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New Instruments of Governance for our Societies

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Abstract— In this paper we argue for ICT technologies to play a more prominent role in supporting the governance of our society. The Internet together with Web2.0 technologies such as social media have enabled a shift of power towards individuals in recent years, making governance of our societies increasingly difficult with our outdated government structures. We explore the vision of how a pervasively deployed Internet of Things together with recent advances in social signal processing and persuasive technologies can enable new ways of decentralized governance. We propose new principles for the operation of future ICT devices in order to support our vision and outline how emerging technologies can contribute towards the achievement of it. While doing so, we highlight key technological and societal challenges that need to be overcome.

Keywords: *Internet of Things; Persuasive technology; Societal mediation; Governance; User behavior; Decision making*

“The fact is that our social future will be determined by the human qualities of the activities being mediated through hundreds of millions of programmed devices, and by our ability consciously to resonate with and thereby to recognize these qualities.” - Steve Talbott (2003)

I. INTRODUCTION

The Internet and Web2.0 revolution have brought disruptive change to many areas of our lives. Emerging tools such as social media platforms or one-to-many communication infrastructures have proven powerful tools to reach and influence large audiences across national boundaries.

People are slowly beginning to understand how to use and exploit these tools for defending their own interests in positive ways - bringing more cohesion and local solidarity to communities - or to use them for their own ideological crusades.

The disruptive changes that these tools can bring and their impact on societies have been already demonstrated in the recent years. Examples are the Riots in London or the recent uprisings in Egypt or Tunisia that have been coordinated and fueled by social media tools. These tools have brought an abrupt unprecedented shift of power to the people away from existing governments.

In contrast our current governance structures have been installed in the post-war era and since have only undergone incremental change. The only responses so far to the opportunities and dangers of the Web2.0 age from our

governing bodies have been e-Government initiatives with the goal to offer an increased portfolio of public services to citizens in an efficient and cost effective manner.

At the same time, there is an increasing gap in expectations from the people and the actions of their governments, which has become clear to even the staunchest defenders of the status quo. Local governance structures seem to diminish in importance. Large groups of people feel they are held hostage by world politics big enterprises and banks. They increasingly realize they have no agency over how roughly half the money they pay in taxes is spent. There is a growing frustration of people about the indifference of governments to local problems and the lack of local impact their taxes deliver on their everyday lives, services and investments in infrastructure.

One of the major challenges each decision making system is thus faced with is a refusal of people to act according to the regulations of a society. Such behavior can lead to severe disruptions of societal functioning and disintegrate its underlying socio-economic fabric. Law enforcement currently plays a critical role in ensuring compliance to laws and societal regulations. However the current structures face significant difficulties if such disruptive behavior is coordinated at scale, e.g. by the help of modern social media tools or modern communication technology. The growing feeling that the current system is unfair, unjust and not in the interest of ordinary citizens is no longer confined to Occupy London, Wikileaks and the Indignations.

With the state of affairs around the world becoming increasingly volatile and pressures on existing governance structures mounting, we argue that the disruptive change and the imbalance of power brought by the globalization, the Internet and Web2.0 can only be adequately overcome by a radical rethink of our own governance structures and tools to realize them.

We argue that current governance structures must transform into semi-organized networks with flat and efficient properties. In doing so they must embrace disruptive technologies such as the Internet of Things. Next generation of pervasive ICT devices can play a unique role in stabilizing and balancing new societal structures, by disambiguating the productive functions to slow down, to mediate, to look for balance in long term, mid and short term of bureaucracy and democratic politics from their current actualizations that have become ineffective in a 'real-time' world.

Our contribution presented in this paper is not the creation of something entirely novel nor do we claim the concepts presented here have never been thought of. In fact various thinkers that we cite have provided the seeds for the vision we present. Instead it is the analysis of recent societal and technology trends and combination of those into a vision for the evolution of the Internet of Things, which we hope will once become useful for the further development of our society.

