a society driven by the care for the others, and to the informed government of anthropocene, in which are included wide, but educated masses, trained through gamified processes and networked according to expertise and interests.

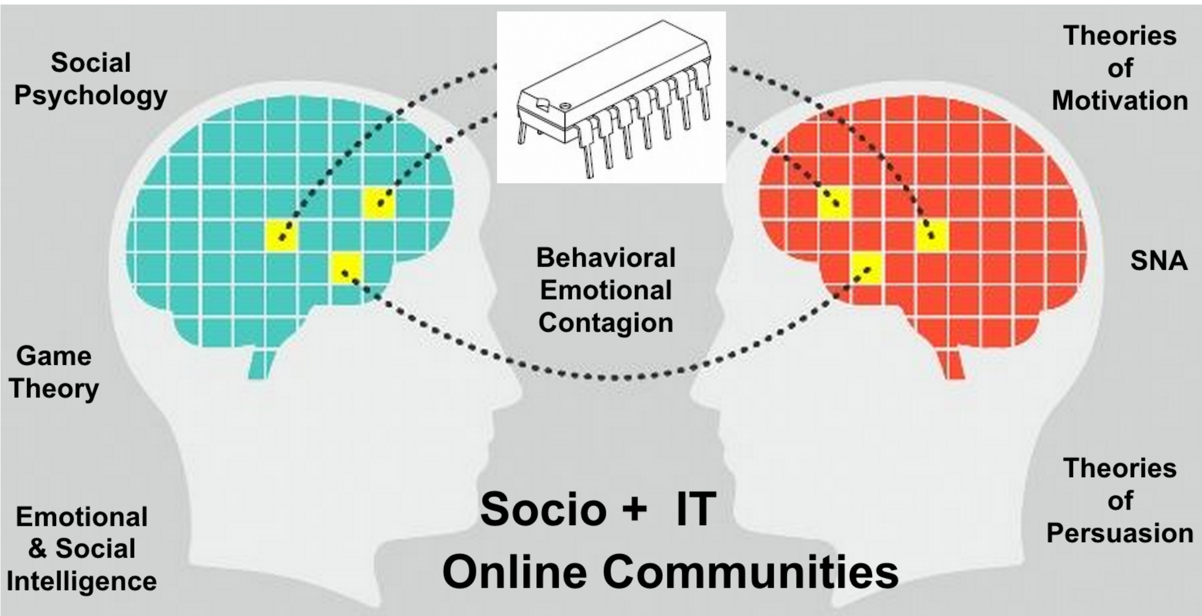

Figure 12: Set of methodologies used in our programming of socio-psychological processes in Online Communities

CharityNet is an example of this approach, supporting de-monopolization - crowdsourced management as a systemic Innovation of humanitarian sector, introducing transparency / accountability, through providing tangible and verified results. Its goal is creating intrinsic motivation for charity actions. It is achieved among others techniques, through building gamified quests around real-world humanitarian challenges, thus increasing consistency and prolonging charity motivation.

The Online Charity Environment Management (which CharityNet represents) design is driven by the the following directions, that we advocate in designing others crowdsourced management systems:

CULTURAL GOALS REDESIGN
Our mission is to work strategically, to change SUCCESS equation from "How great profit I make" to "How compassionate and helpful I am".

SOCIAL MOTIVATION. COLLECTIVE INTELLIGENCE
We focus on three needs that lead to intrinsic motivation: Competence, Autonomy & Relatedness. We recognize the need and the lack of the CONSISTENCY in charity. CharityNet motivates joint solving of charity problems, mutual inspiration, motivation and subtle communal pressure, which produces HABITS! The system will warn us about consequences of our PASSIVITY.

SCAFFOLDING THRESHOLD
The first step is the most important one. We count on "consistency principle". We know that "doing" can be entry-point prior "giving"**.** CharityNet donates first dollar to newcomers to distribute it to a protége.

SIMPLICITY
allowing micropayments and one-click payments. Mobile apps.

TRUST. TANGIBLE RESULTS. TRANSPARENCY
Problem: "People doubt in campaigns and their results"
We spread word through social recommendation instead of selling. We provide direct link to protégés, who paired with VERIFIERS provide concrete tangible actions.

Example of the ISSS system for Insights proposal

The ISSS insights system follows the following scenario:

> *An ISSS community member proposes an **INSIGHT** – something that embodies significant parts of the results and experience of the community, which (most importantly) is likely to be relevant / beneficial to the larger community or other communities of practice. This INSIGHT then becomes an **object / entity in the system**, and is **transformed** through a sequence of **states**, until it reaches either ACCEPTED or REJECTED state (or whatever we'll want to call them).*

Concrete CITTS system implementation highly depends on the specific domain of interest. Through the following ISSS example of CITTS systems for providing insights in the ISSS community we can recognize **INSIGHTS / SUPPORT / CONTEST** data types as relevant to the concrete example of ISSS CITTS system; however even being just an example, it underlines fundamental nature and component of CITTS systems.

