






# Policy Making Analysis and Practitioner User Experience

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**Abstract.** This article presents the work on social media analysis-driven policy-making platforms that are powered by classic social media analysis technologies, such as policy modelling, linguistic analysis, opinion mining, sentiment analysis and information visualization. The approach examines the user design perspective towards user experience in policymaking for all the innovative modules used. The technology behind such complex task is presented while the resulting platform is appraised on the potential for real world application. The findings drive the development and the requirements for the summative usability assessment tests. We also report on the level the practitioners adopted the policy formulation tools.

**Keywords:** Policy making · Social network analysis · Opinion mining · Content analysis · Natural language interfaces · User experience

## 1 Introduction

The increasing computational power and the adoption of modern software frameworks have driven the development of more and more impressive user-friendly interface designs for different users' requirements [1]. Successful approaches formulate the suitable design, functionalities and satisfying user experience for their target users as main stakeholders [2]. It is evident that identifying correctly the stakeholders needs, even analysing and visualizing various sources of big data on any level (quantitative, qualitative, semantic, etc.), is a prerequisite. Identifying the end-users and what they really need from an interface, module or application can make the difference between success and failure of the design, especially in complex environment like the policy making stages [3].

The article examines a set of Information Communication Technology (ICT) tools in the policy making process especially in parliamentary policy cycle. These tools use

crowdsourcing, data analysis, brand monitoring, content analysis and opinion mining to visualise critical insights to assist the decision makers. The decision makers utilise the integrated policy making analytics tools to gain a clear and fast overview of the citizens' arguments, sentiments, opinions and trend analyses in the policy making arena.

The relevant market for software products, offers several tools for policy formulation and validation, but it is relatively new and limited when it comes to dedicated analysis for policy making. On the other hand, the market for data collection, sentiment analysis, opinion mining, argument extraction, linguistic analysis for web content is already quite developed and highly competitive as there are solutions from a variety of organisations already in market [4–6].

One may find several applications for potential customers like political institutions, mass media organisations, individual politicians and policy makers based on the social media analysis. But these tend to ignore the user experience of these stakeholders and the accuracy of the data provided. It must be noted that it is rather difficult to create, promote and distribute an integrated tool suite for policy making as a package. During the last 10 years, a lot of individual stand-alone modules were advertised and sold individually, especially in the more competitive market of big data, artificial intelligence and content analysis. That is why in this work the end users or the major stakeholders evaluate the tools for policy making before the general public.

This work presents results from multiple usability assessment tests, as well as contributes towards best practices in user-driven design. The proposed methods are implemented and validated by users/participants in formal evaluation. The findings and UX facilitator meta-evaluation provide insights that can lead to optimization towards the number of participants, selection of evaluators and problem severity identification via specific views from domain experts as they have been utilised in this work.

## 2 Related Work

An array of new ideas, research projects, platforms, techniques and products are emerging through the massive use of the social web into the policy-making process, based mainly on social media analysis. The empowerment of citizens, businesses and other organizations is a strategic priority realised through the use of new technological tools facilitating digital interaction between administrations and citizens/businesses for high-quality public services. Such empowerment would aim at giving citizens access to better services, designed around their needs and in collaboration with them, while, at the same time, allowing their effective involvement in the policy-making process [7].

The basic framework concept and the actions derived from this strategic priority are incorporated in the following words: Listen, Analyse, Receive, Act (Fig. 1).

*Listening* and Monitoring what people say, then *Analysing* with ICT tools the conversations and get the main stakeholder opinions in order to *Receive* all responses and data properly displayed for an effective use and finally *Act* based on this information.

In this way, citizens could be directly involved in the policy making stages of the Policy Cycle (Agenda Setting, Policy Formulation, Policy Adoption, Policy Implementation, Policy Evaluation) using simple ICT tools with social networks and user-friendly capabilities offered by Web 3.0 tools and channels. Recent research introduced



**Fig. 1.** Policy makers concept framework.

approaches that exploit the identification of “reputation models” [8] with advanced linguistic analysis of social web texts, emphasising on policy implementation and evaluation [9, 10].