II. EXPLORING THE OPPORTUNITY

Let us imagine a global decentralized network of networks in which we embed the costs of Climate Change, animal and plant protection, evenly distributed food and other basic services for humans, and that being that. Between everyday praxis and global governance citizens pay in micro currencies (of different kinds of bartering) for real services, as well as a flat generic fee whenever starting up applications on a connected device. Infrastructure can be crowd-sourced and crowd-funded this way and since all actions and transactions are in the Cloud somewhere it does not help to try to not pay that ten cents for a bit of light on that dark road home.

Most centralized governance structures of today will then be replaced by every-days ICT devices that are able to participate in a societal mediation process. Globally networked and pervasively deployed, they will embed deeply into them the regulations and values of our society. They will be able to observe our behavior and adapt their behavior accordingly in order to influence our compliance to the regulations they embed. Every 5 years – or whenever appropriate - the new generations get to vote on the slider structure setting the generic fee and regulations; a bit more for this, a bit for that. The settings can be tuned at regular intervals based on evaluation outcomes from empirically evidence.

We believe that our thinking is not far from reality. At a speech to the Pittsburgh Technology Council in 2009, Eric Schmidt focused on the negative effects on innovation and integration of (what he called) institutional fragmentation and wondered if governments - and the very process of policy and policymaking itself - could not benefit from the iterative cycles of measuring success and failure that characterize the engineering and design prototyping cycles. With this amount of real-time tracking and aggregated data and information and not heuristics, governing itself could. Particular laws can be effective for three months and evaluated, adjusted and on the basis of real data - "not estimates" adjusted again. It is this process that can lead to combinatorial innovation and system innovation [1][1].

Gérald Santucci, Head of Unit "Enterprise Networking and RFID" at European Commission, confronts Internet of Things (IoT) as a fullfledged reality with full connectivity on all layers and works back from that situation to the current political, economic and socio- cultural and psychological realities [2]:

"The Internet of Things is heralding not only a new technological paradigm but also the dawn of a new societal paradigm as new forms of collaboration among people and things will profoundly change the way the economy and the society operate. For the economy, the Internet of Things will bring a disruption - only companies that are able to exploit this

new potential will survive. For the society, it will impose a new "social contract", not only among humans but also among people and objects. And new challenges will surely emerge, in particular ethics - what is the place of humans in a 'new society' where 'thinking objects' dominate and gradually conquer their autonomy?"

A. Scenario

Sal awakens: she smells coffee. A few minutes ago her alarm clock, alerted by her restless rolling before waking, had quietly asked "coffee?" and she had mumbled "yes." "Yes", "no" and 'Cappuccino' are the only words it knows.

In the early days of Internet of Things, way back in the nineties when it did not have a real name yet her dad had once told her that it only knew "yes" and "no". She could not imagine life without the Cappuccino option.

'Oh Sally, don't you cry. Oh Sally, don't you cry. A man is a man, does the best he can. Oh Sally, don't you cry.'" Unbelievable she thought, "Sweet Sally sail on by". Her favorite song! On the hyperlocal news channel she always woke to. Always handy to know if a neighbor needed a hand, or if someone had out loaned a power drill or two. It had been her dad's favorite too. In a way, she thought, he had given her life, after dying himself way too early, long before seeing his vision come true. Then it hit her. Planned serendipity, off course! Smiling now, she realized she always fell for this. How easy she forgot that her house and all its things played alongside her in the theater of everyday life.

She had consciously set her hyperlocal news wider then her team city gossip channel. Team City, that was how Europe was called now. She liked it. Everybody could feel like a player and the best thing was , they all had the same coach, Coach, all five hundred million of them. It had been a gradual process. The first coach that was introduced was the Privacy Coach. It was the first app that all EU citizens had had to install on their new EU ID, a foldable screen tablet that outblinded the Iphone 8 and positively zipped any Microsoft tool. It was a barter system, ID, phone, game computer all in one and the cool thing was that it recognized any member of your team within a ten kilometer radius. It also held NFC. You were asked to set your privacies settings tuned to a series of activities, services and products. The product list seemed never to end, but as most people buy 90% the same every week, after setting that once, it was basically set for years. You held your EUID to anything you wanted to lease no one bought anything anymore, so nineties!) and it told you if that matched with your settings. Then she remembered the next thing had been the Safety Coach, Security Coach and Ambient Coach, all non optional.

