Chapter 4
Policy Modeling Methodologies

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ABSTRACT

The process to develop sustainable public policies is done by public authorities ensuring the involvement of all stakeholders. ICT is rarely included in most of the today's applied policymaking processes. Other process definitions with a focus on ICT inclusion in policy modeling still exist, but they are not well defined. This chapter gives an overview of the existing policy modeling process types and explains their major foci and how they consider ICT and the practical process in public authorities. Afterwards, based on these descriptions, the general requirements on a new ICT-oriented policy modeling process that allows the inclusion of ICT into a valid and useful process for public authorities is given.

INTRODUCTION

The implementation of public policies follows a policy making lifecycle to ensure that all required aspects are well considered and so the requirements for an effective policy can be ensured. The process were defined through their practical use in the public authorities and got improved, based on changes because of problems or based on new findings in the governance research domain. The primary goal is a stable and valid process that can ensure an effective policy making. The policy modeling, as well as the policy making process, are a very complex circumstance with a couple of involved stakeholders. Furthermore the process has to follow the democratic idea of western countries, which includes a valuable routine that encounters the general good of citizens. The considering of all of these requirements is complex, so that the resulting structure for policy processes is complex too.

In this policy making process various institutions, departments, interest groups, experts and many more are involved. Their part of work is necessary to create new policies. But how they are involved and also their influences and limita-

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tions need to be defined too. All of that issues are defined in the policy making process too. During past years the policy making process was refined and adapted in many ways, but from the today's point of view, they are less considering ICT.

Since the last decades ICT got more and more important for the society, especially for administrations, because of their new powerful ways to store and organize data. So of course, ICT is in general used in public authorities. But until the last years the used technologies were mostly limited on general data provision and analysis of quantitative data, which are mostly statistical data about indicators. In the last years the web has changed and got more social. There are now new opportunities to stay in contact with (interested) people and – what is more important – these opportunities are used by a wide range of citizens. In 2009 approximately 67% of internet users accessed social networking sites (Redecker et al., 2010; Nielsen Online, 2009). In fact this means that there are now new possibilities to engage citizens and consider their opinions, for instance based on the use of social media. But unfortunately these possibilities of using the engagements of citizens in the social web and others are currently not used and considered sufficiently. The current applied processes are not adequate since they focus on "offline methods". But to make use of these new opportunities and to allow the integration of new ICT features, it is necessary to change the existing approaches, but this sounds simpler than it is.

To enable such required changes on the existing process governance model, we want to give an overview about the current existing policy modeling methodologies. Most of the today's existing process models are conventional models that are primary used in public authorities. But we also want on introduce existing ICT and technology based process definitions that taking the ICT into a special account. So this chapter aims give an overview about the current existing types of process definitions and should outline their characteristics and handicaps concerning a process definition that can be used in public authorities, as well as their consideration of ICT.

OVERVIEW ABOUT POLICY MODELING

In the following sections we majorly focus on policy modeling. Estrada (2011) defines policy modeling as "an academic or empirical research work, that is supported by the use of different theories as well as quantitative or qualitative models and techniques, to analytically evaluate the past (causes) and future (effects) of any policy on society, anywhere and anytime." So the major focus lays on the policy and the causes and effects on the society. The creation of policies consists of a huge number of tasks and involved stakeholders. To bring them in an efficient and effective order, the policy modeling can be seen as a process, where it is defined what actor has what task at a certain time. This arrangement of task and stakeholders regarding the development of policies is commonly named as policy modeling process. We use the terms policy modeling policy creation synonymously.