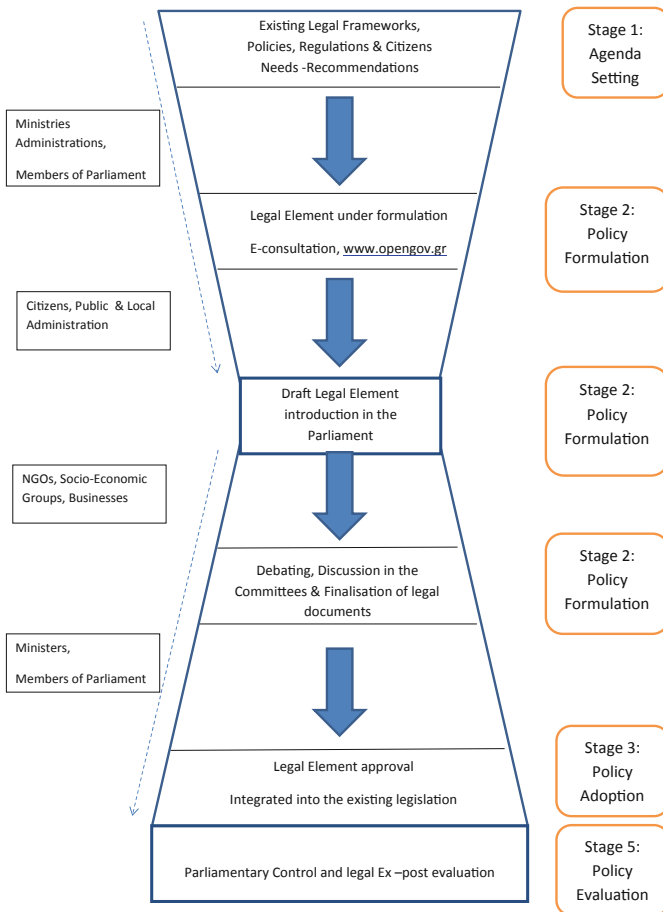
Additionally, organisations like Parliaments and mainly NGOs, Civil Society Organisations or Governmental Institutions in several European Countries have developed a series of non-sustainable tools, online platforms for public consultation, crowdsourcing, citizens’ engagement and e-participation in the law making process [11].

Although there is not a clear methodology, roadmap or pathway from user design to user experience covering all the stages of policy making. overall, based on the results of several research projects, it seems that there is a need for user-friendly integrated ICT tools that allows policy makers to have, among others [12]:

- an interpretation of citizens’ discussions, for or against a policy agenda (Agenda Setting Stage and Evaluation Stage),
- a stable feedback loop between the vast amount of crowd opinion on the web and the agenda of the decision-maker, for a given policy during the Policy Formulation Stage,
- a clear and complete plan on the understanding of how the citizens’ opinion, arguments and needs can (or should) affect the policy-making agenda during the Policy Formulation Stage,
- a novel and valuable resource of ideas and opinions for the Policy Formulation Stage,
- a complete set of tools for the discovery, aggregation, analysis and visualization of arguments, expressed in the web in support or against a given policy, during the discussion in the Policy Adoption Stage and during the Policy Implementation Stage,
- a continuous usability testing bringing closer digital transformation and the digital society, as a continuous horizontal process,
- a full integration of multimedia archives (video, image, text) with customized services addressed to citizens’ needs,
- transparent, with access to interconnectivity, open prototypes, open source tools, open data and open architecture,
- evidence-based accountable results in the Policy Evaluation Stage, and

- an integrated platform or a tool suite with a modular, open architecture, naturally lending itself to future improvements on each of its modules (and the techniques each one applies).

Meanwhile, the past decade, research in policymaking, tried to elaborate prototype web-based tools having as main purpose to provide the decision-makers, users and stakeholders with a semi or fully automated solution for data acquisition, argument extraction, opinion mining, sentiment analysis, argument summarization and visualization that works in a collaborative form in the policy-making regime [13]. Primary, it was foreseen to create an integrated Tool Suite that successfully integrates all selective modules that perform the aforementioned tasks under a simple work environment making it easy for the users to switch between these modules. The following figure indicates the perception of the policy lifecycle that is rather compatible with the five Policy Stages described before [14], having four Policy Stages –as the Policy Implementation is not