The Cappuccino was good. The moment she had finished dressing, the window that had been opaque became a huge map indicating the whereabouts of her team. All of them basically worked whenever they wanted to on fine-tuning the most optimal conditions for human dolphin conversation. She remembered how the team was put together. It had been quite awkward. She had been turned inside out. No stone left unturned. She had felt naked throughout. Vulnerable, scared. No doubt everybody felt that way. Later it occurred to her that this had happened not only to her team, but to everybody in the

Union, literally everybody. It felt like being broken and being put together again with the help of likeminded people, animals, plants and things. Each of these occupied an equal place in any team in Team City.

Oh how awful it had been when all their bank accounts, assets, and wealth had been put into one large team account overnight. For some this resembled the works of the early Christians who owned one house and some things, but sold all surplus in order to set up funds for the group. Others thought it was positively communist and creepy. And this sharing energy bundles, awful. If Ted in Edinburgh installed three new lamps, someone had to dim one. Or Ted had to barter something off course. Well, he was awfully good at cooking vindaloos, hmm..

III. CLOSING THE LOOP BETWEEN HUMAN AND MACHINES

In this section we provide initial arguments for the feasibility of our hypothesis that emerging ICT technologies could become useful instruments for governance of our society. We reflect upon the fact that our increasing dependency and reliance on technology can be exploited to influence and shape human (social) behavior. We propose two principles of technology behavior for the design of future ICT devices, in order to support our paradigm shift and introduce a possible model to enable ICT supported social mediation processes. By identifying emerging technology trends and discussing how they can support this vision, we prove in principle the feasibility of our ideas.

A. Human technology dependency

The technological development of the past decades has transformed the way of human life, bringing great convenience and unimaginable opportunities to every aspect of it. Many, if not all of our daily activities rely on technology of some form or another. We wake up by our alarm clocks, use heating systems and air conditioning for an appropriate shower and ambient experience. Our meals and food supplies depend on a variety of kitchen equipment – not to mention the machinery required in the food processing industry. Our cars, buses and trains that bring us to work are full of technology, so are the offices and factories in which we are working. Most financial transactions require technology, our evening and weekend entertainment would appear empty without it. Instant communication over distance would still be a dream.

Our society expects technology to work and we experience great inconvenience if this is not the case. Some harmless examples are empty car or mobile phone batteries, broken elevators, hard-drive failures or problems with the Internet connection. More severe cases of technology failure can lead to significant damage to entire economies or the loss of life.

In today's world such incidents are luckily exceptions as great effort is spent by manufacturers our economies and governments to ensure high reliability of technology and the service provided through them to our society. However the discussion above shows how dependent our modern society and its individuals are on technology.

B. Reconsidering the principles of technology behavior

Many of us believe that it is a basic human right to have technology working as expected – as long as we have paid for it and in many cases even if we haven't. This assumption is a fundamental pillar of our consumer society and enforced by a meanwhile very complex body of legislation.

While we do not disagree with such expectation, we believe that new principles are required, in order to modulate such expectations based on our own behavior towards the society in which we live in.

In the following we propose two principles that should govern the operation of next generations of ICT devices. These principles will serve as foundation to enable our envisioned ICT enabled societal mediation processes.

Principle 1: *Technology around us only continues to work as expected if we behave as expected.*

We still believe that the expectation of technology to “work as expected” is a valid and appropriate basic consumer right. However this right may be revoked if a person knowingly violates rules and regulation, implying that these rules and regulations must be well communicated. The principle above does not undermine consumer rights; it only defines certain boundaries in which these rights are appropriate.

A proper implementation of this principle has the potential to positively influence behavior of humans in our society and to provide more efficient ways of governance. In the following a few motivating examples are provided:

- Would you fail to pay your speeding or parking ticket, if your car decides to stop working?
- Would you commit an offense such as bribery or theft if all your assets become frozen?
- Would you lie or cheat others if all your entertainment and communication devices decide to limit their service availability, leaving you in increased boredom and isolation?
- Would you continue tax fraud if your boiler decides your time for hot showers is suddenly over?