The ISSS demo is implemented using **Domain Map** storage, that is on the other hand realized and supported through DataTalks (Figure 13).

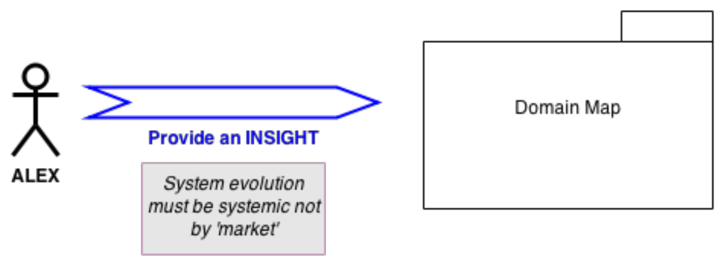

Figure 13: ISSS Domain Map

At the moment, **ideas** (data types) recognized in Domain Map are: ***Insight***, ***Support*** and ***Contest***. At the Figure 14 we see the overview of currently supported ISSS DataTalks ideas. In the following lines we will elaborate on DataTalks architecture. DataTalks supports describing ideas (data types), idea instances values changes, and relation with other ideas.

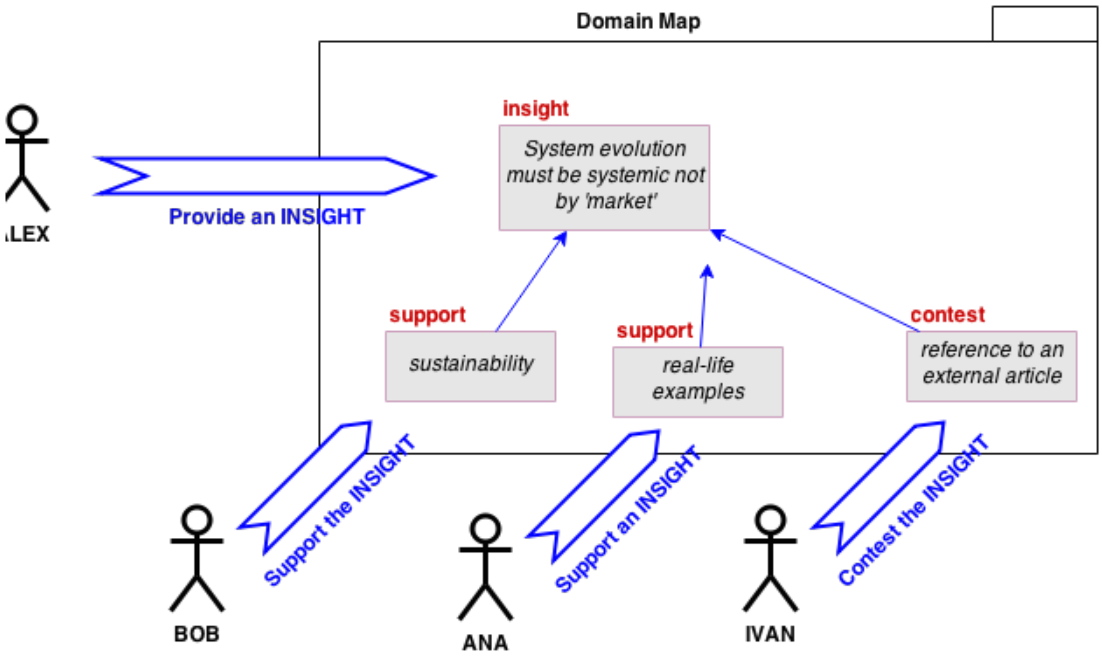

Figure 14: ISSS DataTalks ideas with scenario

How does CITTS change?

Here we are looking for a way in which the CITTS can <u>**evolve** further</u>, either through **interventions** of the user community alone, or through **collaboration** (through a suitable ***transdiscipline***) of a larger community, which naturally includes the techies / developers.

Figure 15-17 present changes in system that support continuous system sustainability which is the main nature of CITTS system.

Diagram that is equivalent to UML Communication diagram is ***UML Activity diagram*** which is similar to BPMN-like diagrams presented at Figure 15-17.

