Policy Co-creation in the Era of Data Science

Borut Sluban* and Stefano Battiston

FINEXUS: Center for Financial Networks and Sustainability
Department of Banking and Finance
University of Zurich
Switzerland
** borut.sluban@uzh.ch*

Abstract

Policy co-creation holds promises to increase citizens' trust in institutions and policy acceptance but no established approach has emerged yet. We propose a policy co-creation framework that leverages on complexity science and data science to involve both experts and stakeholders from the policy area, as well as the wider audience. Our iterative process consists of three stages: (i) identification of the main policy issues by a balanced expert group and launch of a non-technical stakeholder survey, (ii) analysis of stakeholders' positions towards the issues via a Policy Network Map, and (iii) assessing the public leaning towards the issues using text mining techniques on big data from the social media. The output from stage two and three feeds back into a new round of assessments until a target level of support is reached. At this point, the expert group can formulate its final recommendations that will be used by policy makers to prepare a first policy proposal. We illustrate the feasibility of the proposed workflow by means of use cases from on-going and previous work.

Keywords— policy co-creation; citizen engagement; social media; text mining; network analysis.

1 Introduction

Today's society is characterized by the interplay between socio-technological processes and economic interdependencies. In this context, the recent developments in data science are often expected to deliver solutions that can help the policy making process better cope with such complexity. In particular, policy co-creation, i.e., a policy making process that involves a wide range of stakeholders, is commonly mentioned as a tool to increase citizens' trust in institutions and policy acceptance. However, at present there is no established approach to policy co-creation that leverages on complexity science and data science. In this paper we propose a novel policy co-creation framework that involves both experts and stakeholders from the policy area, as well as the wider audience, and builds on insights from network science and text mining.

The first stage of the framework includes a breakdown of the policy context into an initial set of the most relevant policy issues by an expert group reflecting a balanced representation of economic and social interests. It also includes the preparation of a semi-structured, non-technical survey targeted to the engaged public (i.e. not just to the professionals from the advocacy and lobbying groups). The second stage consists of mapping out the positions of the stakeholders towards the various policy issues, and to visualize them through the concept of Policy Network Map. The third stage uses the output of the previous stage to stir a debate in the social media and to extract, by means of text mining techniques, the public leaning towards the policy issues identified in the first stage, as well as towards potential newly emerging issues. Finally, the assessment of the public leaning is taken as a feedback to the first stage and the process is iterated until a desired level of stakeholders' support is reached. At this point, the expert group can issue its final recommendations, which can be used by policy makers to formulate a first policy proposal.

The design of this process aims to involve citizens before the first policy proposal is formulated, because from that stage on, many aspects of the discussion that could increase support and acceptance are typically already excluded. The process also aims to have a phase of value-based and non technical discussion among citizens and stakeholders, which is fundamental for them to feel they have ownership of the policy.

In many countries, governments are already working on

improving the communication with citizens and to increase their involvement in the law-making process. For example, the European Commission has been making a significant effort to try and engage an increasing number of citizens in the EU law-making process with open public consultations[1], formerly known as the initiative "Your Voice in Europe", where citizens and stakeholder can provide feedback to policy proposals by means of responses to the open public consultations. Typically, the responses are limited the few hundreds in number, mostly coming from the lobbying organisations that are active in the policy area concerned by the proposal. Some studies report also a certain disproportion in the representations of the interests from the private sector, especially in the area of finance and energy. Hence, there is a growing awareness of the need to try to engage and involve in the law-making process a broader spectrum of interests, in particular those from civil society, consumers and savers. One of the barriers to the participation is the complexity of the policy proposal and the required prior knowledge in legal matters. For instance, for many policy proposals in the area of Banking and Finance [2] or Climate action [3] it may be hard to understand the social and economic consequences for individual citizens. It is then difficult to engage citizens if they do not see how they are affected. The representation of the information is thus critical to make the public more aware of the implications of these policies on their daily lives.

2 Policy co-creation framework

The process of policy reforms is often triggered by initiatives of the stakeholders that are going to be affected by that future policy, e.g., a specific sector of the industry. In democratic regimes so far policy makers typically consult a limited number of experts and the largest directly involved stakeholders before issuing a new policy proposal. However, this process many leave citizens underrepresented in the process of shaping the policy. Recently European and United States governments have put in place mechanisms to increase the transparency of their decision making. First attempts include open public consultations, which manage to attract large directly involved stakeholders, but failed to engage the broader public to participate.

