COMMENTARY

The Futurium—a Foresight Platform for Evidence-Based and Participatory Policymaking

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Abstract This paper presents the *Futurium* platform used by Digital Futures, a foresight project launched by the European Commission's Directorate General for Communications Networks, Content and Technology (DG CONNECT). Futurium was initially developed with the primary purpose of hosting and curating visions and policy ideas generated by Digital Futures (Digital Futures was launched in July 2011 by DG CONNECT's Director General Robert Madelin following a prior DG CONNECT exercise called Digital Science.). However, it has turned into a platform on which to experiment with new policymaking models based on scientific evidence and stakeholder participation, referred to in this paper as 'Policy Making 3.0'. The platform hosts an online foresight toolkit to facilitate the joint creation of ideas to help design future policies. It leverages the potential of social networks, open data, semantic and knowledge mining technologies as well as participatory brainstorming techniques to engage stakeholders and harness their views and creativity to better inform policies that matter to them. The Futurium distinguishes between different variables, reflecting the emotional vs. rational mindsets of the participants, and offers the possibility to frame the engagement and co-creation process into multiple phases of a workflow. Futurium was developed to support Digital Futures, but its open architecture makes it easily adaptable to any policymaking/decision-making context where thinking ahead, participation, scientific evidence and agility are needed. Futurium is an early prototype implementation of the Policy Making 3.0 model, which is a long-term vision requiring further investigation and experimentation. The Futurium production website can be seen here: ec.europa.eu/digital-agenda/futurium.

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1 Rationale

Nowadays, public policies need to be continuously reviewed and adapted to deal with unforeseen issues or to react to emergency situations such as coping with the consequences of the on-going systemic crisis. Rapidly evolving socio-political contexts exert influence on policymakers who have to take decisions more quickly and accurately than in the past.

Very often, they have no other choice but to react to emergencies. The austerity measures put in place by several governments and businesses to prevent financial bailouts are typical examples of policies introduced to face up to potential risks.

There is a growing need to improve forward thinking in policymaking practices. New policies are often thought up on the basis of current trends rather than by capturing future opportunities offered, for instance, by long-term advances in science and technology.

The need to focus on short-term measures often prevents governments and businesses from orientating their policy choices towards future possibilities, partly because they have been elected to come up with tangible responses to current challenges that matter to citizens and partly because long-term investment decisions may be too risky. This may make it difficult to put in place sustainable solutions to structural problems.

How can these shortcomings in current policymaking be overcome?

The challenges can be articulated along two main axes, highlighting typical tensions between different policymaking mindsets:

1. Evidence about the status of the real world vs. inspiration from longer-term thinking
2. Delegated leadership vs. participatory leadership

1.1 Evidence vs. Futures

Our current ability to gain insight into the status of the real world (individuals, society, economy, environment, etc.) makes it possible to inform policy decisions more successfully than in the past. Smart infrastructure and the internet enable to monitor the impact of policies more rapidly and to produce more accurate projections and forecasts (e.g. through simulation). However, the opportunity to use information and communication technology (ICT) to gather and share instantaneous real world data (e.g. open data) from which knowledge can be extracted is still largely untapped. The future spread of the 'Internet of Things' as the real world superconnector and the emergence of 'big data' are even more promising avenues to be explored[1].

Although accuracy can be improved significantly through better use of ICT, relying only on understanding current trends and short-term forecasts may turn out to be limiting. Looking for the unexpected, detecting 'weak signals' and exploring alternative paths offered by progress in science and technology may help us to see challenges and opportunities earlier, thus broadening and improving the strategic base of policymaking.

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[1] See, for instance, the FuturICT initiative: www.futurict.eu.

The use of normative foresight methodologies[2] to embed anticipatory thinking, beyond incremental improvements in current policies, is also needed to make policymaking more future proof. A better trade-off between incremental and normative methods is illustrated in Fig. 1.

1.2 Representative vs. Participatory Leadership

The advent of social networks has opened up new prospects for policymaking. They give a voice to everyone and allow people to organise themselves into groups and ultimately contribute to policy debates at local, national and international levels.