It is clear that this principle leaves plenty of room for discussion and interpretation. On one side it needs to be decided what “expected behavior” will be considered. On the other side the technology response has to be appropriate to the “unexpected behavior”. The questions raised above however clearly demonstrate the potential that even simple binary decision such as “work” or “don't work” of today's technological artifacts could have on our choice of actions towards compliance to existing regulations. This power of devices to influence our current and future behavior represents an underexploited opportunity and calls for a stronger role of ICT devices to participate in our day-to-day societal mediation processes.

Principle 2: *Each ICT device should assume an active role in the societal mediation process, by adapting their behavior towards a user based on a user's compliance to regulations.*

Social mediation is often described as a process or means “to create or restore the social fabric by preventing or resolving conflicts through the intervention of a neutral and independent third party [who guarantees communication between partners]”.

Adapting this definition, we can define in our context *societal mediation* to be the process or means to create or restore the social fabric by preventing or resolving conflicts with *societal regulations* through the intervention of a neutral and independent third party.

ICT devices are ideally suited to assume the role for “neutral and independent third party”, however this requires a paradigm shift in the current operation.

Currently ICT devices are agnostic to social actions of their users. They assume a passive role and typically perform as expected. Any non-expected behavior is either accidental, e.g. bug or failure or malicious (by manipulation e.g. virus).

Our second principle provides further guidance for the first one. It advocates for devices to assume an active role in the societal mediation process and to adapt their behavior towards the behavior of a human. Furthermore, devices make the decision of adapting their behavior autonomously or in concertation with each other based on a user’s compliance to societal regulations they are able to observe. Alternatively they can assist in implementing decisions that have made by an external decision/observation process.

These qualities have been implicit in pervasive computing, ubicomp, calm computing and IoT as it posits its own disappearance as visible technology as a prerequisite for its success. In IoT computational process no longer only link up data sets but real life information linked to human interaction. Objects, people, situations and interactions all become 'information spaces'. What it means to be 'human' itself becomes subject to change. If we do not investigate the possibility that IoT generates authentically new situations and experiences, then we will miss out on this unique opportunity to balance the best of human solidarity and creativity with the best of connected computing support.

C. ICT supported social mediation

We see the future world as a techno-social eco-system in which humans, animals, plants and man-made artifacts (software, machines and technology) co-exist in fruitful symbioses and embrace the confluence of each other. ICT supported societal mediation represents the key to keep our societies at the point of equilibrium. It is achieved by carefully coordinated interventions and behavior adaptation of ICT devices based on human behavior that is evaluated against societal regulations deeply encoded into those.

For ICT devices there are several requirements to contribute to the above vision:

- They must be able to observe and recognize human social behavior and actions.
- They must be able to evaluate recognized behavior against encoded societal regulations and make a decision whether societal mediation is required.

- They must be able to execute an appropriate mediation processes by adapting their behavior towards humans.

In the following we discuss each of the above requirements in more detail and argue that existing research already provides partial answers for the fulfillment of those. We believe that combining advances in these technological areas will enable us to close the currently disconnected feedback loop between humans and machines.

1) Machine understanding of human behavior

Machine understanding of human behavior refers to the ability of an ICT device to recognize the expressed behavior of a human or a group of humans and to interpret this behavior in the context in which it has been expressed. It goes beyond mere activity recognition to also include other human traits such as social interactions between humans, humans and machines and expressed emotions and affect. Interpretation of the recognised behavior requires a thorough understanding of the holistic context in which it was been expressed. This includes environmental context and situation as well as the social context of a human [3].

Activity recognition itself has been a rich area of research in the pervasive research community in the recent years. Much of the work is based on the use of machine learning techniques to classify a human’s performed activity based on data stream from captured from wearable and environmental sensors subsequently extracted features [4]. Recent advances in social signal processing [5] represent important enablers for the understanding of a human’s social behavior and context by providing the ability to sense and understand human social signals. Combined with an understanding of the surrounding context of a user, a holistic understand of human behavior can be built [6].