TYPES OF EXISTING PROCESS DEFINITIONS

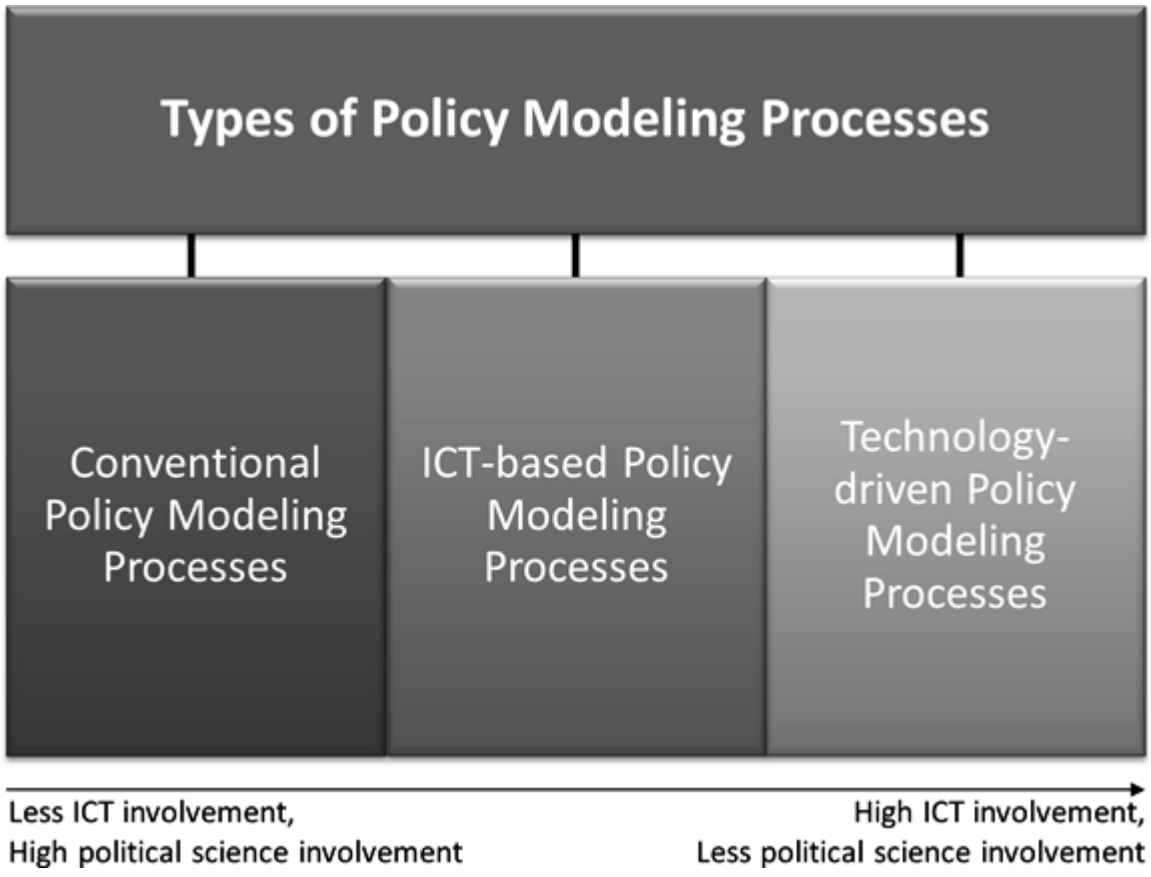
The process of Policy Modeling (PM) is a complex challenge, which includes various tasks with a predefined order to ensure the creation of an effective policy. To face this challenge the structure of the accruing tasks were investigated by several existing process definitions. The processes enable the definition of process-tasks and supporting tools for an efficient task-solving. In particular the supporting tools are nowadays brought by the

Information and Communication Technologies (ICT), with the rising role of internet, social web and further ICT-based technologies. The definition of PM-processes was often defined in existing works by setting goals for their categorization.

To structure the high number of existing definitions of policy making processes with regard of the ICT aspect, Burkhardt et al. (2013) classified the existing policy modeling process into three groups (see also Figure 1): (1) conventional policy modeling processes, (2) ICT-based policy modeling processes, and (3) technology-driven policy modeling processes. The characteristic of the ICT involvement and specialization increases from the group of conventional policy modeling processes to the technology-driven policy modeling processes. On the other hand, the political science involvement does decrease. This fact is also addressed as general important gap for the integrating of ICT in the political decision making (OECD Publication, 2001; Lallana, 2010).

The most established process-definitions are the conventional ones, which are mostly used in public authorities. We mean with conventional that the process definition does not involve ICT-based tools. Beside these conventional processes, few adaptations were applied to use ICT-tools in the PM-process. We sub-summarize in this paper the PM-processes that involve ICT-based tools for supporting tasks as ICT-based policy model-

Figure 1. Types of existing policy modeling process definitions regarding their integration level of ICT and the respected political science involvement



ing processes. A third group of PM-processes is technology-driven and constrains the PM-process to the limitations of technologies.

