Responsible AI in policy making: Policy simulations

Abstract:

This paper discusses how the involvement of AI can impact policymaking. Policymaking is a rigid and thorough process prone to human bias and error. In order to sift through bureaucratic processes and build on accurate decision making, policymaking models and simulations can be utilized. Alongside supporting literature on different steps of policymaking and AI integration, this paper also involves conducting quantitative primary research with Indian citizens, either in the field of law and politics or in other occupations and political awareness. Not only proper time, fund, and energy allocation is needed for the development of a democratic civilian, but a crystal clear process is also needed. A lot of money and time can be saved if major and underlying obstacles are identified and eliminated before the policy goes through the implementation stages.

Introduction:

The term "artificial intelligence" (AI) refers to the process of imitating human intelligence using algorithmic instructions that are embedded within software systems. It is possible to create a virtual model to understand or demonstrate the impact or mechanism of our products and ideas when AI is integrated with machine learning, which is another category of AI that comprehends a system that is built from data. This is made possible when AI is used to learn from data. During the process of experimentation and system analysis, simulation that makes use of artificial intelligence and machine learning can help save time, effort, and money. It is also possible to construct the simulation so that it depicts something that cannot be produced or obtained in the real world. These advantages lead us to insights, methods of risk reduction, and various other significant evaluations. The simulation has the potential to be utilized to present real-life systems and scenarios in a variety of domains, including but not limited to the fields of politics, medicine, architecture, and even armaments and transportation. The history of digital simulation dates back to World War II, when John von Neumann and Stanislaw Ulam developed the Monte Carlo method to approach uncertain events and possible decision-making. The MIT Servomechanisms Laboratory created the Whirlwind, arguably the first large-scale, high-speed computer, as part of a project for the US Navy under the direction of Jay Forrester. When the project started in 1944, it was initially meant to design an aircraft simulator during World War II, but researchers soon realized that the system was too slow and inaccurate. As a result of this, the simulation did not give a realistic enough feel for it to be used as a proper training method for pilots. (Kim) One of the simulation projects was the one that stood out in 2003. Linden Lab launched Second Life, a 3D-generated virtual game. Despite the significance of real-life social

interactions amongst the players in this game, it was not recognized as a social platform. The trajectory of simulation progress skyrocketed when the Oculus Rift was created in 2013. It was a watershed moment for technology fans everywhere. The then-cutting-edge Oculus Rift DK1 was not the first VR headset ever created, but it was the first high-quality yet affordable VR system available to the general public. (John #) Currently, we see a rapid increase in the usage of simulation across various fields. AI subfields like Large language models have facilitated the speed and convenience with which we can approach digital simulation LLMs such as ChatGPT can be especially beneficial in making solvers even easier to use. For example, if one of our engineers wanted to run a simulation about an electric car, they would first have to translate the specifications for different systems (e.g., battery, motor, charger, etc.), which requires a lot of time and expertise.

But with LLMs, anyone could write an English-language statement that simply states the desired outcome, such as “Design an electric car with a 2,000-mile range that goes from 0 to 60 mph in one second.” The simulation would automatically generate a multitude of solutions for the entire car, some of which the human mind might never have considered. (Hout) Alongside the adoption of AI in industries, the adoption of AI in administrative processes is becoming increasingly common. The use of simulations has a number of potential advantages, the most notable of which are an increase in the efficiency of operational processes and a reduction of any potential risks. As a result, I would like to discuss the use of artificial intelligence simulation to provide support to policymakers in this study. The purpose of this discussion is to determine whether or not public policymaking can be integrated with innovative thinking and decision-making, thereby offering the potential for optimized, evidence-based solutions to complex societal issues. The primary objective of this case study is to make a meaningful contribution to the ongoing academic conversation surrounding the responsible implementation of artificial intelligence (AI) within the policymaking sphere. This will be accomplished by conducting a comprehensive examination of the challenges and potential benefits associated with this particular undertaking. For primary research on this topic, I have conducted a Google survey to understand what people of various backgrounds know about policymaking, AI, and the integration of AI with policymaking. The insights and results extracted from this quantitative data would help us understand where do people stand when it comes to their awareness about policymaking.

Problem statement:

The policymaking process in India faces numerous challenges, which arise from the complicated bureaucratic structures, political breakdown, and widespread corruption within the system. Crafting policies that effectively address the needs of all regions and

groups within a country can be challenging due to its diverse sociocultural landscape and large population. The presence of income and wealth inequities, as well as limited infrastructure and administrative capacity, further complicates the implementation of effective policies. In addition, the actions of special interest groups, a lack of strategic planning, and strict rules can slow down progress. In order to effectively address these challenges, it is crucial for India to place emphasis on policymaking that is grounded in empirical evidence. Additionally, there is a need to enhance transparency, strengthen governance, and involve the public in the decision-making process. Simultaneously, it is crucial to tackle pressing issues such as education, healthcare, and environmental sustainability.

The central focus of the research revolves around the main challenge, which is the responsible and ethical application of artificial intelligence (AI) in policy simulations. More specifically, this pertains to the aspects of transparency, fairness, accountability, accuracy, and the mitigation of bias. It is crucial to acknowledge and tackle the challenges present in the policymaking process in India, as they have significant implications for the country's economic development, social equality, and overall welfare. Policies that are successful have the potential to promote economic growth, mitigate disparities, and cultivate a just and all-encompassing society. In addition, the implementation of transparent and accountable governance practices plays a crucial role in fostering public trust, reducing instances of corruption, and effectively allocating resources. Policymaking plays a crucial role in effectively addressing urgent environmental concerns and ensuring the protection of national security interests. In a nation characterized by diversity, such as India, the implementation of meticulously designed policies assumes paramount importance in fostering social cohesion and augmenting global influence. In order to improve the well-being of Indian citizens and strengthen India's global reputation, it is crucial to prioritize effective governance and proactive policy formulation. This entails ensuring the provision of essential services and fostering opportunities for economic growth and prosperity. As we discuss examples of Indian policymaking, Policy was made without enough debate before it was put into action; the views of one or more important parties affected by a decision did not seem to be fully considered or gathered before policy was made; well-thought-out decisions on issues that are not politically charged have been overturned at the eleventh hour, even when no new information or circumstances have come to light; and problems that were already known or could have been predicted while policy was being made appear. (Agarwal and Somanathan) When it comes to making ideal public policies, the following steps are followed:

Agenda Setting/Identification of Issues or Problems

- Before any policy comes into place, a problem must exist that will attract the attention of the government. Such problems must be defined and considered serious enough for government action.
- A public problem is a condition or situation that produces needs or dissatisfaction among people and for which relief or redress by governmental action is sought.
- There must be a prevailing dissatisfaction with the status quo.
- Policy formulation and adoption are not automatic; the issue or problem must first compete for space on the policy agenda.
- It usually scales several hurdles inherent in the policy environment.

Criteria for Identifying public problems

- Does the problem affect a larger segment of society?
- Do the affected people consider the condition a problem?
- Does the problem indirectly or remotely impact others?
- Can an individual action bring relief?
- Will government intervention be effective?
- Will the public accept the government's intervention?
- Is the problem tainted with civil disobedience?

Policy Formulation

- Policy formulation is the development of effective and acceptable courses of action for addressing issues already on the policy agenda.
- Effective: The policy proposed must be regarded as a valid, efficient, and implementable solution to the issues at hand.
- Acceptable: the proposed course of action must be authorized by legitimate decision-makers (politically feasible).

Policy formulators need to consider the following:

- Whether the proposal is technically sound
- Whether it is directed at the problem's causes
- How the intervention sought will solve or lessen the problem (outcomes)
- Whether it's budgetary costs is reasonable or acceptable
- Whether the proposal is politically acceptable

Policy Adoption:

- Comprehensive scanning, incremental scanning, and mixed scanning are all used to look at policy options in order to find the best one for solving the problem or challenge that has been identified.