As pointed out in [1] policy problems and their solutions coevolve as in a design process. We build on insights from the research program on Global Systems Science as well as on our ongoing work to propose an iterative policy co-creation process articulated in three stages as illustrated in Figure 1.

1. Assessment of the policy context and identification of the main issues
2. Mapping out stakeholders and their positions on the issues through a Policy Network Map
3. Assessment of public leaning towards the issues using text mining and feeding back the outcome to stage one.

This workflow is repeated until a target level of support and among stakeholders and citizens is reached.

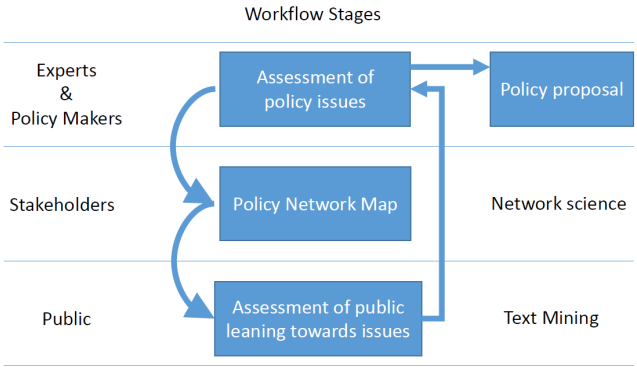

Figure 1: Stages of the iterative policy co-creation process. Indicating who is involved in each stage.

The first stage gets initiated when the demand for a policy reform emerge from some sector in the industry or from some group of citizens. At this stage it is important that policy makers set up a balanced expert group to assess the policy context. After providing a report with early stage recommendations, the expert group should issue a general public survey that is formulated in a language widely accessible. A good example is the recent survey issued by the EU High level expert group on *Sustainable Finance*[4]. Respondents are invited to provide evidence-based feedbacks but also to provide argumentation based on shared social values, specifying reasons, problems and suggesting solutions at a level that is conceptual and political but does not involve yet legal expertise. The goal of such a survey is on one hand to acquire knowledge of the positions of stakeholders on the issues selected by the experts, and on the other hand to gather new issues, problems and suggestions of the proposed policies as identified by stakeholders and citizens.

In the second stage the responses of various stakeholder groups are analysed to extract their leanings towards the pol-

[1] https://ec.europa.eu/info/consultations_en, http://ec.europa.eu/assets/epsc/pages/60-years

[2] https://ec.europa.eu/info/consultations-banking-and-finance_en

[3] http://ec.europa.eu/clima/consultations_en

[4] https://ec.europa.eu/eusurvey/runner/sustainable-finance-interim-report-2017

icy proposal and visualize them with the concept of Policy Network Maps, see example in the Figure 2.

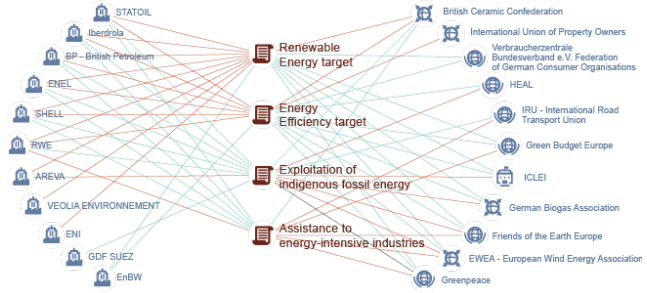

Figure 2: Policy Network Maps visualisation example showing support (green) and opposition (red) of different organisations towards selected policy issues.

The visualization of stakeholder preferences on policy issues is a valuable feedback to policy makers, but also a good medium to foster public debate on social media, when moving on to the third stage of the proposed policy co-creation workflow. To create a policy network map the main issues of a policy proposal need to be identified, which make policies also more relatable, as key issues can show the relevance for and consequences on the daily lives of citizens. These issues are extracted from the acquired public responses and the early stage recommendations of the expert group by using topic detection and semantic analysis backed by expert knowledge. After a set of policy issues describing possible solutions to a set of problems is identified, the positions of the involved stakeholders can be mapped out. The concept of Policy Network Maps [3] uses clustering of stakeholder opinion patterns to form groups with similar positions on the issues, and combines it with a novel visualization of a bipartite signed network to show the polarization of stakeholders on the selected issues. The developed approach is used to detect consensual and segregating issues within a population and to identify the subgroups holding a particular position towards these issues.