Today, in principle, citizens could be empowered to co-decide on issues that matter to them by transposing well-established direct democracy tools such as referenda into the virtual space. Recently, new forms of 'liquid democracy' have also been debated and explored by movements and parties[3]. People have been coming up with foundational tools and technologies supporting new forms of e-Democracy since the late 1990s. There is, however, still a long way to go due, for instance, to the unresolved issues of trust in and the security of the underlying IT infrastructures as well as identity management. Another challenge is the fact that e-Democracy tools are now widely available and have not been taken up by all citizens.

Social media can, however, still be used to improve the links between policymakers and stakeholders to take a more participatory approach to the design of future policies. Brainstorming and engagement techniques such as 'the art of participatory leadership'[4], traditionally used in in-person workshops, could be transposed into the virtual space to engage (potentially) all citizens in policymaking. This would be hugely advantageous in terms of the wealth of ideas generated and the legitimacy of the process.

In the near future, the success of governments could depend on their ability to enable their constituencies to 'influence' policy decisions, i.e. by empowering stakeholders (including citizens) to co-create ideas to provide better grounds for the decisions that matter to them. Managing participation, co-creation and the emergence of a form of collective intelligence could therefore become essential to future democratic governments.
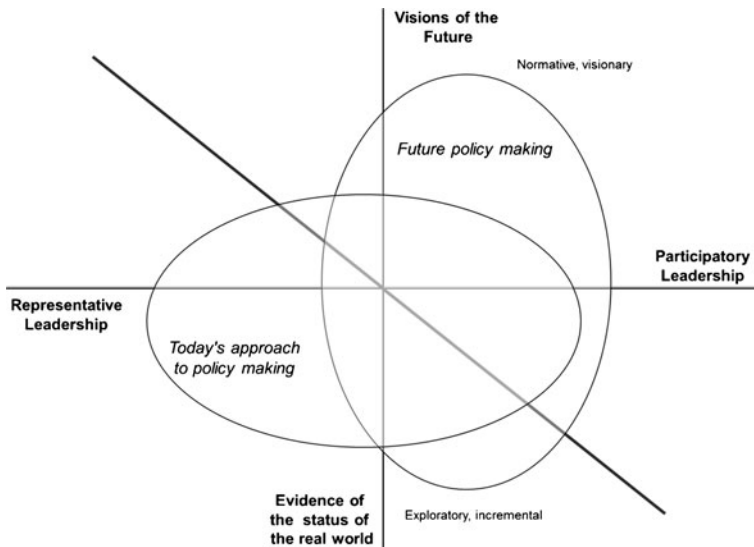
2 Policy Making 3.0

Policy Making 3.0 is a participatory and evidence-based model designed to provide an answer to the above challenges. It is based on the metaphor of a 'collective brain' (or emerging collective intelligence) according to which stakeholders and policymakers form a social network to co-design policies on the basis of two distinct factors:

- The scientific evidence stemming from the *collective wisdom* of stakeholders and policymakers. This is the collective and rational contribution of the participants to

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[2] http://forlearn.jrc.ec.europa.eu/guide/4_methodology/meth_explo-norma.htm
[3] http://bjsonline.org/2011/12/understanding-the-occupy-movement-perspectives-from-the-social-sciences
[4] http://www.artofhosting.org/home/

**Fig. 1** Characterisation of policymaking models

the policy (the 'left hemisphere' of the social network's brain). Evidence is often elicited from data from and numerical models of the real world (e.g. statistics, data mining etc.).

- The visions resulting from the *collective aspirations* of stakeholders and policy makers, which are measurable through the social network. This can be considered as the 'emotional and imaginative' contribution of the participants to the policy (the 'right hemisphere' of the social network's brain).[5]

Figure 2 captures the essential elements of the Policy Making 3.0 process:

1. The implementation of policies co-developed by policymakers and stakeholders has an impact on the real world (individuals, society, economy, environment etc.).
2. The real world is monitored and data are gathered, measured and analysed through knowledge mining and statistical tools, which makes it possible to identify trends, issues and challenges and to elicit scientific evidence.
3. The scientific evidence provides information which stakeholders and policymakers can use to reshape policies.
4. Stakeholders and policymakers interact in social networks where other factors rather than evidence emerge, such as personal opinions, corporate interests, lobbying, ideological values and other 'non-measurable' factors (i.e. that cannot