Conventional Policy Modeling Processes

The conventional PM processes are the most established definitions and primary used and implemented at public authorities. They have been researched since decades, but unfortunately they lightly consider the ICT-tools and their opportunities. Novel approaches for eParticipation and eGovernment cannot be reconciled with the conventional PM-processes. The most advantage of such conventional PM-process definitions is their accurate documentation. No other category of PM-process definition provides such a well described definition of each process step.

Overview and Classification

One of the first established and referenced policy modeling lifecycles was developed by Lasswell (1956). He introduced into a 7-phase life-cycle, which was later often reused and simplified by other researchers. Most of the conventional defined PM-process, i.e. in (Jones, 1984; Brewer & DeLeon, 1983; Howlett, Ramesh, & Perl, 2009; Wallace, Pollack & Young, 2010; Anderson, 1984; Hupe & Hill 2006), are not equal, but they describe the most necessary five steps in a similar way (Howlett, Ramesh, & Perl, 2009; Hupe & Hill 2006). For instance, Patton and Sawicki (1983) describing a 7-step process cycle, with an additional different step order. After problem definition, their process requires a definition of evaluation criteria, and after policy making, they define an evaluation phase of all alternative policies that results (in the following step 5) in the selection of the preferred. In general the most process definitions using a three to seven stage model and cover with the diverse stage-numbers the same issues. This fact allows the grouping of these approaches into a generalized five-stage model (Howlett, Ramesh, & Perl, 2009; Wallace, Pollack & Young, 2010), which is sketched in more detail also in Figure 2:

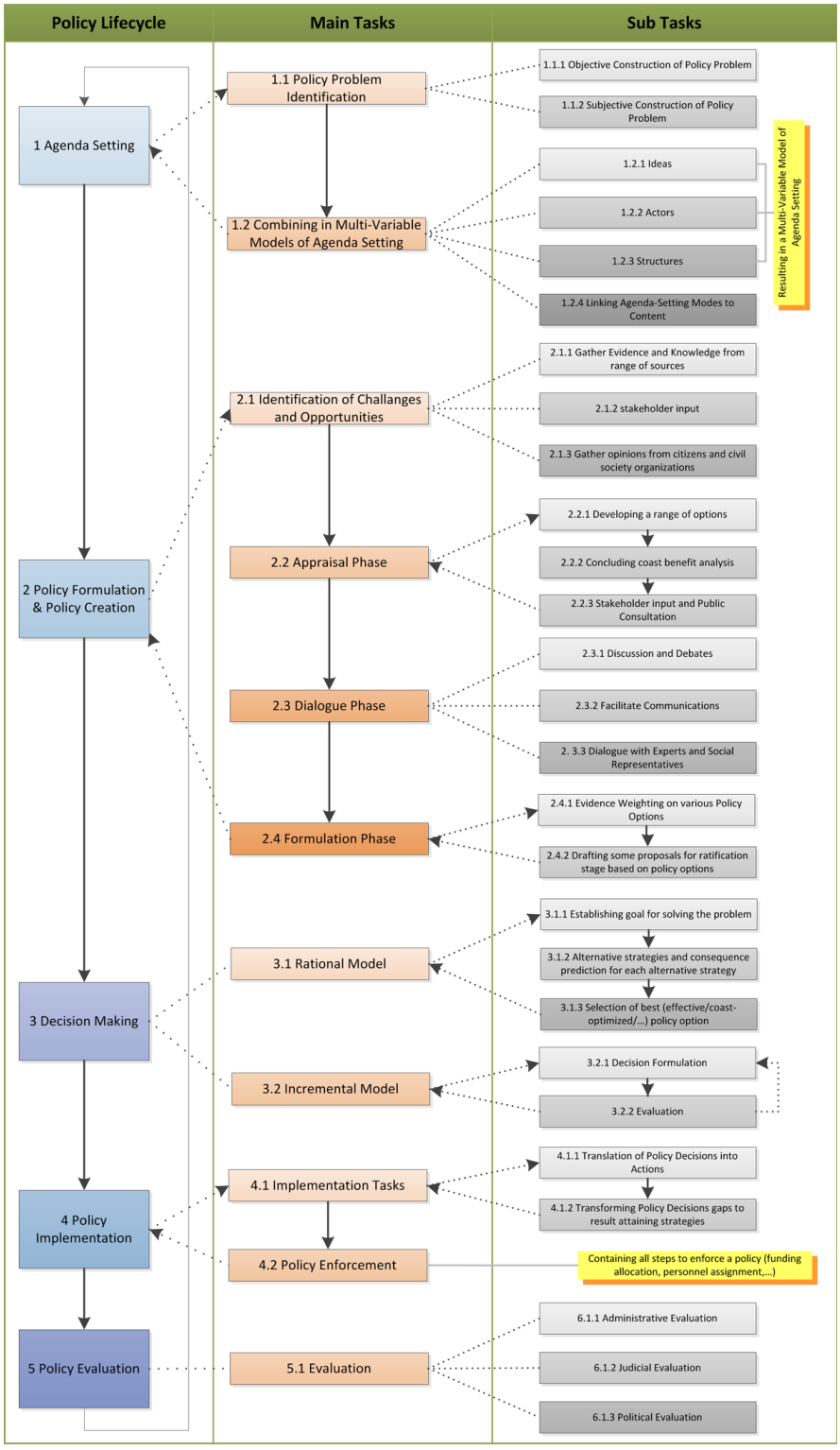
1. **Agenda Setting:** The function of this stage is to recognize a problem and to identify the related reasons.
2. **Policy Formulation:** Based on the identified problem, in this stage proposals for solutions are defined.
3. **Policy Decision:** Mostly Politicians in the role of decision-makers act in this stage to decide which proposal and with which condition a policy should be implemented.
4. **Policy Implementation:** The goal of this stage is the ratification of a new policy for validation.
5. **Policy Evaluation:** In this stage the implemented policy is analyzed and observed. The goal of this stage is to identify if the faced policy-problem is solved.