- Factors influencing public policy choice and adoption include the following: preference of the society, party affiliations (party loyalty, manifesto, agenda, strength), constituency interest, natural factors, public opinion (public perception of policy issues), reverence, decision rules, and public interest (number of people to be affected).
- The final decision reached may have adopted any of the following decision-making styles: Bargaining (negotiation with peers to harmonize goals); Persuasion (winning others with facts and skills); Command (superior decisions binding on subordinates); Majority building (bargaining for numerical strength); Presidential Decision Making (actions taken for and on behalf of the country with appropriate approvals)

Policy Implementation

- Policy implementation is defined as 'what happens after a policy is adopted. Basically, it refers to all that needs to be done to carry out what the government has decided to do.
- Implementation constitutes the action part of the adopted policy and is critical to policy outcomes. Actors in the implementation process include: administrative agencies; legislative oversight; judicial enforcement of relevant laws on non-compliance; pressure groups through lobbying of administrative agencies; and community-directly affected people.
- It is worthy of note that policy implementation is shrouded in uncertainty because policies sometimes fail.
- This may be due to the following: political forces that disrupt implementation processes; a lack of resources; communication challenges between policymakers and policy implementers; and organizational misfits.

Policy Evaluation

- Policy evaluation is a systematic process for assessing the design, implementation, and outcomes of public policies. It is the final stage of the policy process.
- It includes appraisals of policy's content, implementation, goal attainment, and other effects by official and private evaluators. It can occur at any time in the policy process; it looks backwards and forwards, as the case may be.
- Usually, policy impacts (policy output and policy outcomes) are evaluated.
- Challenges of policy evaluation include: Uncertainty over policy goals; Difficulty in determining causality; Diffuse policy impact; it is difficult to evaluate unintended impacts; Difficulties in data acquisition; time constraints; lack of influence

Conclusion:

- Public policies are the decisions of the government on any problem or issue and are usually complex, as issues may not make it to the agenda.
- Understanding the process will enrich the citizenry and should provoke active participation.
- Every stage of the process is important, and policies may succeed or fail.
- The good news is that with better understanding of the public policy process, we can influence the process positively and perhaps differentiate between whether the government is slow or the process is complex. (Silvasahu #)

  The use of AI simulation has the potential to greatly improve the entirety of the public policy process, encompassing various stages such as agenda setting and policy evaluation. With the help of data analysis and predictive analytics, artificial intelligence (AI) can find new problems, rate how serious they are, and predict future patterns, which makes setting priorities easier. Additionally, the analysis of public opinion and demographic data can aid in establishing criteria for problem identification. Within the context of policy formulation, AI-driven tools can be used to simulate the potential outcomes of various policy options. These tools take into account factors such as cost-effectiveness, feasibility, and political acceptability. In the context of policy adoption, artificial intelligence (AI) undertakes the task of analyzing the preferences of stakeholders and providing real-time support to decision-makers. During implementation, artificial intelligence (AI) can improve the efficiency of workflows, make sure that resources are used well, track progress, and suggest ways to make things better. Using artificial intelligence (AI) to study and rate the results of policies, find connections between policies, and give useful information for future policy-making is what policy evaluation is all about. Most of the time, using AI simulations gives policymakers evidence-based information that improves operational efficiency and the effectiveness of policy implementation. It is important to note that ethical considerations hold utmost significance in this context.

Solution

Building real-life scenarios backed by accurate data can be vital in the process of assessing raw and truthful problems in society. Targeting an audience for research, asking the right questions, and the ideation process with a potential policy proposal can become a seamless and time-effective process. And such is possible through AI simulation.

An integral part of policymaking is policy modeling. Policy modeling can be defined “as an academic or empirical analytical research work that is supported.”

Engaging policymakers and other stakeholders in the modelling process increases the chance of the model’s impact on policy output (Susser et al. #)

One of policy-evaluating analytical tool is “Policy Modeling Consistency (PMC-Index).” The following factors are considered while evaluating policy modeling with this tool:

Definition and classification of policy modeling

"Policy modeling" is "an academic or empirical research project that uses different theories, as well as quantitative or qualitative models and techniques, to look at the causes and effects of any policy on society, anywhere and at any time in the past and future." As an integral part of this definition, “policy” is defined as “a theoretical or technical instrument that is formulated to solve specific problems affecting, directly or indirectly, societies.

Multidisciplinary approach

In the 30 years from 1979 to 2009, 1501 papers were published in JPM. Most of them were about benefit/cost analysis, probabilistic or forecasting analysis using econometric methods, and the use of secondary data from both micro and macroeconomics. Also, among these 1501 papers, and for the past 30 years, there has been an increasing dependency of policy modeling on econometrics models, methods, and techniques. Ninety-seven percent (97%) or 1456 of these

The Policy Modeling Consistency Index (PMC-Index)

With the Omnia Mobilis assumption, this paper proposes the “Policy Modeling Consistency Index (PMC-Index) as a tool to evaluate policy modeling. This purpose-built index performs the following functions: (i) to evaluate the consistency level of any policy modeling; (ii) to identify the strengths and weaknesses of any policy modeling.
The construction of the PMC index involves the use of fifty (50) sub-variables distributed among ten (10) main variables. These 10 main variables are: ($X1$) types of

Application of PMC-Index and PMC-Surface: an example

The PMC-Index and PMC-Surface were used to show how they work in this paper by using three policy modeling examples from three different JPM papers (Paper 1). The first is the paper entitled 'the Korea unification: how painful and costly' (Paper 1), authored by Ruiz Estrada and Park (2008). The second paper is 'the openness growth monitoring model' (Paper 2), authored by Ruiz Estrada and Yap (2006). The third paper is 'the trade liberalization monitoring model' (Paper-3) (Estrada #)

Modeling and policymaking:

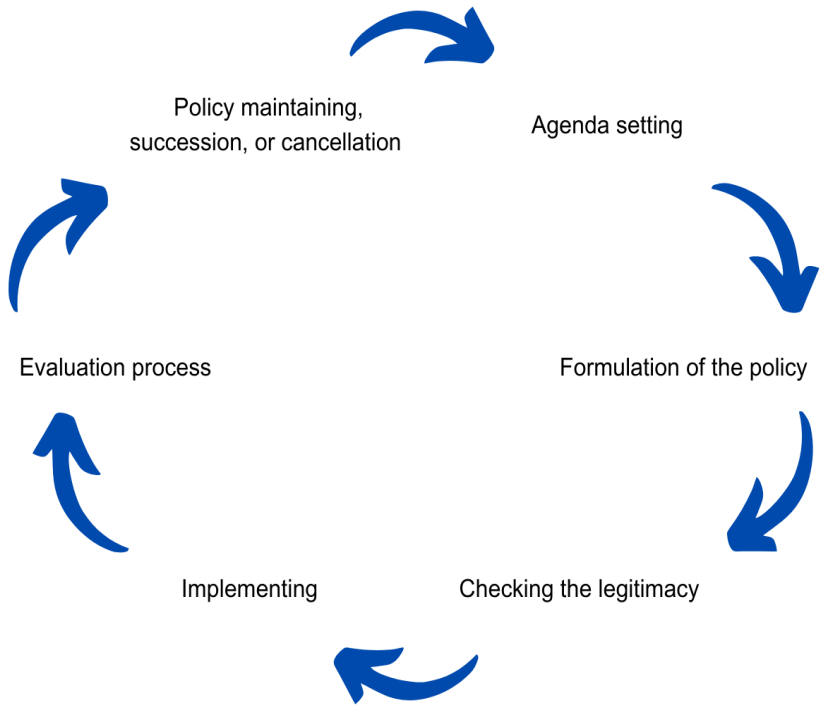
The application of models in policymaking is characterized by several challenges from the perspective of modelers and policy users [22], [23], and [24]. Many of these problems include models not being able to answer specific questions that users need answers to [22], models not being clear about what they do [25], policymakers not trusting models, models not being able to help with decisions quickly [26], institutions not being able to use complex modeling [27], and a lack of diversity in who is involved in making decisions or changes [22].

Engaging policymakers and other stakeholders in the modeling process increases the chance of the model's impact on policy output [26], [27], [28]. As a result, many formats of stakeholder-informed modeling, such as participatory modeling, group model building, or participatory simulation, exist. Policymakers and other interested parties can be a part of these kinds of processes at different stages of model development, from gathering data to building and validating the model to figuring out what the results mean and how to use the model [29]. This kind of involvement can make it more likely that models will answer the exact questions that policymakers are asking. It also makes it easier for policymakers to control the modeling process and steer modelers toward producing the results that policymakers need to support their already held beliefs [14] or to defend decisions and proposals that they have already made.

There is very little knowledge about the influence of policy on modeling. From science-policy relations research, we know that politics can generally shape research, especially in commissioned work [30]. Policymakers ask modelers to do work, which means that policymakers and modelers work together in some way [5, 23]. However, more research needs to be done on how and how much policymakers affect modeling. (Susser et al., #)

Policy cycle model

The policy cycle is the most optimal model through which policies are made, put into action, and evaluated. It is usually described in six stages, which are: agenda setting, policy formulation, adoption, implementation, evaluation, and policy maintenance. It is understood as a cycle, as the outcome of the implementation of the policy will help in determining any alteration in the existing policy or the creation of a new one.