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[5] It must be stressed that the idea of spelling out the 'rational' and 'emotional' intelligence of participants and aggregating them in a linear way is a deliberate simplification done only with the purpose of explaining the model rather than applying reductionism. More comprehensive and accurate approaches to map mindsets could be explored in possible follow-up studies. Furthermore, the links to prior research endeavours in such areas as multi-agent systems and intelligent agents should be further explored, particularly for those that concern trust models and languages.
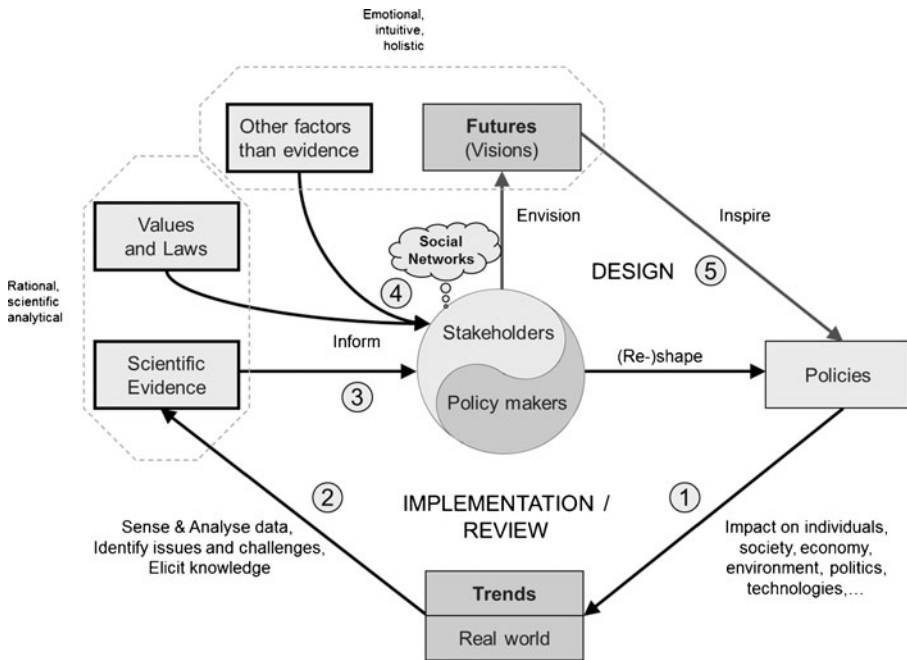
Fig. 2 Scientific evidence and people's opinions inform policy decisions

be easily sensed and automatically captured). Such factors often prevail over the scientific evidence. There are also boundary constraints that come in the form of values and laws (e.g. constitutional rules).

5. Policies may also be inspired by desirable visions and aspirations that are not necessarily in line with current, short-term trends and can also be considered as part of the 'emotional' and intuitive factors that influence decisions.

Most neuroscientists recognise the above concepts as primitive mechanisms that determine the actions and reactions of individuals. Policy Making 3.0 scales up the metaphor of the 'left and right brains' to the social network to make current policymaking processes more evidence based, participatory, transparent and agile.

2.1 Participatory Foresight Model

In order to allow policymakers and stakeholders to work together and co-create in social networks, a common vocabulary of shared concepts (futures, policies etc.) is needed:

- Vision: A vision is a snapshot of the future—what the world might look like at any given point in the future. It can provoke emotions and be a source of inspiration.
- Trend: A trend is a complex phenomenon (or set of phenomena) observable today that may have an influence on the future, either directly or indirectly, by generating other trends affecting the future.

- Future: For our purposes, a future is either a vision or a long-lasting trend, i.e. a trend that is set to be still active in the future. A future, be it a trend or a vision, may have challenges and opportunities associated with it.
- Desirability: How much an individual wants a future to become reality: it reflects a person's emotional response or gut reaction.
- Likelihood: Probability that a future will materialise (or continue if it is already an established trend) irrespective of the timeframe: it reflects the person's rational view.
- Policy: A set of specific objectives and actions designed to underpin a chosen future: the objectives/actions must be attainable within a given timeframe.
- Impact: The effects/consequences that the policy would have on the context, if implemented: there must be a metric defined in such a way that the impact on the environment (in a broad sense) can be measured and reported.
- Plausibility: An assessment of the feasibility of the implementation of the given policy, taking into account structural aspects (i.e. simplicity, modularity etc.), costs, risks, liability, decidability, governance, etc.
- Support: The actual support given to a particular policy, i.e. the overall aggregated value judgement: 'like it!' or 'hate it!'.