**Fig. 2.** The Hellenic Parliament policy making framework.

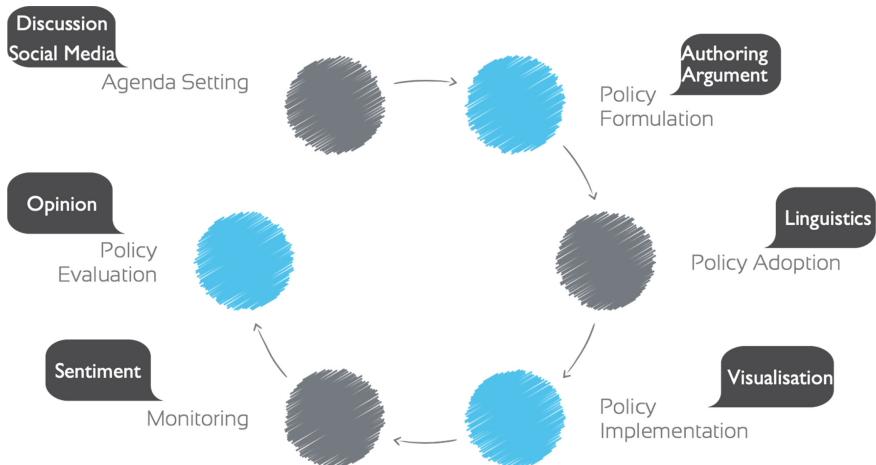
part of the Parliamentary Work—incorporated in the following scheme of the policy cycle that has been used in the use case of the Hellenic Parliament (Fig. 2).

### 3 Innovative ICT Approaches in Policymaking

The main two constraining factors that hinder the generation of a trusted relationship between citizens (and especially young people) and decision makers are (a) existing ICT approaches that focus on tools/modules/components for isolated stages of the decision-making cycle, making it impossible for decision makers to adopt a unified and coherent solution that covers their needs and satisfies engagement requirements for more than one decision-making cycle, and (b) the undisputed fact that public opinions and outputs are not considered sufficiently by decision makers, because of the lack of practical and technical opportunities, as well as knowledge, on how to embed them into the formal decision-making mechanisms.

In essence, there was a need for an open source, trusted cloud-based service-delivery prototype that will:

1. Link the different steps of the public decision-making process with existing tools and services used by parliamentary institutions.
2. Support decision makers to choose the right blend of tools and services through a guided template that will evaluate a-priori the impact of their generated actions (in terms of engagement) based on open service cataloguing.
3. Deliver case-specific and customised service mashups to public authorities in a smart and integrated manner to allow for instant deployment and operation without the need for intense ICT investments.



**Fig. 3.** ICT tools in the policy making cycle.

4. Cater for the innovation growth of software developers by offering the option for promoting their services through an open innovation platform where various tools, services and components may be included and promoted (Fig. 3).

Having at hands these policy-making stages, the users/stakeholders and their needs, the question that arises is which ICT tools, modules or innovative approaches could be used in a parliamentary environment.

The development and application of the mentioned policymaking tools has the additional advantage of fitting nicely into the greater European interoperability Framework, as provided through the ongoing ISA2 programme [15]. More specifically, the greater objectives of legal Interoperability, i.e. to enable smooth implementation of European public policies through better legislation, can be essentially supported by appropriate configuration of the policymaking tools. Furthermore, digital support of evidence-based decision and policymaking is difficult to be imagined without appropriate, structured data formats and xml-based web-standards, exactly as proposed in the tested solution. For this reason, the proposed Integrated ICT approach should be a sustainable open platform that integrates tools for policy making.

To summarize, it is more than evident that the users need a customised integrated web-based accessible policymaking analytics approach that successfully integrates all policymaking tools under a single work environment making it easy for users to switch between tasks and applications, while allowing them to complete all steps of the policy-making cycle. The following paragraphs refer to the tools that have been found to be of use for end-to-end policymaking.

### 3.1 Policy Model Authoring Environment

The Policy Model Authoring Environment is the environment for authoring the models with respect to policy domains and the policies themselves. This tool allows for the visual representation of the policy argumentation models. It facilitates the needs of non-ICT skilled end-users to assist policy makers in policy formulation on a conceptual level and deliver a machine-readable representation of the respective models. The authoring tool enables the domain experts that support policy makers with creating and maintaining policy models. It supports authoring of the policy models for all domains, it deploys all the computational tools necessary and it brings together the arguments about the introduced policies.