The stages of a policy cycle are as follows:

A. Agenda Setting: In this stage, the issues that are in need of government action are brought to the attention of policymakers, and various aspects of these issues are assessed; the most concerning areas are prioritized. This assessment is helpful in determining the objectives of the policy. The definition of problem setting is always contestable and depends on the ruling government's ideologies, their view of benefits, and prejudice. One of the main problems with policymaking in India is the fragmentation of the structure. The Planning Commission was an institution in the Government of India that formulated India's five-year plans and was then replaced with the NITI Aayog. The legislature then approved these plans. However, with the passing of the years, more power has shifted into the hands of the executive. Other than this, India has adopted the parliamentary form of democracy as a quasi-federal structure of governance, which means that there are various levels of hierarchy to be considered before setting objectives. Such fragmentation fails to recognize that actions taken in one sector have serious implications for the future and may work at cross purposes with the policies of

the other sector. Besides, it becomes very difficult, even for closely related sectors, to align their policies in accordance with a common overall agenda.

B. Policy Formulation: This is the stage that gives structure to the policy. Goals are set, costs are determined, policy instruments are chosen, possible effects are evaluated, and stakeholders are established. Multiple solutions are put forward, with consideration of meeting objectives within established limitations. Public policy is often prepared without sufficient input from sources external to the government and without adequate examination of the issues involved. Some of the best experts in many fields work outside of government. However, the government's policy processes and structures do not have good ways to get input from outside sources. Because they are not involved enough and sometimes different solutions with different effects are not considered in the best way possible, this can hurt the groups that the policy affects. Before converting policy proposals into policies, a number of analyses, like cost-benefit analysis, economic forecasting, operations research and systems analysis, and budgeting analysis, can be run using up-to-date data. The success of the policy may depend on the views of those it will affect.

C. Adoption or Legitimation: This is the stage of decision-making where the best solution is chosen from amongst the different solutions that vary based on the policy instruments used. This approval of the policy may come from various sources—legislative, executive, in tandem with interest groups, or from referendums. Policies require approval from various levels of the government before being adopted. India’s federal structure makes demarcations for certain legislative powers and duties; that is, the power to make laws on certain subjects is divided across Centre, the States, or both. However, the Center frequently decides on the financial requirements for the autonomy that states receive. Friction or differences in understanding between the States and the Center can also prove detrimental to policymakers when certain States refuse to follow the mandate of the Center.

D. Implementation: This is with regard to how the policy will be put into action. This often means creating working networks where actors, resources, and knowledge are connected. This may involve clear communication with the required agents, such as executive public bodies like the Ministry of Human Resource Development, or creating, say, an organization to implement policy decisions. These agents will have to account for the usage of resources, whether monetary, human, legal, or the like.

Monitoring implementation is another important part of this stage. Proper implementation is critical to the success of any policy’s objectives. This means establishing a clear chain of command and putting effort into its coordination and

control. This can come at great expense to the government. The successful implementation of social sector schemes requires a high degree of political commitment and administrative coordination.

E. Evaluation: The government assesses the effect of the implemented policy at this stage. This is to determine how successful the policy was, its impact, and whether it has been implemented correctly. This can be difficult to evaluate as the policies may have several objectives to meet. There may also be multiple ways to measure the impact, which can lead to different evaluations of its effectiveness depending on the standards of measurement used. Under the current government, NITI Aayog actively monitors and evaluates the implementation of government programs and initiatives.

F. Policy Maintenance, Succession, or Termination: This stage determines whether the policy is to be maintained by improving or further developing it. Often, if problems are identified with the current policies, they are either modified or terminated. Using the example of the Right to Education Act, the Center is currently considering the extension of the Act to cover students until class 12, where currently covers students until class 8. (Pappachan, 2019)

Models have helped policymakers explore unknown futures, set appropriate targets, and assess policy options for reaching these targets. In some cases, the use of models goes beyond being mere “number generators” [3], towards ‘negotiation tools’ for policymaking processes. But we also see that in most of the cases we have looked into, the models help make decisions, but the decisions are made with model results as one of many inputs, especially in the later stages of negotiations. Therefore, models inform but do not make decisions. (Susser et al., 2021, #)

We also find real-world examples of models that change policy, especially when it comes to "acceptable" questions, scenarios that need to be looked into, and outputs that need to be made. In all investigated cases, and presumably in general, policymakers retain control over the exploitation and political use of the results. Therefore, models do not dictate policies. Our findings show that policymakers have an impact on modeling, mainly in the early stages, like when the model study plan is being made, by working with modelers to define problems, goals, assumptions, and input data. In almost all of our cases, governmental organizations have commissioned the modeling, and this commissioned work may generally be more susceptible to policymakers' influence. (Susser et al., 2021, #)

Using a systems approach with dynamic simulation modeling can help you map, visualize, and quantify a complex system. It can also help stakeholders talk about it [26] and find key points where you can make a difference. Leverage points are those places

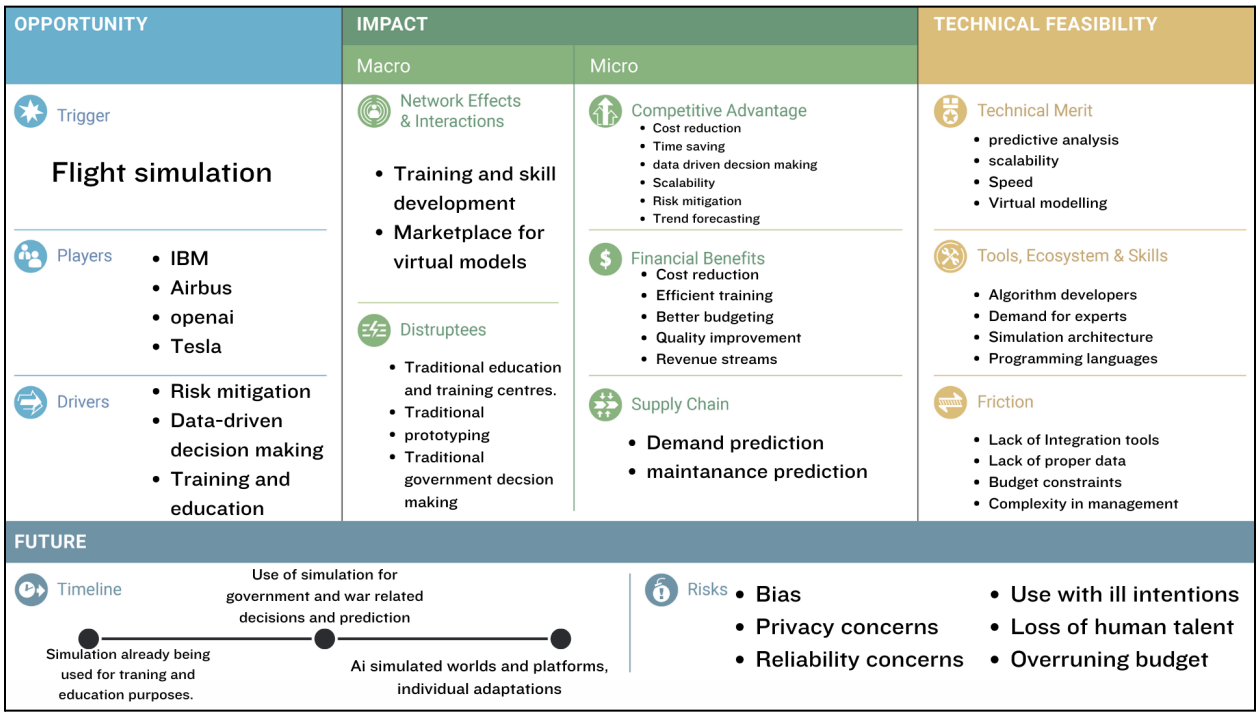
in a system where a small shift can create a large impact [27]. Traditional reductionist research methods, which look at the relationships between different parts of a system separately [28–30], make it hard to find leverage points in complex systems. Also, it is hard to figure out what direction of change is needed to get the result you want without fully analyzing and comprehending the system and how it works [27, 31]. (Freebairn et al., 2016, #)