The co-creation process then consists of the three layers explained in Fig. 3 and described below.

1. Futures (what we all want to achieve): Stakeholders co-create futures (visions or long-lasting trends). They can vote on them according to their desirability (emotional reaction) and likelihood (rational reaction). Stakeholders can also link futures to each other. In particular, they can analyse the causality links between them (for instance, how to get to 'a world without unemployment' future) or see a future as the extrapolation (unfolding) of current trends.
2. Policies (how to underpin the futures): Stakeholders co-create policy ideas to underpin the futures. They can vote on policy ideas according to their perceived
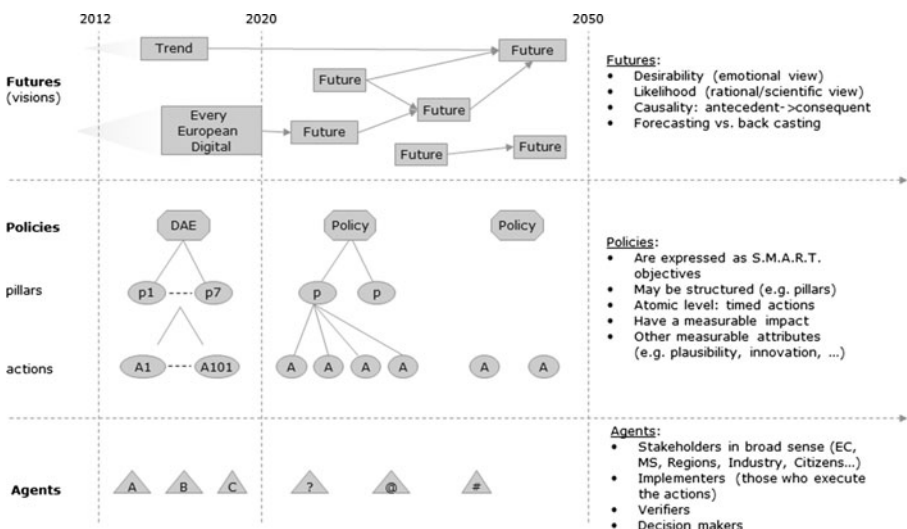

Fig. 3 The three levels of co-creation used in the Digital Futures project

impact and the actual support for them. Policies are expressed as specific, measurable, actionable, relevant and timely actions. Policies can be packaged into groups or pillars. Policies are analysed with techniques such as strengths, weaknesses, opportunities, threats (SWOT) analysis to create a more informed process for their assessment and when it comes to voting.

3. Agents (who executes the policies): Stakeholders engage in large-scale online role games to simulate possible behavioural responses of key actors (or agents) affected by the policies (for instance, the European Commission, EU member states or particular stakeholders). This simulation makes it possible to analyse, in advance, the complex flows of actions/reactions that would occur should the policies be implemented. This form of 'reality check' will in turn shape possible refinements of and improvements to the vision and the policy ideas.

3 The Futurium Experimental Platform

The Policy Making 3.0 model is implemented by Futurium, an online laboratory setup to co-develop futures and policy ideas. Futurium combines the informal nature of social networks with a methodological approach of foresights to engage stakeholders in the co-creation of the futures that they all want.