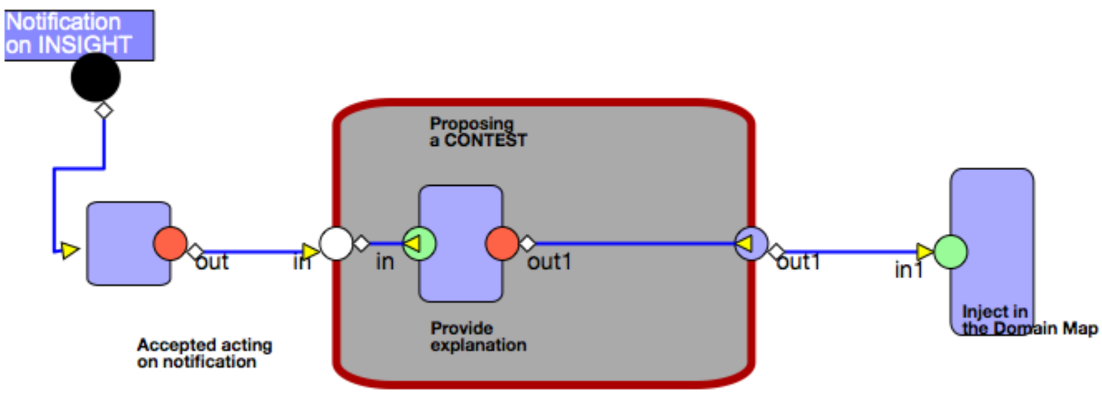

Figure 15: 0th approximation of ***Proposing a CONTEST TTPt***

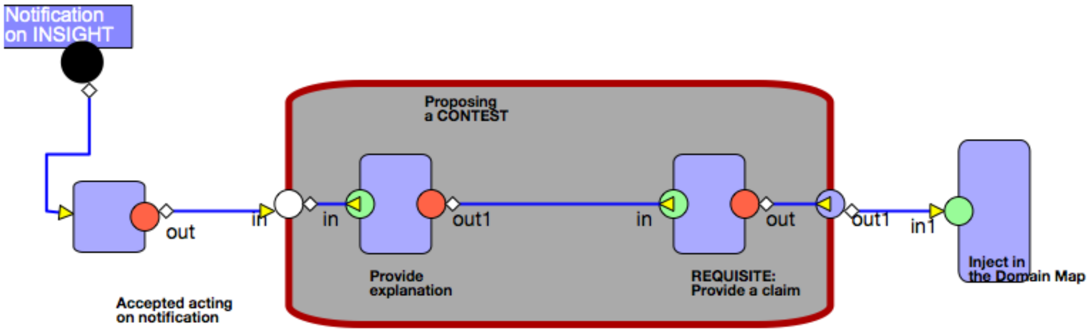

Figure 16: 1st approximation (alternative 0) of ***Proposing a CONTEST TTPt***

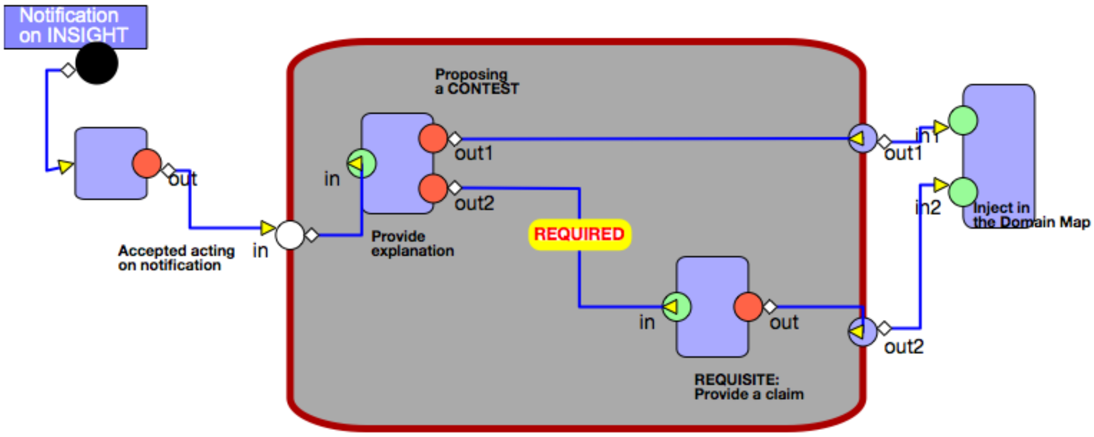

Figure 17: 2nd approximation (alternative 1) of ***Proposing a CONTEST TTPt***

Conclusion

The previous examples elaborate need and propose solution for collaborative dialog of system behaviors and mechanisms of collectively intelligent systems.

Patterns presented on figures 15-17 are evolutional steps and branches of trans-technical patterns governing complex system behavior. System community members are capable of maintaining dialog related to the each part of pattern which will eventually end-up with consensus and pattern changes, but it also can end up with pattern branching.

Pattern branching is absolutely regular evolution of patterns and represents either multiple opinions (lack of agreement) in the community or members-categories personalization. Both sources of branching are fundamentally important in sustainable evolution of systems, but also for adjusting system to particular scenarios and actats which leads to more efficient system value production.

We have presented the system systanability-feedback loop that is cappable of detecting issues with fundamental system values and mechanisms how domain-experts can identify positive and negative trans-technical patterns and approaches for adaptive systems to response to system-changes and challenges and how emerge to the next sustainable “equilibrium”.