User interface visualization aids users to create advanced and complex models with minimal cognitive load. It could be an integral part of the system, seamlessly allowing the authorship of policy models, also being fully compatible with all modern web browsers [16]. This solution is highly portable, only requiring the use of the web interface. It can be easily accessed by policy makers, assistants, researchers and other end-users, using simple user accounts. Other potential users like NGOs, market researchers and business analysts could make use of it as well.

### 3.2 Open Data Acquisition and Analysis

Open data has generated a great deal of excitement around the world for its potential to empower citizens, change how government works, and improve the delivery of public services. Analytics powered by open data can help uncover citizens' preferences, reveal problems, anomalies and variations in public administrations' performance [17]. This module can communicate with and draw data from a variety of text sources, based on ad hoc needs. The sources can be websites, RSS feeds, search engine results, such as Google or Yahoo, and social media, such as Twitter and Facebook.

It provides a unique point of entry for the gathering of data from a variety of sources, minimizing the effort for configuration. The module can be critical for a variety of domains, such as reputation management, news updates and policy making. All these domains of application require a constant stream of information from multiple text sources to enable acting and reacting efficiently. The module is built as a web service, which enables integration in any system setting that uses web services [18–20], practically all contemporary applications.

The module is usable by and useful for any company that exploits online text. For example: news agencies, reputation management service providers, online analytics providers and decision-support system designers. It must be noted that there are several companies that focus on a specific data provider, Twitter, for instance, or provide analytics services, such as SumAll, BigPanda, Looker and AWS Data Pipeline. However, to the best of the authors' knowledge, there is no unified, broad solution for textual data gathering from all the aforementioned sources.

### 3.3 Linguistic Analysis

This module analyses and pre-processes textual information that collected from a variety of sources to transform free text into a set of structured data, usable by business analytics or text analytics modules. It provides a unified set of well-established tools that can be used to pre-process and structure free text for follow-up use by business intelligence tools. The cleaning up of data can reflect significant effort. Its lack, on the other hand, can lead to erroneous or nonsensical business analysis results. The Linguistic Analysis module, also built as a web service, covers a variety of aspects from character encoding considerations to tokenization and sentence splitting in the pre-processing of free text, so as to provide a common, established tool, useable in a data analytics pipeline [21].

### 3.4 Argument Extraction

The Argument Extraction module can discover and extract arguments from free text (including texts from social media, blogs, news sites, etc.) [22]. Thus, it can help gain intuition and understanding to support a claim, be it a proposed policy or a generic subject of conversation. The module is the only known software detecting and extracting arguments in many languages, such as English, Greek and German. It can provide precious information regarding a policy or a product, empowering business intelligence with the logic of every internet user. The module can detect tendencies and stances related to specific subjects, so that a policy maker can act and react in a timely, efficient manner,

taking into account the public (or target-group) arguments on a subject, such as a policy or a product. This is also built as a web service [23, 24].

### 3.5 Opinion Mining and Sentiment Analysis

This module, offered as a web service, can assign sentiment values (positive, negative, neutral) to multi-lingual text and especially to arguments. Thus, it can provide at-a-glance information about the public (or target-group) reaction to an issue, an event or a policy. It provides a unified solution for sentiment analysis across different languages (e.g. English, Greek, and German). The module can be critical for a variety of domains, such as reputation management, news updates and policy making. All these domains of application analyse the public sentiment from text data, to enable acting and reacting efficiently [25].

### 3.6 Visualisation

The visualization modules provide intuitive access to the data crawled and analysed by external text analysis techniques, similar to the works presented in [26, 27]. It is realized as a web application and can therefore be accessed via a browser [28]. The visual interface supports the exploration of statistical features within thematic categories identified in the underlying content. Besides the quantity of information present for the respective categories, the extracted sentiment scores (from positive to negative) are depicted. Moreover, the content of the respective documents can be accessed via most frequent terms. Both the analysis of the evolution of thematic categories over time and of demographic information about the authors of the screened documents are supported (Fig. 4).