An outline of the Futurium architecture can be seen in Fig. 4. The architecture consists of the following components: front-end participatory tools, knowledge-harvesting tools for both policymakers and stakeholders, data-crawling tools to extract knowledge from popular social networks and embed it into the Futurium, data-gathering tools to fetch real world data and to input it into the Futurium.
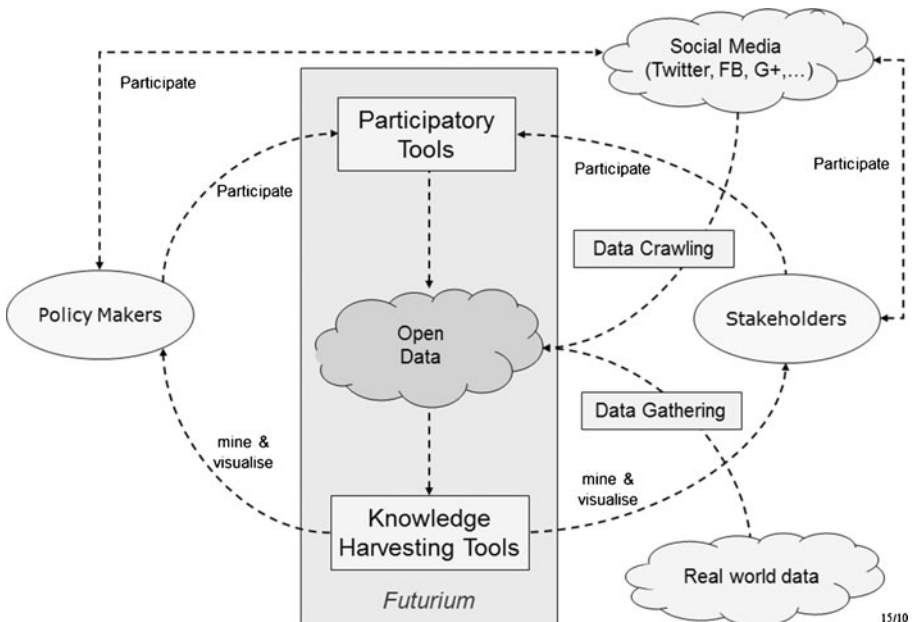

Fig. 4 The Futurium architecture

3.1 Front-end Participatory Tools

Besides the standard tools available in most social networks (e.g. blogs, polls, content subscription, update notifications, messaging, creation of groups, etc.), Futurium participatory tools offer several features to support participatory foresight:

- Co-creation (wiki) of futures, i.e. visions and long-term trends, and the related challenges and opportunities. Each future can be expressed in any form or style. However, to make it easier to compare futures and extract knowledge from the Futurium, our advice is to develop futures by using one of the suggested styles (i.e. essay or narrative). Futures are annotated with semantic information that allows them to be retrieved, categorised and linked to other futures.
- Voting on the future according to (1) its desirability (how much an individual wants a future to become reality) and (2) its likelihood (the probability that a future will materialise or will continue in case it is already an established trend).
- Co-creation (wiki) of policies, i.e. a set of objectives and actions underpinning a chosen future. Policies are annotated with semantic information that allows them to be retrieved, categorised and linked to other policies. Policies can also be linked to the futures that they are designed to implement.
- Voting of policies according to (1) impact (the effects/consequences that the policy would have, if implemented), (2) plausibility (the overall assessment of the possibility to implement the policy) and (3) support (the actual support given to a particular policy, i.e. the overall aggregated value judgement: 'like it!' or 'hate it!').
- Feeding and curating a library of web resources, including scientific papers, foresight reports, etc. Library entries are annotated with semantic information that allows them to be retrieved and categorised, linking to policies and futures.
- Providing evidence about the futures and policies: library entries can be used to give scientific evidence to policies and futures just like bibliographic references in a book or article.

Furthermore, at a later stage, the front-end participatory tools will provide support to organise participatory brainstorming events, including the registration process, sharing background information and drawing mind maps and reports.

3.2 Knowledge-Harvesting Tools for Both Policymakers and Stakeholders

Knowledge-harvesting tools combine basic statistical functions with data-mining, modelling and simulation tools. Examples of knowledge-mining tools include: association rules (to understand complex dependencies among variables), sentiment analysis and text-mining tools (for instance, to generate semantic structures on raw textual data available in blogs and forums); visual analytics tools to render visualisations of data for the stakeholders and the policymakers meaningful. Knowledge-harvesting tools will be made available once a critical mass of information is gathered.

3.3 Data-Crawling Tools

The Futurium will also subsequently integrate tools ('crawlers') to fetch data from social media in an anonymous manner. This will make it possible to take the content

shared on popular social networks like Facebook or Twitter and to process it automatically.

Usually, social media provide Application Programming Interfaces (APIs) to third parties to extract data from their databases (for instance, third party data-mining companies make use of such data for business purposes such as targeted advertising). Futurium will adopt the principle of symmetry of access to anonymous data and the mined knowledge.