System dynamics modeling has been used to show how common a disease is, what factors put people at risk, and the local situation. It has also been used to simulate the health effects of interventions, which has helped many people in the community work together on prevention [34]. One example is Loyo et al. [35], who used a stakeholder engagement process to create a system dynamics model that could simulate how different interventions would affect the outcomes of chronic diseases. The model was used to illustrate which interventions were the most effective leverage points in the local context or system and, therefore,mobilize the prevention efforts of community stakeholders [35]. (Freebairn et al., 2016, #)
Participatory modeling methods, like the one Loyo et al. [35] talked about, can help us understand problems and come up with good solutions in the health sector [36, 37]. Participatory modeling, first and foremost, helps community stakeholders understand how multiple variables, factors, and interventions interact. Secondly, modeling can test the potential impact of programs and policies on the'safety' of a virtual environment before they are implemented, saving time, effort, and costs. Thirdly, modeling demonstrates the potential secondary and tertiary effects (and even unintended consequences) of intervention strategie Modeling prioritizes data collection and facilitates dialogue among stakeholders [36]. (Freebairn et al., 2016, #)

Participatory simulation modeling involves people from different fields working together to build a model. It can be used with a number of different modeling approaches [31, 37, 38]. The benefit of this involvement is that it helps people come up with a shared mental picture of the system's causal pathways and possible points of intervention [39]. (Freebairn et al., 2016, #)

A participatory modeling approach enhances stakeholder knowledge and understanding of the system and its dynamics in varying conditions. It finds and describes difficult and controversial issues in the real world [33] and the effects of possible solutions, which makes it easier to come up with action plans based on facts [39, 40]. The involvement of key decision-makers in the model development and validation increases their sense of ownership and confidence that the model is valid for their local context. They are therefore more likely to draw on the outputs to inform decisions about priority interventions and policies [23, 37, 39, 41]. (Freebairn et al., 2016, #)

To know more about simulation-based policy creation It is important to understand simulation technology and all aspects surrounding it.



The emerging technology analysis canvas represents that there are present risks and benefits of the AI simulation. With the use of supporting infrastructure, expertise, and accurate data, AI simulation can revolutionize decision-making, modeling, and forecasting. There is a possibility that progress in AI simulation can increase adoption on an individual level and scale industries and real-life scenarios of simulation.

Now that we know the scope of AI simulation in policymaking, let us delve into how we can approach the next step in policy design with the help of AI, which is scenario design.

Scenario analysis

Policy is seen as a process by which decision-makers Decision-makers use the instruments under their control to approach the general goals of society. Models can help to choose instrument settings, evaluate policy options, and assess their appropriateness to a particular situation. But they cannot design policy; the interactions between policymakers and models are critical if modeling is to be useful in the policy process. Policy models need to take into account both the real-world factors that affect and limit decisions and the main issues that lead to analyses. These include the actors within the system as well as the geographic and disciplinary contexts of the problems.

Scenario-writing provides a way of ordering understanding and judgment about different phenomena to help users interact most effectively with a model and to insure that the perspectives of the model are most appropriate to the needs of the decision-maker. It is an iterative and evolutionary process that can provide a great deal of insight into the assessment phase of policy design. (Clapham et al., n.d., #)

Scenario specifications

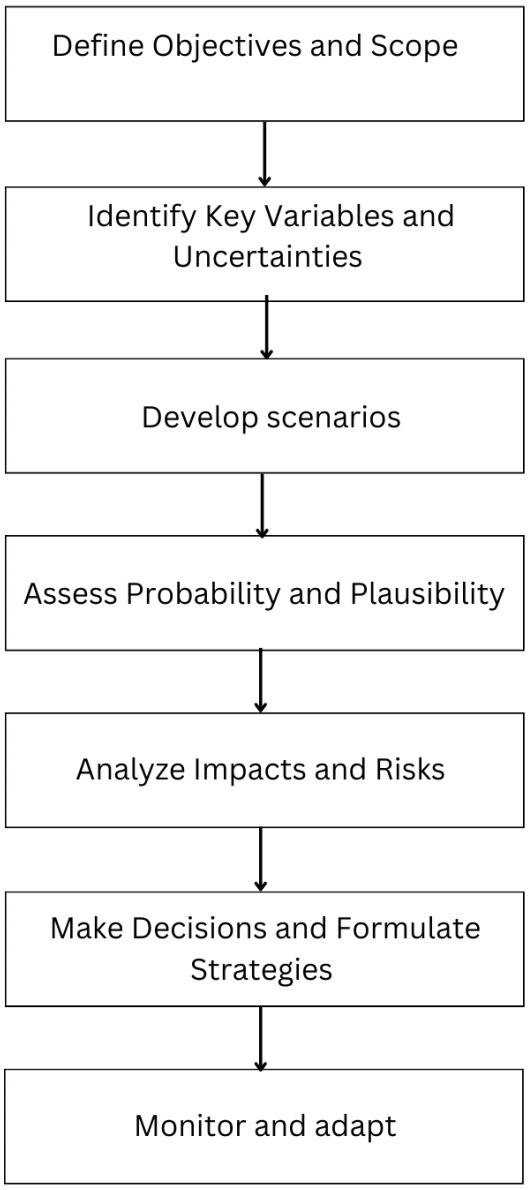
The scenario specification process can be summarized as shown in Fig. 9. The basis of the analysis is the motive scenario, a set of motivations that determines the purposes, directions, and boundaries for the analysis. These goals can be regarded as the problem set. Once the motive scenario is chosen, a set of preferred strategies and tactics is determined for the actors who are considered in the analysis, and the instruments and instrument settings are chosen. A specific scenario comprises a set of instrument settings that are thought appropriate to realize the motive scenario. In principle, an infinite number of specific scenarios might correspond to any motive scenario, and in practice, the number may be very large (Biswas, 1975). The analyst must generate a large number of possible scenarios and filter out all but the most useful. The mechanism may be entirely intuitive, or it may involve the use of special techniques. The result of this is a relatively small number of scenarios, which will actually be assessed using the simulation model. To enable the computer to handle the scenario, implementation first requires model input. reflecting thepolicymaker This is possible only to the degree that the parameters of the model are appropriate "handles" for policy actions. The various elements of the policy set must be identified with model variables and then translated into numerical inputs. When the input set is complete, the model can be run, and the output reflects the calculated responses of the system to the policy actions simulated by the inputs. Any scenario then consists of an input set reflecting the actions of the policymaker and an output set reflecting the behavior of the system. This relationship is summarized in some detail in Fig. 10. After the model has been run, the results must be interpreted, both for the performance of the policy scenario and for the adequacy of the model (Clapham et al., n.d., #)

Scenario analysis

Steps:

1. Define objective and scope
   - Objective
   - Scope
2. Define uncertainities
3. Develop scenarios
   - Create
   - characterize
4. Assessment
   - Probability
   - Plausability
5. Risk and impact
   - Risk assessment
   - Impact analysis
6. Decisions and strategies
   - Decision making
   - Strategy formulation
7. Monitor and adapt
   - Track changes
   - Adjust

Diagram:



Computer simulation models can process vast quantities of information, data, and judgments to bring them to a form useful for policy assessment and design. That is their power, but unless they are constructed and presented so that they can be used, they have no role whatsoever. Model-building is a highly dynamic process where the state of a model at any point in time is determined by clients, model-builders, and technical factors such as the information available to both and the available computer capacity. The key to the usefulness of policy-oriented simulation models is the relationship between the model-builder and the policymaker. Some care must be given to building this relationship early in the exercise. The model-builder must understand what the policymaker needs, and the latter must have a feeling for what the former can provide him with and how it will fit into his decision-making structure. Neither of these points can be generalized. The policymaker may need help assessing the differences between available options, getting a feel for the wider implications of options he has already chosen, or designing new and unique options. But what he needs depends on the nature and dynamics of the particular problems at hand as well as on his own personality and position. In the same way, model-builders can deliver advice, predictions, projections, or interpretations at varying levels of sophistication and detail. These are also in accordance with their personalities and backgrounds. Policy modeling is an iterative process. The model-builder must proceed on the basis of tentative understandings of the system as the policy maker sees it, and his view of the system and the nature of the model he builds are updated through interactions with his client. These understandings must be tentative, both because complex policy systems in the real world are constantly changing and also because it is unrealistic to expect that a model-builder's perception of the system is good enough to build the right model the first time. (Clapham et al., n.d., #)

Role of AI in Policy Simulation and Modeling:

The term artificial intelligence (AI) refers to the system in which simulation is used to imitate the intellectual behaviors of human beings. Simulations are the most important technical aspect of training the dataset in an enriched way. For instance, simulations in self-driving would result in real-time congestion images, which would be trained for semantic segmentation.