The visual interface enables the view on the underlying data structures from different perspectives. The techniques used constitute the front-end of a document processing pipeline. The techniques have been chosen and designed in order to allow for a comprehensive view on the evolving topics and sentiments of the discussion. In addition, the user may pursue its interests from different perspectives. In effect, through application of design principles from information visualization, “questions to the data” may be asked.

The visual interface enables users to analyse the evolution of topics with respect to sentiments, keywords and quantitative information. It supports the user to extract emerging trends in predefined categories and to compare different audiences with respect to their underlying opinions. The user gains a detailed insight about the supporters or opponents of a given opinion.

The visual interface can be used as Graphical User Interface to access any data reflecting the described structure. These again are analysed and stored in a database. The main stakeholders to be addressed with this solution are policy makers. However, the visual interface offers a generic view on textual content that is categorized and analysed with keyword extraction and sentiment analysis techniques. Therefore, it can also be considered for application in the domains of journalism or marketing, with respect to brand monitoring.



## Policy Component

Invest in Nuclear Energy (Policy Component 445)

Increase Energy Efficiency (Policy Component 443)

Increase RES penetration to final consum... (Policy Component 442)

New Growth Model for Greece (Policy Component 447)

Exploit own Fossil Fuel sources (Policy Component 446)

### Wordcloud for Policy Component 447

grid matter alternative fossil fuel source free water mwe electricity work  
 generate plant cost store energy create heat  
 amount price wind earth renewable power oil mw solar kwh  
 biomass year sun time system run power oil mw solar kwh  
 people rate capacity state nuclear high technology world form supply  
 generator million site area generation grow global country project

Frequently used words

### Arguments

Invest in Waste to Energy (Arguments 1866)

Reduce Energy Cost (Arguments 1814)

Fuel Cells Co Gen Heat and Power by Hydr... (Arguments 1829)

Invest in District Heating/Cooling Netw... (Arguments 1827)

Invest in District Heating/Cooling Netw... (Arguments 1825)

Wind turbines can be installed on remote... (Arguments 1838)

Innovation and Research Development (Arguments 1809)

Tax Revenue with social security (Arguments 1812)

Increase Employment rate (Arguments 1813)

Sustainable Investments (Arguments 1810)

Invest in District Heating/Cooling Netw... (Arguments 1826)

Investments in clean and highly efficien... (Arguments 1846)

Research for the best suited locations f... (Arguments 1841)

Optimisation of energy mix (Arguments 1815)

**Fig. 4.** Policy and argumentation visualisation.

## 3.7 Public Dialogue

This module provides public dialogue capabilities, including discussions, comments, forums, feedback services, deliberation and structured argumentation systems. It ensures seamless integration with major social media networks, similar to the works presented in [29, 30], allowing citizens to use popular and familiar discussion services and, thus, to increase the visibility and outreach. The module is using graph visualization technologies and can be easily accessed, among others, by policy makers, aids and researchers using simple user accounts. The Public Dialogue module would also be fully compatible with all modern web browsers, which can again be accessed by other modules and users [31, 32].

### 3.8 E-Participation Services

The right to petition constitutes one of the basic rights all citizens enjoy, characterized by such essential traits as extension, compulsion, popularity as well as participation [33], and actually entails the capability of the former to freely, either alone or as part of a group. The Petition Tool is accessible in external locations allowing users to create petitions easily and at any time, mostly for free, through user-friendly interfaces. It aspires to leverage e-petitioning to provide an additional channel for connecting citizens, communities and other groups of people, especially the young generation, with decision makers, and thereby inducing action, political or not, with regard to issues that are of interest to a great mass of people [34].

Another facet of democratic participation and engagement in the decision-making process is manifested through voting. The voting Tool combines the best of breed features of current online polling approaches (e.g. user-friendliness, simplicity, ubiquitous engagement, prevention of fraud etc.) to provide appropriate voting tools that will allow on one side decision makers to obtain tangible evidence on what citizens think and on the other will enable citizens to voice their opinion and actively drive developments on various social levels.