3.4 Data-Gathering Tools

Futurium will, in its final phase, integrate tools to gather or import data from real world data sources, i.e. data gathered through devices, sensors or software modules connected via the internet. These might be used to monitor the status of large utilities enabled by ICT policies/infrastructures, to trace the penetration of a certain technology and, in general, to measure any real world data that are accessible via the internet (e.g. broadband performance). Smart cities provide numerous examples of data sets that are openly accessible and accessible through standard APIs in such fields as urban mobility, energy efficiency, eHealth, etc.

The implementation of this last set of features clearly goes beyond the scope of the Digital Futures project and may take years. However, the Futurium architecture already makes it possible to carry out small experiments by collaborating with any research endeavour that is working on similar issues or with any existing open data infrastructure that can be interfaced with the Futurium.

4 Review of Related Work

The project presented above can be positioned at the crossroads of a number of related research strands in the areas of e-Government and e-Democracy, big data, modelling and simulation, foundational research on computer science and ICT (e.g. multi-agent systems), methodological research in foresight, as well as social sciences and humanities research studying the impacts of ICT and the digital transformation on democratic processes.

What follows is a sample of relevant research that should give a clear sense of the value and potential of the Futurium project.

A comprehensive analysis of e-Democracy models is provided by T. Päivärinta and Ø. Sæbø.[6] It distinguishes between models where citizens set the political agenda from models where the agenda is set by the governments, as well as between models where citizens participate only implicitly in decision-making processes from models where they have a well-defined and visible role. In this respect, Policy Making 3.0, as it stands today, falls under the category of models that are more informative rather than deliberative. Stakeholders are engaged in the 'crowdsourcing' of ideas for co-creation rather than taking part in the actual agenda-setting and decision-making processes.

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[6] http://ec.europa.eu/digital-agenda/futurium

Evidence-based and participatory[7] approaches to policymaking have been launched by the UK government in the 'Modernising Government' white paper[8]. A few years later, the White Paper on European Governance marked the beginning of a new approach at the European level, which was followed by the European Commission's 'Smart Regulation' policy[9]. European Union Member States have taken various initiatives to promote citizen involvement in policymaking[10], the most notable being taken by the Finnish government[11]. Numerous governmental initiatives have also been launched in the USA, Brazil, Canada and Australia. Another key example is the European citizens' initiative, which allows EU citizens to participate directly in the development of EU policies using a variety of means, including online consultations. Recent movements (e.g. Occupy Wall Street) and parties (e.g. German Pirate Party) have also used social media and collaborative tools supporting citizen empowerment and participatory decision making[12].

Policy Making 3.0's specificity lies in the fact that it is a model that captures both the evidence and the participatory aspects of policymaking and converts them into separate measurable variables.

Another related area of investigation is big data and knowledge mining. Evidence-based policy is often linked to the availability of open data. Statistics based on open data have been pursued at the US federal level[13], OECD[14] and the European Commission[15]. The DAE Score Board[16] has been developed by the European Commission to inform the review and development of the Digital Agenda. More recently, the advent of open data has stimulated a new wave of research initiatives to bring evidence to policymaking and decision making. This includes social data mining[17], crowdsourcing of data collection and processing and initiatives such as FuturIST[18].

Considerable work is also being conducted in the area of complex systems science[19], the internet futures[20] as well as under the social science and humanities programme of the European Commission[21]. Recently, the OnLife initiative and its Manifesto[22] were launched to bring social science, philosophical and anthropological insights into the policymaking processes.

Foresight is also a well-known set of studies and techniques to inform and substantiate policymaking with future-proof inputs. However, it is seldom open to