While the algorithms for machine understanding of human behavior are maturing, our vision requires observation capabilities to be ubiquitous to work. Already today every smart phone provides enough observational capabilities for its users to enable longitudinal studies of human behavior [7] (see also the Quantified Self movement). As these devices blend and combine their information flows with those from interconnected sensors and identification technologies in our homes and cities inside the melting pot of the Internet of Things, pervasive observation of human behavior will soon become a reality.

2) Persuasive technologies

Closing the feedback loop requires for machines an effective way of influencing humans. A societal mediation process can only be effective, if a desired behavior is achieved as result of action(s) initiated by the process. One of the key challenges is to select the right intervention for a particular situation for which a mediation process has been triggered and the individual(s) involved in it.

Answers provide the research by human computer interaction (HCI) community which has long focused on exploring effective ways of computer to human communication and vice versa.

Of particular importance for the fulfillment of our vision represents Captology [8] an emerging discipline of HCI that looks at how people are motivated or persuaded when interacting with computing devices, rather than through them. Captology stands for “Computers as persuasive technology” and focuses on the design, research and analysis of interactive computing products created for the purpose of changing people’s attitude and behavior. Persuasion is defined as an attempt to change attitudes, behavior of both without the use of coercion or deception.

Persuasive technology has found their ways into many of today’s ICT products, ranging from fitness and lifestyle aids over to computer games and slot machines. Other examples are emerging eco-feedback systems [9] that aim at influencing users towards a more sustainable behavior.

There are various roles an ICT device can assume with respect to the process of persuasion, each providing various techniques and strategies for desired behavior change with respect to certain situations [10]. Several potential examples of how they could be applied by ICT devices to support societal mediation have been described in section II.D.

Here we expand upon it to provide more examples of behavioral adaptations ICT devices could perform, in order to positively influence the compliance to a particular societal regulation. It is important to note that there is significant research necessary to evaluate the effectiveness of these actions depending on a large variety of social situations. Borrowing from a large repertoire of persuasive technology strategies [8], our goal here is just to provide a few plausible cases as starting points for further exploration by the community.

Positive reinforcement: ICT devices can encourage positive behavior of their user by rewarding them with praise, or providing them with extended services, e.g. discounts, or additional service features, e.g. add-ons, better quality etc.

Suggestions and warnings: As a softer form of influence, ICT devices can provide their users or people in their surroundings with immediate feedback in the form of suggestions and warnings should they become aware of behavior violating regulations of a society.

Limitation of service: A more intervening action an ICT can decide to limit its service availability towards its user. For example a laptop can restrict access to that data it contains temporarily to its user, the broadband access router may decide to limit temporarily the data traffic or a user’s mobile phone may decide to only provide its user with 5mins talking time a day and emergency calls until inappropriate behavior of a user is rectified.

Refusal of service: An even stronger form of enforcing compliance to social regulation is the complete refusal of service of an ICT device. This revocation of usage rights can be upheld temporarily until a user reverts to a socially acceptable behavior or be imposed for longer periods of time as a penalty for inadequate actions.

Controlled information exposure: ICT devices can also utilize ways of social influence such as normative influence and social comparison by deliberately exposing information

about user’s wrong-doing, for example through automatic publication of such incidents on the web. Such name-and-shame can be sometimes effective, in order to prevent anti-social behavior from re-occurring.

The variety of possible situation and the diversity of human nature make it difficult to identify the right strategy and response for a particular occurrence of a societal mediation process. However as the body of insights and underlying networked databases grow by further research advances in this field, it is only a matter of time until most mediation instances can be appropriately handled.

3) *Encoding societal regulations*

Mireille Hildebrandt [11] states that "we may need to develop an Ambient Law that is embodied in the algorithms and human machine interfaces that support Aml and for this we will have to break through our paralysis, ready to become literate in terms of a new script."

Our assumption is that laws and regulations of a society can be translated into a light set of programmable rules that will be deployed on the networked ICT device infrastructure surrounding us. Each ICT device will have procedures deeply embedded, (e.g. in a unified operating system for a society) that trigger the evaluation of observed behavior against these rules. Evaluation of these can be either completely distributed or centralized. These rules will be updated at regular intervals based on feedback from empirical evaluations and majority vote of people of a society. It can be envisaged that certain organized networks or societies would opt for strong centralization and others for strong local decision-making.