### 3.9 Social Media Campaign

This Module monitor how social media activity might be a useful capability, especially from a policy perspective, both for detecting new or emergent issues, as well as for getting a better situation awareness of how citizens react to a particular issue or person (e.g. MP, Policy, discussion). The focus will be put upon improving public authorities' ability to actually listen & communicate directly through social media with the population/citizens, especially youth and take into consideration their discussions in all Social Networks for a certain Policy domain [35]. By defining the scope, concept and needs of each user, i.e. of each public authority, it will propose the services and tools that suit each user's needs best [36]. Thus, this integration of innovative services and tools in one platform or tool suite, enhances aspiration to make the most out of social media, by gleaning data and actually listening to what targeted audiences, especially young people, have to say about a certain issue, as well as by analysing the gathered data, in a similar way that a recommender system works [30, 37, 38].

## 4 Evaluation

Before the assessment of the users' acceptance, the authors evaluated the use of these modules as innovative ICT approaches in policymaking. The main research question is their suitability in the different stages of policymaking. Table 1 presents the Policy Making Stages, the main users involved and their needs versus the main ICT modules that satisfy them.

The mentioned suite can be used and marketed as an integrate tool to assist evidence-based policymaking. The next table presents a SWOT-like analysis of the tool's strengths, weaknesses, opportunities and threats concerning its positioning within the future software market. The SWOT analysis was based on the evaluation results, the users' needs,

**Table 1.** Using the appropriate ICT components for all policy making stages.

Policy making stages	Users	Needs	Target analysis
Agenda setting	Government, MPs	Discussions	Dialogue, opinion, sentiment, argument, open data, E-participation, social media
Policy formulation	Citizens	Crowdsourcing, opinion, feedback	Authoring, visualisation, E-participation, social media
Policy adoption	MPs	Aggregation	Linguistics
Policy implementation	Government	Transparent, user friendly	Visualisation
Policy evaluation	MPs, Citizens, government	Effects, accountability	Dialogue, opinion, sentiment, argument, open data, E-participation

the analysis of the ICT environment and the components related to digital strategy of the Strategic plan 2018–2021 of the Hellenic Parliament [39] (Table 2).

**Table 2.** Evidence-based policymaking SWOT analysis.

<p><b>Strengths</b></p> <p>Satisfactory interaction with users</p> <p>Empowers citizens’ participation</p> <p>User friendly</p> <p>Integration of different features</p>	<p><b>Weakness</b></p> <p>GDPR ethical issues</p> <p>No accuracy of arguments</p> <p>NLP processing difficulties</p> <p>Time consuming</p>
<p><b>Opportunities</b></p> <p>Emerging markets</p> <p>Growing societies</p> <p>Web 3.0 research opportunities</p>	<p><b>Threats</b></p> <p>Niche market</p> <p>Similar software business products</p> <p>Advanced ICT technologies</p>

Despite the above-mentioned difficulties, the tool Suite can benefit from the fact that it is a unique product that aims to address specific audiences, including policy makers, advisors, governmental officials, NGO’s, academics, communication specialists, researchers and media institutions.

## 5 Validation in Parliamentary Settings

Complex applications require intuitive design and respective usability testing that can provide feedback to accommodate the proposed design. The specific problem of “too much data from many interaction modules” is tackled through collective problem severity identification by involving a mixed-initiative (as opposed to top-down or bottom-up) appropriateness selection of usability testing assessments and rules for adaptation. This approach contributes to the mitigation of the “observer effect”, which is one of the most pronounced problems in the design and testing of complex applications.

### 5.1 Use Case Scenario

Using the Evaluation Results, Hellenic Parliament Users participated in a study to validate a policy domain (in our case, Energy) with the aforementioned tools following the steps indicated in Fig. 5.



**Fig. 5.** Use case scenario deployment in the Hellenic Parliament.

**Table 3.** Use case scenario in the Hellenic Parliament.

Use case description	User	Relation to the policy stages
Create the ENERGY domain model	Domain author	Agenda Setting/policy formulation
Add terms on the domain	Domain author	Agenda setting/policy formulation
Load the domain	Domain author to policy scientific assistant	Agenda setting/policy formulation
Create the model for the “green energy” policy and “renewable energy” policy	Policy maker & policy scientific assistant	Policy formulation
Add policy components for the relevant policy	Policy maker/scientific assistant	Policy formulation
Load the domain model	Scientific assistant	Policy formulation/policy argumentation
Load existing policies on renewable energy	Scientific assistant	Policy formulation/policy argumentation
Get sentiment for the domain entities	Policy maker, policy advisor	Policy formulation/policy debating
Filter sentiment for the domain entities	Policy maker, policy advisor	Policy formulation/policy debating
Predict sentiment for the domain entities	Policy maker	Policy formulation/policy evaluation
Add new arguments for the policy component of the RES policy model as a key component in optimizing the policy model	Policy analyst/scientific associate to policy makers & standing committee	Policy argumentation
Upload new policy structure	Policy makers	Policy evaluation
Browse argumentation polarity	Policy makers & standing committee members	Policy evaluation
Filter argumentation polarity for the selected policy model	Policy makers & plenum	Policy evaluation
Predict the evolution of polarity for the arguments in the selected policy model	Policy makers & plenum	Policy evaluation