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[7] 'Characterizing E-Participation in Policy-Making', Ann Macintosh, IEEE's International Conference on System Sciences
[8] White Paper 'Modernising Government' by the Prime Minister and the Minister for the Cabinet Office by Command of Her Majesty, March 1999 (http://www.nationalschool.gov.uk/policyhub/docs/modgov.pdf)
[9] COM(2001) 428, COM(2010) 543, COM(2012) 746
[10] http://www.icnl.org/research/resources/ngogovcoop/compover.pdf
[11] http://www.openinggovernment.org/finland-is-about-to-change-what-we-mean-by-law-making/
[12] http://bjsonline.org/2011/12/understanding-the-occupy-movement-perspectives-from-the-social-sciences/
[13] http://www.data.gov/—Empowering People
[14] http://stats.oecd.org/—OECD Main Economic indicators
[15] http://open-data.europa.eu—Open Data Portal
[16] http://ec.europa.eu/digital-agenda/en/scoreboard
[17] http://www.uniroma1.it/sites/default/files/Pedreschi.Roma_.28.02.pdf—Social Data mining, D. Pedreschi
[18] FuturICT initiative: www.futurict.eu
[19] See for instance: http://www.gsdp.eu/about/global-systems-science/ or http://global-systems-science.eu/
[20] http://ec.europa.eu/digital-agenda/en/collective-awareness-platforms
[21] http://ec.europa.eu/research/social-sciences/index_en.html
[22] http://ec.europa.eu/digital-agenda/en/onlife-manifesto—The OnLife Manifesto, L. Floridi et al.

citizen contributions, apart from the need to consult citizens on consultation reports or surveys. Furthermore, most of the foresight studies are based either on trend analysis (explorative) or on backcasting future visions into today's trends (normative), whereas the complexity of policymaking (especially at national and international levels) requires a combination of multiple techniques. A pool of foresight tools and guidelines has been made available by the Millennium Project[23]. Amongst them, the 'real-time Delphi' is the closest to the participatory foresight approach taken in Policy Making 3.0. The idea of modelling events, states and invariants (states that do not change over time), the occurrence of events that affect the environment and the temporal order of events with their timing and probability have been addressed at length in the area of formal methods for complex systems modelling and simulation[24,25]. Those long-cherished approaches could be used to better formalise and further expand the Policy Making 3.0 model.

Finally, in the private sector, the idea of keeping customers 'in the loop' (i.e. to capture their attention, understand their behavioural patterns, obtain their feedback to improve products and services, increase their satisfaction and ultimately influence their choices and life) is as old as marketing and advertising. The idea of using the internet, the web and more sophisticated tools such as intelligent agents and data mining for customer profiling, collective knowledge harnessing and marketing purposes was popular already in the mid- to late 1990s. The 4th Framework Programme funded numerous projects in this field under the area of eBusiness and Electronic Commerce[26].

5 Conclusions and Further Work

This paper introduces the Policy Making 3.0 model and its implementation platform Futurium. If successful, the overall project will support the openness, participation, agility and legitimacy of current policymaking processes.

Policy Making 3.0 brings together a number of concepts and tools in a comprehensive and highly scalable model to ensure incremental adoption of future developments. It is a first abstract model to frame evidence and participation and requires further investigation.

The approach was developed with the primary purpose of hosting and curating visions and policy ideas generated by Digital Futures, a foresight project designed to inform the policy debate that will take place in the context of the renewal of the EU policy framework in 2014. An assessment study of the model and the platform as applied to this particular policy design case would be needed before further conclusions are drawn as to the effectiveness of the approach.

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[23] http://www.millennium-project.org

[24] http://dl.acm.org/citation.cfm?id=868974 F. Accordino, T. Bolognesi—constraint-oriented specification style and notation

[25] A layer on top of Prolog for composing behavioural constraints, F. Accordino, T. Bolognesi, Wiley.

[26] Using multimedia software agents in the light mobility industry, F. Accordino et al., in "Advances in Information Technologies", IOS Press, 1997. Paper developed under the FP4-ESPRIT project Marketing with Intelligent Agents

One important aspect that will need to be explored is the possible long-term philosophical implications of Policy Making 3.0. In the coming decades, increasingly faster and reliable forms of communication between multiple stakeholders will mark a significant step towards the vision of Pierre Teilhard de Chardin of a supreme point (Omega Point) towards which the universe is constantly developing to reach increasingly higher levels of consciousness and unity. As a consequence, policymaking and decisions will, in the future, be increasingly taken in a collective way. It is therefore essential to start studying the multiple implications that this may have on mankind and its environment.

Finally, the implementation of Policy Making 3.0 with Futurium is still in its embryonic phase. Its development is meant to be an incremental process. The site www.futurium-lab.eu has been set up to engage potential contributors in the further development and improvement of the Futurium. Those who are interested in contributing may contact: Franco.Accordino@ec.europa.eu.