- **Computational Biology and Bioinformatics**
    - Simulations are exposed in a wide range of ways in this process
- **Robotics**
    - A simulation system is used to improve the automation system in the fields of evaluation of the geometry, planning of motions, cooking, wall painting, satellites, robots for industry and domestic uses, and so on

- **Deep Neural Systems**
    - Neural network system activities such as handwritten identification, pattern identification, and face/character identification
- **Probabilistic inference**
    - Reinforcement learning, decision making, sorting out of problems, Bayesian models, kernel methods, graphical / 3D models
- **Computer Vision**
    - Drilling, graphical data management, assimilation of earth figures, and identifying the activities of humans in the space areas
- **Distributed Computing Framework**
    - Cluster Management
    - Scheduling
    - Data Management

The areas listed above are **significant areas of artificial intelligence systems because of their incredible performance**. Managing the artificial intelligence in the simulation needs some knowledge in the relevant fields.

Steps in AI simulation:

- Step 1: Detect the issue
- Step 2: Frame the issue
- Step 3: Gather the real-time data for progression
- Step 4: Model and enhance the AI system
- Step 5: Corroborate the AI system
- Step 6: Choose a relevant model for research
- Step 7: Frame research conditions/rules
- Step 8: Execute the simulation
- Step 9: Showcase the outputs
- Step 10: Refer additional actions

AI techniques for simulations and modeling:

- Tree AI Techniques
    - Boosting
    - XGBoost and AdaBoost are examples of Boosting tree techniques
    - Random features are constructed to compromise complexity
    - Random Forest
    - Random feature sub-branches are constructed to compromise the trees
    - Bagging
    - This is an accumulation of bootstraps and it is similar to the random forest

    - Decision Trees
    - Simplified binary approach
- Math Equation Techniques
    - Neural Network
    - Multiple Neurons are used to retrieve the optimum result
    - Support Vector Machine (Kernel)
    - Non-linear data separation approach
    - Support Vector Machine (Linear)
    - Key data-based complex equation approach
- Data Comparison Techniques
    - Naïve Bayes
    - Probability-based moderate complexity data comparison approach
    - K: nearest neighbors
    - A distance-based, simplified data comparison approach
    - Kernel Logistic Regression
    - This is also a non-linear data separation approach
    - Logistic Regression and Perceptron
    - Simplified equation approach

Simulation tools for AI

- **Matplotlib**
    - This tool is utilized to build charts, 2D plots, histograms, and other allied graphical representations
- **Tensor Flow**
    - Tensor Flow is widely used in artificial neural networks with the help of deep learning configurations and training
- **Pandas**
    - This is an effective tool for retrieving data from external databases, such as Excel and Word, and it permits the filter and accumulation of huge datasets for investigation
- **Scikit-learn**
    - This is the basic tool of machine learning algorithms such as regression, logistical and linear regressions, its classification, and clustering
- **Keras**
    - Keras tools make use of the system's CPU and GPU for the speedy computations of the deep learning concepts and their prototyping

These are the five important tools used in the simulation process for **effective interfaces and configurations**. Apart from this, we can use tensor flow models such as pre-trained **TensorRT deep learning models, OpenCV, Python, and NVidia**.

Artificial intelligence can run with Python's open-source libraries and plugins. Besides, make use of hyperspectral imaging to leverage and configure the neural networks. (*AI in Modeling and Simulation [Experimental Comparative Study]*, n.d.)

Primary research

For primary research, a Google survey titled “AI in Policymaking” was distributed. We will be studying the input of over 60 people who have filled out the survey. The main intention behind this was to understand people’s stances when it comes to policymaking, AI, and their integration. When it comes to social welfare policymaking, it is important that citizens are aware of their right to ask for policies with a positive impact on society. But even in our democratic system, public participation is not given importance. Policies are made by people out of touch with the relevancy or outdated collection of the research, and hence, it is important to figure out whether people even contribute to policies that are going to affect them. Then why? If yes? Do they think the integration of AI would help the policymaking process when it comes to their participation and other important aspects of the process?

1. Methodology:

The process starts with defining the objective behind the survey, followed by identifying the target audience, which in this case was between the ages of 0-90 years. People from the law background, political background, or other occupations are politically inclined and unpolitical. The question structure was fairly consistent throughout the survey and consisted of rating the understanding of the particular topic from 1 to 10 of no understanding or seamless understanding. On this basis, the Google form was made with the following description: “This form is created to understand people's understanding of AI, policymaking, and how integration of AI can help to create better social welfare policymaking.” Later, the survey was created, tested for glitches and other errors, and links were shortened. The form was sent to multiple WhatsApp groups. The groups were third year college students and senior citizens, as well as forums made to discuss failures of policies regarding the rehabilitation of residential establishments.

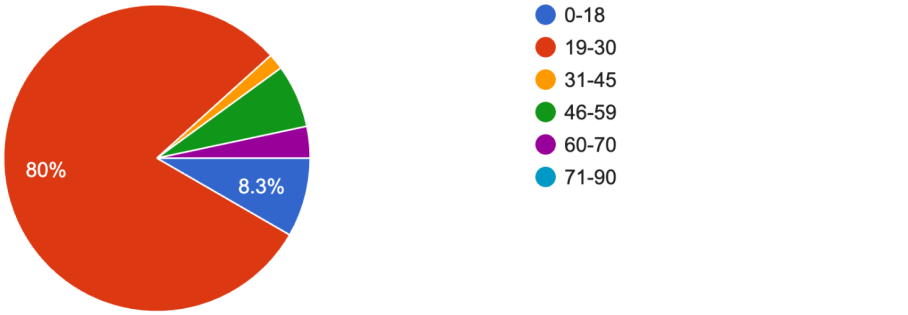
2. Objectives:

- Measuring awareness when it comes to AI, policymaking, and their integration.
- Figuring out the stance on policies made till now.
- To measure the importance of public participation.
- To see if the audience leans towards the integration of AI in policymaking or not.

3. Results:

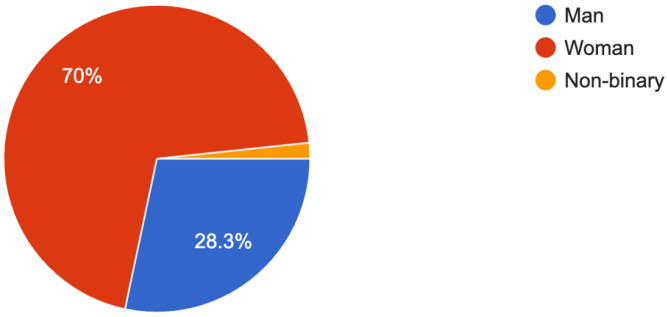
Age:

60 responses



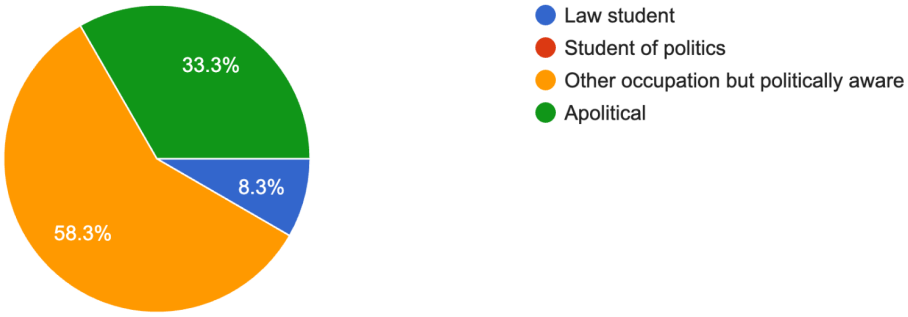
Gender:

60 responses



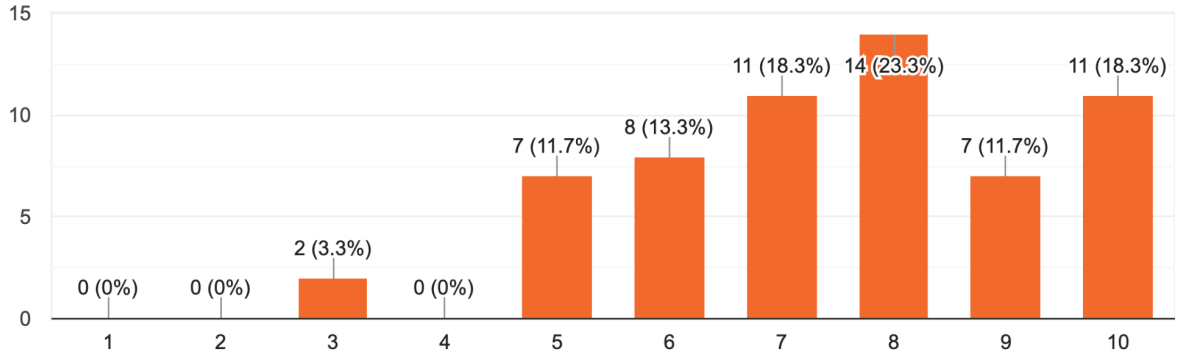
Select what describes you the the best

60 responses



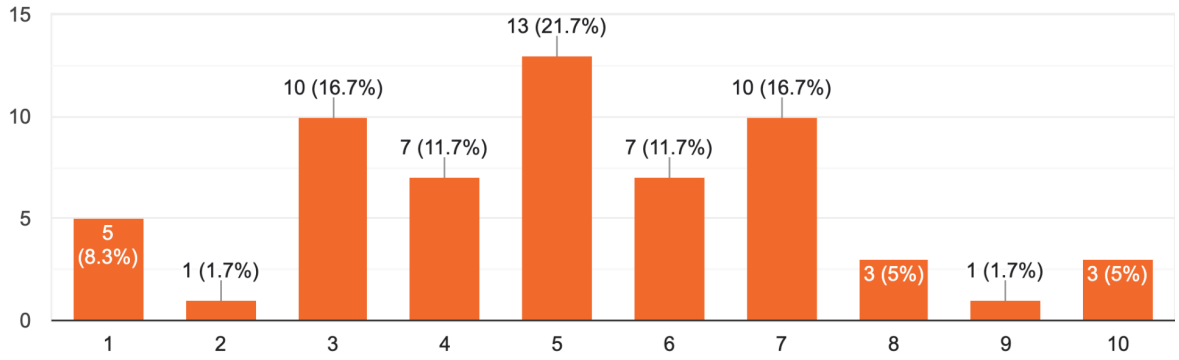
On a scale of 1 to 10, how well do you understand the potential of AI

60 responses



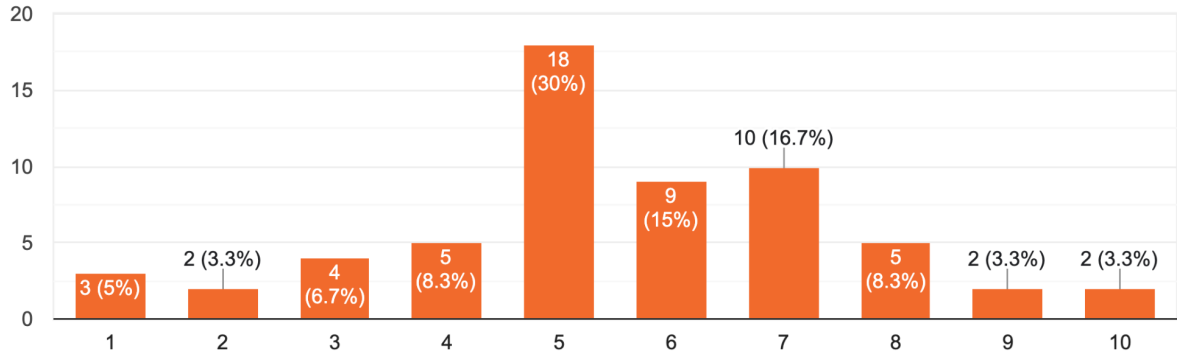
On a scale of 1 to 10, how well do you understand the policy making process?

60 responses



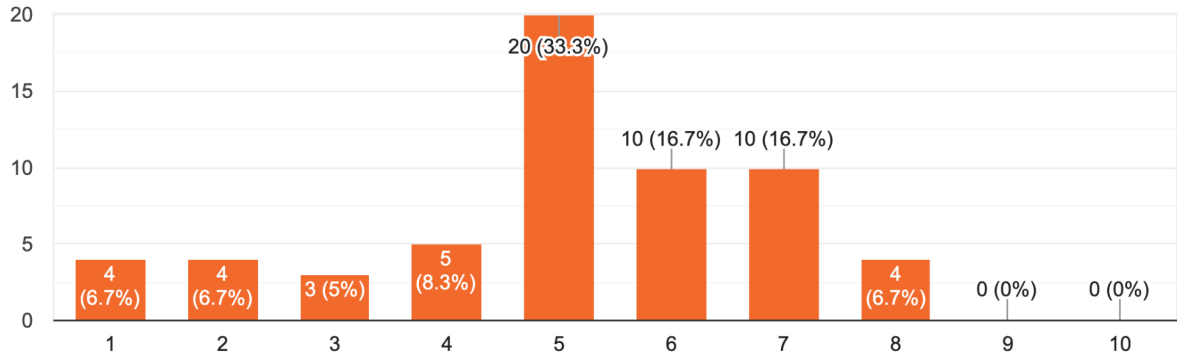
On a scale of 1 to 10, how effectively do you believe AI can be utilized in current policymaking processes?

60 responses



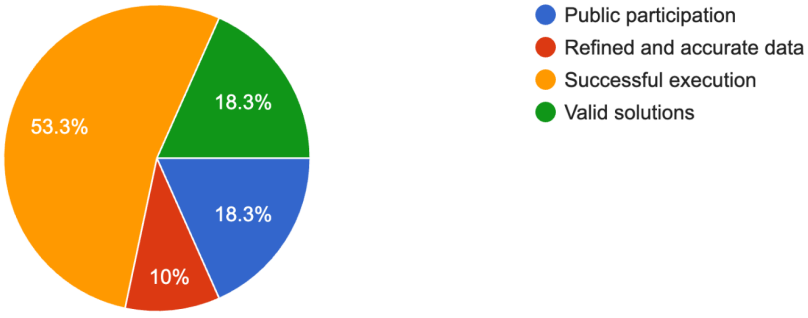
How would you rate the success of Indian social welfare policies created till now.

60 responses



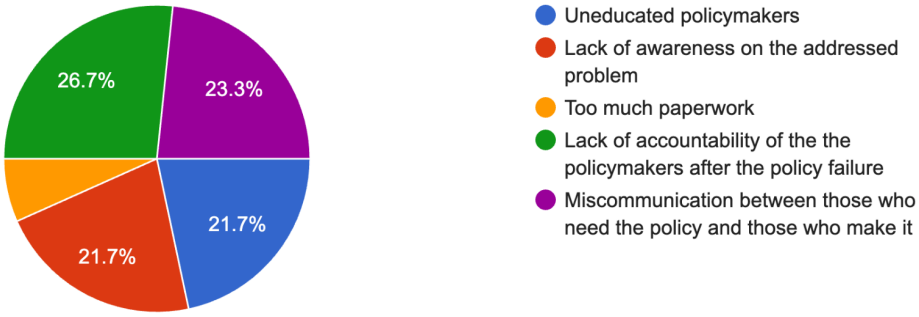
What according to you is lacking in policymaking processes in India?

60 responses



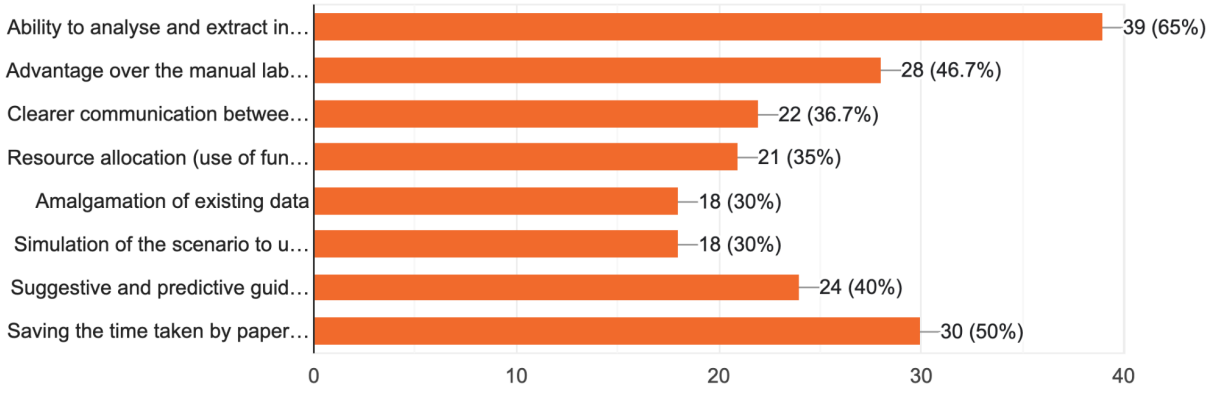
What according to you harms the policymaking process the most?