Table 3 lists the tasks, the target users that engage in the tasks and the respective policy formulation stages.

## 5.2 Results

Two rounds of evaluation have been conducted with 22 participants in total. MPs, governmental officials, scientific advisors, policy domain experts, researchers, administrators and policy consultants were part of the evaluation design, which included three phases. The goal was to evaluate the load of information presented in real time to the user in order to achieve completeness and informativeness in real time. The authors also evaluated the analysis modules and the integrated tool for policymaking before the general public. Furthermore, the participants were asked to fill in an online form after the end of all sessions (a typical procedure, performed in many research works [40, 41]). Each session was adapted to the feedback from the preceding one.

After presentation of the modules, the participants were debriefed on the interaction experience and system feedback, mainly on the visualization module and the authoring tool. Furthermore, an online questionnaire survey was compiled, and focus group discussions were organized to collect feedback and opinions, to better identify the necessary features of the proposed approach. The focus groups involved 4 Members of the Parliament, 3 politics-oriented advisors, 2 policy experts, 5 parliamentary officers, 4 policy analysts as scientific advisors, 2 Political Parties representatives, 2 interaction and content designers.

The main outcomes of these sessions were the following:

- The suite could use public consultation results from selective websites (e.g. Open-Gov.gr) directly and feedback from the legislative process (Stage 2 Policy Formulation)
- Missing transparency of the suite background process, such as which modules presented each set of results, accuracy, demographics and web sources reliability,
- Modules are more appropriate in post-legislative scrutiny [42] assisting the parliamentary control function (Stage 5 Policy Evaluation),
- Tool Suite and modules sustainability is an issue that the authors need to take care of based on the results of the SWOT evaluation.

However, the use of innovative ICT tools poses significant challenges to parliaments, many of which do not seem to be technology-affine [43].

The perception of individual participants was more or less positive, in a Likert scale of 1–5 they have provided the following validation results:

- Usability score: 3.59;
- Suitability to Policy Making score: 3.52;
- Technological readiness score: 3.19.

As a result, the users/stakeholders have acquired some knowledge of standard analyses and the social media analytics, but most have not yet been able to use them in a

highly successful manner or yet to incorporate them efficiently into their working procedures. These facts are also certified by recent research, as the aforementioned innovative approaches failed so far to widely involve important stakeholders, both on the policy and the society side, in the overall process [13]. Moreover, it is at hand that there are still many unsolved challenges regarding the use of ICT in policymaking. Such challenges do not allow policy makers to provide sustainable and inclusive decisions and citizens to engage in policy-making stages [44]. However, the use of state-of-the-art intuitive integrated tools such as the ones that have been demonstrated in this article has the potential to advance digital transformation of the policy cycle.

## 6 Conclusion and Future Work

This work reports on the need to fine-tune accurate analysis to efficient approaches to for collaborative policy formulation. The integrated tools included nine modules, the results of which had technical complexity requiring extensive user training sessions and several iterations of design prototyping, in order to ensure usability. The results of the investigated tool adaptation in the four Policy Cycle Stages, particularly during the Policy Formulation Stage where a lot of users/stakeholders are typically involved, appear to be rather limited. On the other hand, the market for crowdsourcing, consultation, data collection, sentiment analysis and argument extraction for Web 3.0 content is already quite developed and highly competitive.

Future work includes the use of the proposed methodology with recommender systems and especially incorporation in social related recommendation applications [45, 46] and combination with collaborative filtering techniques [47–50] in order to have flexibility on the users' perspective, their preferences and to capture inherent subtle characteristics.

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