The third stage of the policy co-creation process addresses the broader public to acquire also their opinions. The constructed policy network map is used as a motivation and published on social media to initiate the debate on the developing policies. By monitoring the initiated debates, but also more broadly the discussions related to the particular policy context, the leaning of social media users towards policy relevant issues can be modelled. Combining network analysis with topic detection and sentiment analysis, has shown it is possible to identify the major groups of interacting users, detect the topics of their conversation, and assess their sentiment towards these topics. [2] The analysis of public opinion related to the developed policies can provide policy makers with the information about the feasibility and support for a particular policy, and will help them make sure that policy reforms can be understood and accepted by the citizens.

In the further iterations, the first stage is repeated. The goal of policy makers and experts is to assess the results from the second and third stage of the previous iteration, in order to revise the policy recommendations accordingly, and to issue a new survey to evaluate the change in support for the revised policy recommendations. Eventually, if the process is able to converge to a target level of support after a few iterations, the final policy recommendations can form the basis for policy makers to formulate a policy proposal.

In the following sections we provide two use cases of the methodologies that will be adopted for use in the second and third stage of the policy co-creation process.

2.1 Policy Networks Maps use case

To illustrate the applicability of Policy Network Maps, we will mention some of our work in progress [3] on data collected for the European 2030 Climate and energy framework[5]. Note that in this particular case the stakeholder positions were mapped out at a later stage of the policy-making process as we suggest to do in our proposal of the Policy co-creation framework.

In the case of the EU 2030 Climate and energy framework we used the publicly available data on the open consultations regarding this policy framework. A group of domain experts identified 15 key policy issues, for which stakeholders would express their position towards them. In order to present the results of the consultations in a way that would show the interplay of the various position that stakeholders have, we mapped out policy issues, stakeholders, and their positions towards individual issues, as a bipartide network with support and oppose links between stakeholders and policy issues, as shown in Figure 3.

The network layouting algorithm takes the two largest most distinct groups of stakeholders (left and right arcs) and orders the policy issues (in the middle) according to the differences in support or opposition between the two groups.

Considering the final version of the EU 2030 climate and policy framework, which was written and presented by the European commission after the open public consultations, it is possible to identify which stakeholders' preferences were taken into account. Preliminary results show that the sepa-

[5] http://www.consilium.europa.eu/en/policies/climate-change/2030-climate-and-energy-framework/