60 responses



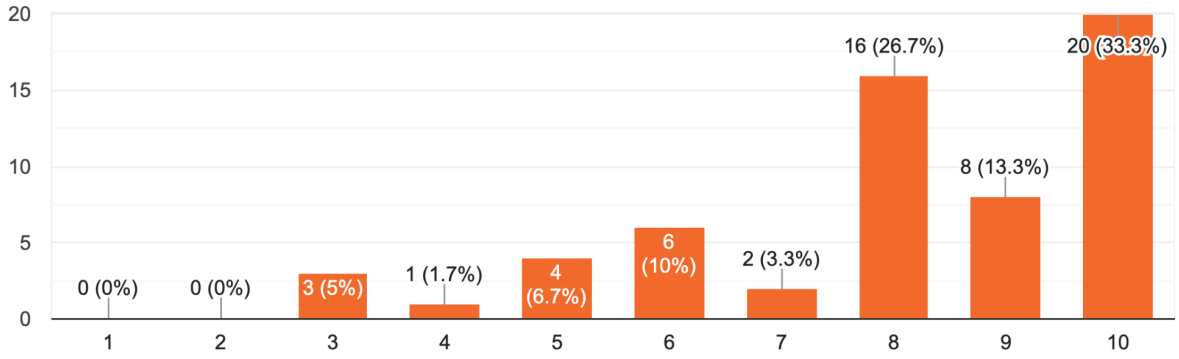
Select all the boxes with which AI can facilitate the process of social welfare policymaking:

60 responses



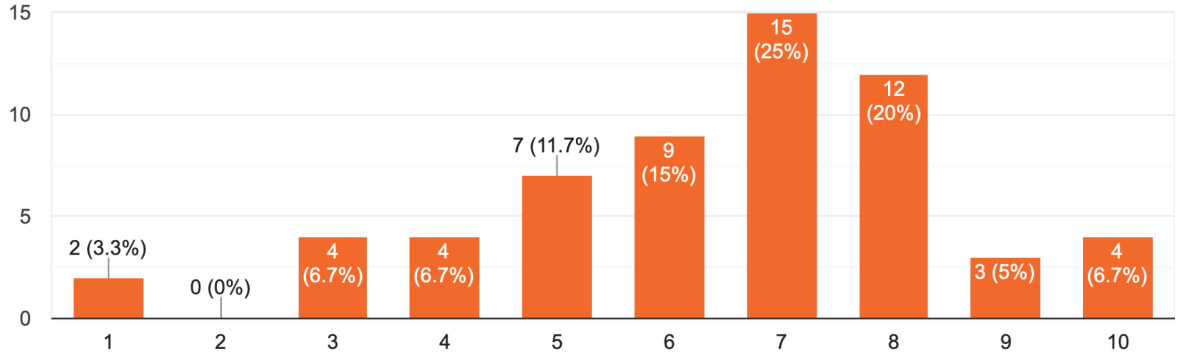
On a scale of one to ten how important is public participation and engagement in social welfare policymaking

60 responses



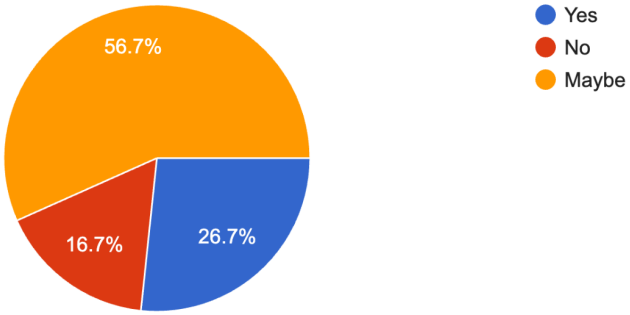
How strongly you believe that AI would change traditional training and decision making processes

60 responses



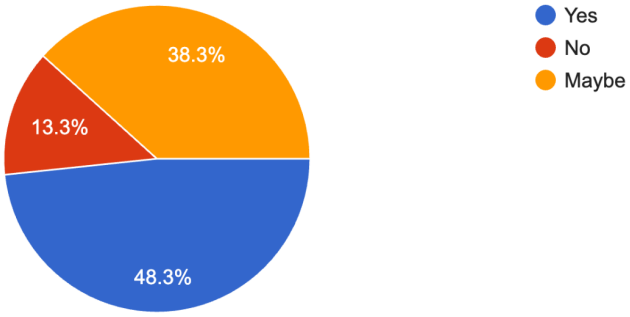
Do you think integration of AI would help to mitigate bias in policymaking?

60 responses



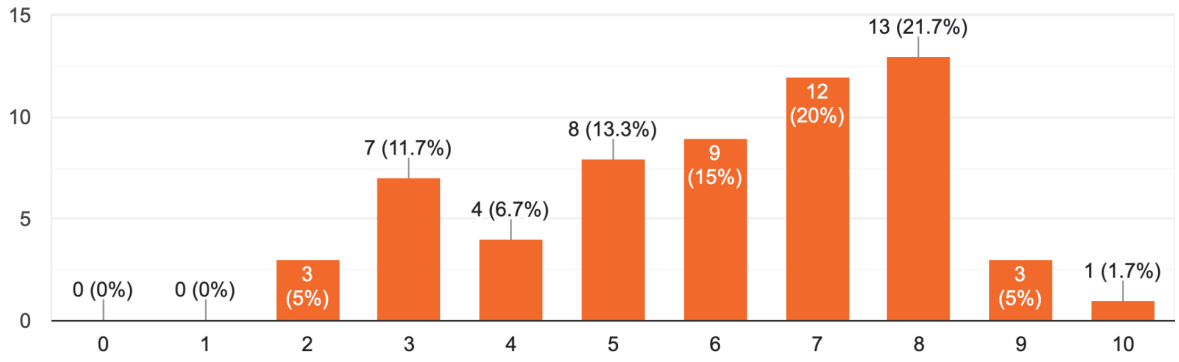
Do you think integration of AI would provide more transparency in the process of policymaking?

60 responses



This is the process of policymaking. According to you how enhanced do you think this cycle will get upon the successful integration of the AI?

60 responses



4. Insights:

    - The average understanding of AI of a respondent is 7.2 on a scale of 1 to 10.
    - The average understanding of policymaking of a respondent is 4.6 on a scale of 1 to 10.
    - The average belief in effectiveness of AI in policymaking among respondents is 5.4 on a scale of 1 to 10.
    - The average rating for success of Indian social welfare policymaking is 5.0 on a scale of 1 to 10.
    - "Miscommunication between those who need the policy and those who make it" was chosen by 40% of the respondents.
    - 32% of the respondents chose "uneducated policymakers."
    - Out of 8, respondents selected 4.6 options regarding the facilitation of social welfare policymaking by AI.
    - The average importance of public participation is 7.2 on a scale of 1 to 10.
    - 52% of the respondents believe that integration of AI in policymaking would help mitigate the bias.
    - 60% of the respondents believe that integration of AI in policymaking would help to provide more transparency in policymaking.
    - People think that cycle of policymaking process would be enhanced by 6.2 on a scale of 1 to 10 with the integration of AI.

5. Analysis:

- The familiarity of respondents with AI seems to be on the higher side but declines when understanding of policymaking is considered.
- A cautious optimism is noticed amongst the results when it comes to respondent's beliefs in the efficiency of AI integration in policymaking.
- Uneducated policymakers and miscommunication between citizens and policymakers rank higher when it comes to the consideration of what goes wrong with policymaking in India.
- Respondents are firm in their belief that public participation is important when it comes to policymaking.
- They also believe that with proper integration of AI in policymaking, bias can be mitigated and better transparency can be provided.