To our knowledge there is not much research on embedding rules and societal regulations in the technology fabric around us. Technological challenges are the encoding and verification of such rules, the societal scale on which a distributed evaluation will have to take place as well as the reliability of the decision making processes behind it. Social acceptance is another challenge, however, may be helped through the uptake of ICT devices: If you own a TomTom to go from A to B, probably some routes are slightly influenced by deals with Texaco or Lukoil or some other petrol station company. Most end users are not aware and even, if they would be -would not stop using these services.

IV. KEY SOCIETAL AND TECHNICAL CHALLENGES

Throughout our previous discussion we have raised various technological gaps and societal challenges that need to be tackled to make our vision a reality. In the following we summarize then and add a few more important considerations.

- How can we achieve a machine perception of human behavior in all its facets across smart environments with heterogeneous observational and computational capabilities?
- What are effective behavioral feedback mechanisms for enforcing the compliance of behavior according to regulations that are considered ethical by our societies?
- How can we scale behavioral feedback systems from smart rooms and houses to an entire society?

- How can we enable efficient distributed evaluation of behavior according to social regulations in the technology fabric around us?
- Who observes the observers?
- How do we transition from now to this vision? Which ICT devices should be considered first for an “upgrade” and which ones will follow next?
- Can technology be a positive 'solution' when it is seen as the driver of disruption?
- Can system failure be prevented without a revolution, breakdown and bloodshed?
- Can citizens be educated into breaking down their notion of autonomy, privacy and security into autonomies, privacies and securities?
- How can accidental actions be differentiated from intentional actions to avoid prejudgment by the ICT fabric?
- Can government be educated to dismantle themselves into semi-organized networks with flat and efficient properties?

V. ISSUES OF ACCEPTANCE

Common sense seems to contradict our assumptions that citizens can be educated into breaking down their notion of autonomy, privacy and security into autonomies, privacies and securities, governments can be educated to dismantle themselves into semi-organized networks with flat and efficient properties, and industry to rethink their business models. Common sense, however, also shows us throughout history that changes in data information models (print, radio, tv, web) have been disruptive to the extent of revolutions breaking down both the good and efficient in the old systems. Will people keep paying taxes to a system that does not deliver the services they want and expect? Isn't it likely that they will organize in smart cities that are more like gated communities, the fastest rising form of building already now in the USA? If as we believe solidarity in generic infrastructure is the key issue, then the question of desirability needs to be reframed in terms of urgency. How much time do we have left before our current forms of organization break under the weight of growing self-organization capabilities? And how do we salvage the strengths of that system: inclusiveness, generic infrastructure, short term vs long term planning? While there are certainly plenty issues of acceptance, we believe that our proposal opens up a framework for debating this.

VI. CONCLUSIONS

We believe Mark Weiser was not entirely honest when he wrote: “My colleagues and I at PARC believe that what we call ubiquitous computing will gradually emerge as the dominant mode of computer access over the next twenty years. Like the personal computer, ubiquitous computing will enable nothing fundamentally new, but by making everything faster and easier to do, with less strain and mental gymnastics, it will transform what is apparently possible.” [12] He probably wanted to soften the blow, as it is becoming very clear that Internet of Things/ubiquitous/ambient intelligence does enable something

fundamentally new: a new ontology between humans, machines and evolving algorithms.

Mark Weiser was able to mentally remove connectivity and functionality from the actual hardware. He pictured 'smartness' as a quality of objects and the environment as he realized the productive limits between human and computer interaction had been reached. We are able to mentally remove the same qualities from the actual hardware that makes up our society as a whole. We picture 'smartness' as the highest level of quality of the relationship that fuels the agency of humans and the agency of an IoT. His vision caught wildfire. In under 20 years it has become the dominant paradigm, as he predicted. We are confident that our vision will become reality in less.

"A new, physically uncompromised, metaphysical initiative of unbiased integrity could unify the world. It could and probably will be provided by the utterly impersonal problem solutions of the computers. Only to their superhuman range of calculative capabilities can and may all political, scientific, and religious leaders face-savingly acquiesce. [13]

R. Buckminster Fuller (1969)

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