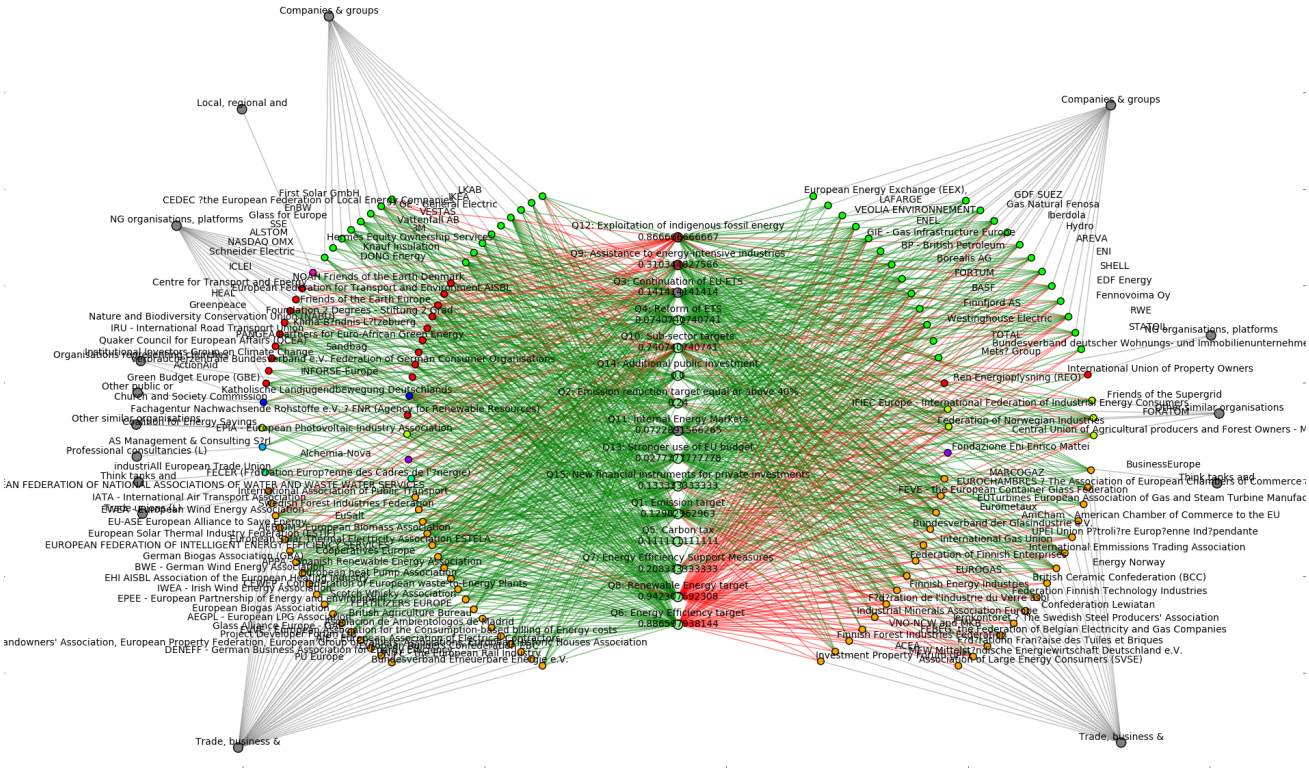

Figure 3: Policy Network Maps visualisation of stakeholder positions on the issues of the EU 2030 climate and energy framework policy proposal, as provided in the open public consultations. Green links show support and red links show opposition. In the middle pro green energy issues are coloured green, pro brown energy (fossil fuels) are brown, other gray. Organizations of same type are indicated by same colour.

ration into the two largest groups as presented in Figure 3, largely aligns with winners and losers of the consultation process. In other words, that the final proposal of the commission holds the same position towards policy issues as one of the largest stakeholder groups identified by our (stakeholder mapping) approach.

The main aim of the Policy Network Maps is to represent the diversity of interests among stakeholders and their patterns of support or opposition to the objectives of the policy proposal. They serve as a tool to provide both policy makers and stakeholders such as advocacy groups and individual citizens with a better idea of policy feasibility, in the spirit of a transparent co-creation process.

2.2 Public leaning on relevant topics use case

In our previous work [2] we followed the conversations on Twitter in the areas of Environment, Sustainability, Energy, and Finance, to identify the major groups active in these areas, to see what their are talking about, and what is their predominant leaning on a selection of topics. We have first identified the user community structure based on their interaction (retweeting) behaviour, and have labelled them according to their most prominent users' publishing/tweeting interests. Using a force directed network layout algorithm to visualize the interactions between users, groups of densely connected users are positioned closer together, whereas users not connected to that group are positioned further away, see Figure 4. This network layout captures quite good the partitioning into user communities, each coloured by its own colour.

The content analysis of nine largest user communities showed the various topics debated, and sentiment analysis revealed the similarities and differences in the leanings of the communities towards selected environmental topics, see Figure 5.

A predominant agreement among the communities can be observed of what are positive and what are negative topics, like 'green energy' and 'recycling', opposed to 'pollution' and 'fracking'. The two major exceptions to this are: a fairly closed community (Skeptic) not that negative towards fossil fuels and fracking, and a community lead by influential celebrities widely spreading some good news on plans to reduce emissions causing pollution, and bad attitude towards fracking.