6. Validation:

- United States, Europe, China, and Canada have opted for AI when it comes to strategy formulation:
    1. Healthcare: FDA Using AI for analyzing images for diagnostic purposes. (*Artificial Intelligence and Machine Learning (AI/ML)-Enabled Medical D*, 2023)
    2. City of Hangzhou is using AI for urban planning. (Cugurullo, n.d., #)
    3. NHS (National Health Services) is integrating public participation to shape healthcare policymaking. (*NHS England » Public Asked to Shape Future Use of Health Data by the NHS*, 2023)

AI, simulation, and used cases:

The AI found an early result that was 16% more fair than a cutting-edge progressive tax framework studied by academic economists in terms of both increasing productivity and making sure that everyone had the same amount of money. The improvement over current US policy was even greater. “I think it's a totally interesting idea,” says Blake LeBaron at Brandeis University in Massachusetts, who has used neural networks to model financial markets.

Can you learn much from only four AI workers? In theory, yes, because simple interactions between a handful of agents soon lead to very complex behaviors. (For all its complexity, Go still involves only two players, for example.) Even so, everyone involved in the project agrees that increasing the number of workers in the simulation will be essential if the tool is to model realistic scenarios.

Gaming the system

The double dose of AI is key. Neural networks have been used to control agents in simulated economies before. But making the policymaker an AI as well leads to a model in which the workers and policymaker continually adapt to each other’s actions. This dynamic environment was a challenge for the reinforcement-learning models since a strategy learned under one tax policy may not work so well under another. But it also meant the AIs found ways to game the system. For example, some workers learned to avoid tax by reducing their productivity to qualify for a lower tax bracket and then increasing it again. The Salesforce team says this give-and-take between workers and policymakers leads to a simulation more realistic than anything achieved by previous models, where tax policies are typically fixed.

The tax policy that the AI economist came up with is a little unusual. Unlike most existing policies, which are either progressive (that is, higher earners are taxed more) or regressive (higher earners are taxed less), the AI’s policy cobbled together aspects of

both, applying the highest tax rates to rich and poor and the lowest to middle-income workers. Like many solutions that AIs come up with—such as some of AlphaZero's game-winning moves—the result appears counterintuitive and not something that a human might have devised. But its impact on the economy led to a smaller gap between rich and poor.
To see if the AI-generated tax policy would influence human behavior in a similar way, the team tested it on more than 100 crowdworkers hired through Amazon's Mechanical Turk, who were asked to take control of the workers in the simulation. They found that the policy encouraged humans to play in much the same way as the AIs, suggesting—at least in principle—that the AI economist could be used to influence real economic activity. (Douglas, 2020)

In the end, the use of artificial intelligence (AI), advanced simulation techniques, and powerful tools together creates a unique chance to create policies based on facts that can effectively deal with tough societal problems.

Conclusion

In India, where policymaking is characterized by bureaucratic complexities, political instability, and pervasive corruption, a transformative approach based on data-driven, transparent, and ethical principles is required. In policy simulations, the responsible application of artificial intelligence (AI) emerges as a crucial solution. AI can bring transparency and accountability to the process, allowing policymakers to make informed, evidence-based decisions. It provides the means to reduce bias and ensure fairness in policy formulation, taking into account the nation's diverse sociocultural landscape. In addition, AI simulations enable policymakers to anticipate policy effects, optimize resource allocation, and effectively engage the public. In addition, they play a vital role in addressing pressing issues such as environmental sustainability and national security. The adoption of AI-driven, evidence-based policymaking has the potential to foster economic growth, reduce disparities, and create a more equitable and prosperous society in India, which faces numerous challenges. For the successful integration of AI into the policymaking process, collaboration between policymakers, experts, and the general public is essential.
Incorporating AI-driven simulations into the policymaking process has enormous potential for addressing intricate societal issues. AI simulations provide a systematic, data-driven approach to problem analysis and policy ideation, thereby streamlining the entire policymaking process. The core of this process is policy modeling, which uses models and AI techniques to support empirical research. ParticipThe participation of

policymakers and stakeholders in the modeling process increases the likelihood that the model will influence policy outcomes.

The "Policy Modeling Consistency (PMC-Index)" metric, which assesses policy modeling based on a number of factors, aids in policy evaluation. These evaluations assist policymakers in making well-informed decisions regarding policy alternatives. In order to utilize models effectively, policymakers must overcome several obstacles, including model transparency, trust-building, and the need for timely decision-making support.

The policy cycle model offers a structured framework for policymaking, with stages such as agenda setting, policy formulation, adoption, implementation, evaluation, and policy maintenance. However, India's fragmented governance structure poses unique obstacles to navigating this cycle.

AI simulations have the potential to address these challenges by providing insights and predictions at each stage of the policy cycle. These simulations enable policymakers to make informed decisions, optimize resource allocation, and foresee policy consequences. In addition, they enable scenario analysis, allowing policymakers to investigate various alternatives and their potential outcomes.

In addition, participatory modeling engages stakeholders and policymakers in collaborative decision-making. Before implementing interventions, these processes aid stakeholders in comprehending the complexity of policy issues and evaluating the potential effects of interventions.

The role of AI technology in policy simulation and modeling is crucial. It employs simulations to imitate human cognitive behaviors, making it a potent decision-making, forecasting, and modeling tool. AI techniques like decision trees, neural networks, and support vector machines aid in policy analysis. Moreover, simulation tools such as Matplotlib, TensorFlow, Pandas, Scikit-learn, and Keras facilitate accurate modeling and analysis.

In conclusion, AI-driven simulations and modeling have the potential to revolutionize the policymaking process by offering data-driven, evidence-based, and collaborative approaches to complex societal problems. These technologies enable policymakers to navigate the complexities of policy formulation, evaluation, and implementation, resulting in better-informed and more effective policy decisions.

There is a gap between Ai understanding and policymaking which needs to be closed. Despite an average performance of Indian social welfare policies, there is an optimism that Integration of AI may bring positive change in the process and implementation. Public participation is important and is needed at greater level to solve the problems of miscommunication between the citizens and policymakers. This might lead to addressing and pin pointing exact issues and key factors when it comes to formulating social welfare making policies.

In the end, the use of artificial intelligence (AI), advanced simulation techniques, and powerful tools together creates a unique chance to create policies based on facts that can effectively deal with tough societal problems. As we have seen, this synergy can be utilized in a variety of fields, including transportation, healthcare, environmental conservation, and public safety. This comprehensive approach unfolds as follows:
Using data analysis, we can gather and interpret vast datasets pertinent to the problem at hand, beginning with a precise definition of policy objectives. Regardless of the issue at hand, whether it be traffic congestion, healthcare accessibility, or environmental sustainability, sound data analysis is the bedrock of informed decision-making.
The decisive step is the application of AI simulations, a technique that can model a variety of scenarios and policy interventions. Decision trees, neural networks, and probabilistic inference are some examples of AI techniques that can be used to simulate possible outcomes very accurately. A variety of sophisticated tools, including TensorFlow, Pandas, Scikit-learn, and Matplotlib, that enable the creation and execution of AI models power these simulations.
To ensure the accuracy and applicability of simulations, it is necessary to establish research conditions and rules that define the simulation's parameters and constraints. This meticulous methodology ensures simulations closely resemble real-world scenarios, which contributes to the development of sound policy recommendations.
Upon running the simulations, we can analyze the outputs to gain profound insights into the effectiveness of various policy options. This critical analysis informs the core of policy formulation, allowing us to formulate evidence-based recommendations.
Throughout this process, it is critical to involve stakeholders, experts, and the larger community. Their input and feedback enrich the policy development process, making it more inclusive and representative of diverse viewpoints.
Transparent policymaking requires effective communication of findings, aided by visualization tools like Matplotlib. Policymakers, the general public, and interested parties must comprehend the reasoning behind policy recommendations and their potential societal impact.
Policy formulation does not conclude with recommendations but continues with implementation advocacy. Engagement with policymakers and the demonstration of the benefits of proposed policies are essential to achieving tangible change.

Post-implementation monitoring and evaluation ensure that policies continue to be effective over time. AI techniques facilitate ongoing evaluation, enabling modifications and refinements as societal conditions evolve.
In a world where challenges are becoming more complex, this comprehensive approach to policy formulation offers some hope. By leveraging the power of AI, simulations, data analysis, and stakeholder engagement, we can develop policies that are not only well-informed but also adaptable and responsive to society's ever-changing needs. Collaboration between experts in AI, domain-specific knowledge, and policy analysis is crucial for this endeavor. Collectively, we can navigate the complex terrain of policy formulation and ensure that our decisions are in line with our hopes for a better, more equitable world. We have the potential to shape policies that pave the way for a brighter future through the integration of technology and human knowledge.

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