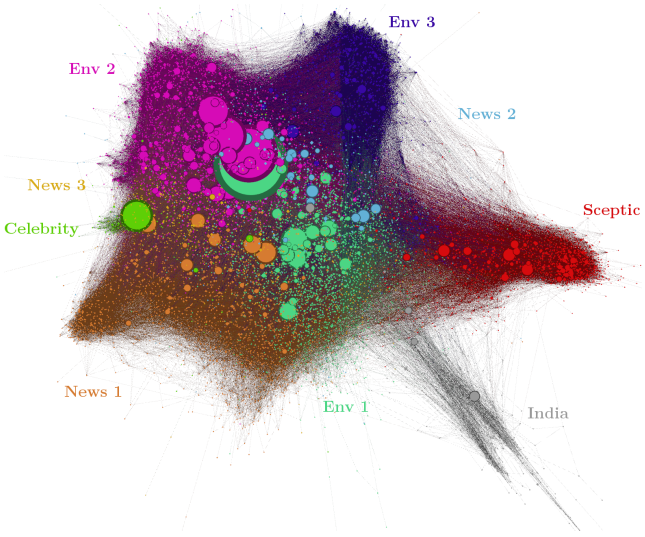

Figure 4: Retweet network of 9 largest user communities, discussing environmental topics. Node colors correspond to community, and size to influence in terms of the user's retweet count. (Figure taken from [2].)

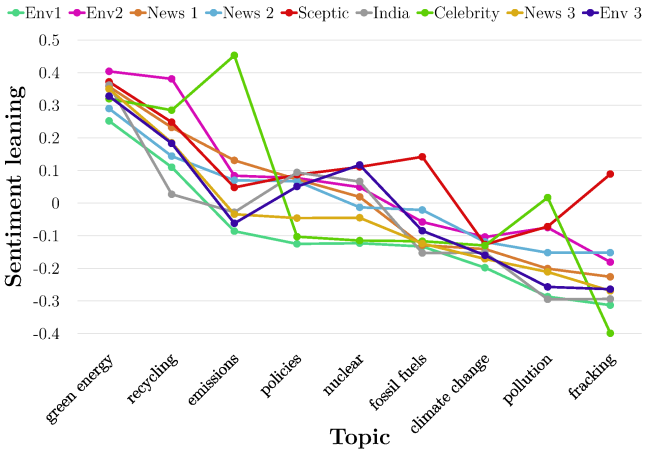

Figure 5: Sentiment leading of largest user communities towards selected environmental issues. (Figure taken from [2].)

Such an approach combining network analysis with content and sentiment analysis, provides a useful tool for computing the community structure of the stakeholders interested in a policy proposal, and thereby identify the groups of social media users that share a similar position on the corresponding policy issues. The next step would be to implement a system for tracking the debate on social media that would allow to see the temporal evolution of the public's familiarity with and understanding of relevant policy issues.

The analysis of public opinion related to the developed policies would provide policy makers with the information about the feasibility and support for a particular policy, and would help them make sure that policy reforms can be understood and accepted by the citizens. Policy makers would need to revise their policy proposals accordingly, followed by an additional round of assessment, that would show whether their proposal reaches an acceptable level of agreement and support among all the stakeholders.

3 Conclusion

We have proposed a framework for an iterative policy co-creating process supported by network analysis and big-data text mining techniques.

The process is articulated in three stages. In the first stage an expert group reflecting a balanced representation of economic and social interests identifies an initial set of policy issues and prepares a semi-structured, non-technical survey. In the second stage, an analysis of the positions of the stakeholders towards the various policy issues is conducted using a Policy Network Map. In the third stage, the results from the survey are used to stir a debate in the social media. From this content, by means of text mining techniques, the public leaning towards the policy issues identified. Finally, the assessment of the public leaning is taken as a feedback to the first stage and the process is iterated until a desired level of stakeholders' support is reached. At this point, the expert group can issue its final recommendations, which can be used by policy makers to formulate a first policy proposal.

The design of this process aims to involve citizens before the first policy proposal is formulated. This increases the possibilities that a wider range of interests is represented in the process. The process also aims to provide a platform for a value-based and non technical discussion among citizens and stakeholders, before the debate becomes entrenched in the legal details.

Improved communication and knowledge representation can lead to a more efficient policy co-creation cycle. Hence introducing a data driven iterative process of policy design would foster a policy brewing ecosystem, where feasible and sustainable policies are co-created by the synergy of policy makers and the civic society.

Acknowledgements

This work was supported in part by the European Commission H2020 FET project DOLFINS (grant no. 640772).

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