Application in Public Governance

The application of conventional policy modeling processes is well known, because they are commonly used in public authorities. These kinds of process definitions are defined mostly decades ago and just gently changed. In particular regarding the integration of ICT there were only very moderate changes, but they were essential to keep the administration effective. However, the overall integration of ICT needs for advanced consideration fundamentally adapted and changed, to be more effective and maybe for some use cases also more efficient.

Today the problem identification of agenda setting bases on the objective and subjective construction of an existing problem. Mostly only the objective problem construction based on observed indicators is used. Therefore the public authorities using ICT to analyze the indicators, but there is no automatic observation on an ICT-driven

Figure 2. The conventional policy making process (based on Howlett et al. 2009) with its major steps and its concrete tasks



in-depth analysis used. Instead of heavy use of ICT, analysts and experts try to get an overview only based on the existing indicator data. This work progress is similar to the combination of the multi-variable models that are required to define the problem context, such as involved actors or structural reasons for such a problem. The agenda setting is primary defined by the involvement of analysts and experts with just moderate (but ICT is here in prevalent use) use of ICT.

The policy formulation and creation phase is mostly defined without the use of ICT features. For instance, the identification of challenges and opportunities is mostly done by a group of experts. For this task the experts making propositions usually based on their experience. This is similar to the appraisal phase. If the employed experts of a public authorities do not have a deep understanding for a very special topic, they are involving external experts for this work. To bridge such expertise gaps it is not established to bridge these with intelligent/expert ICT features. The only sub-task where ICT is used is the public consultation. Here, the work etc. is sometimes announced on the authority website, next to the existing media like an official gazette. In the dialogue phase today no ICT platforms are used, instead the traditional meetings etc. are the usual platform for allowing discussions to an existing issue. In the formulation phase, the proposals for possible problem solutions will be developed and weighted – the weighting is mostly based on political interest, e.g. what solution will be more accepted by the citizen. But if there is a weighting based on the expected impact of a solution, there are sometimes simulation features of ICT used.

The decision making phase is today a complete offline tasks. Here the decision makers aiming to choose the best policy option to solve the problem. Decision makers are on the one hand experts from the domain, but also politicians.

The policy making phase is using ICT, but it is used to ensure that no mistakes will happened and so high quality implementation is guaranteed. Neither for the implementation tasks, nor for the policy enforcement ICT is used to achieve another goal then the optimal implementation.

In the policy evaluation the impact of a created policy will be measured. Therefore different criteria can be set to detect the impact. In the administrative evaluation the implementation of the policy, e.g. regarding the aligned funding or the involved intuitions will be analyzed. The judicial evaluation analyses the embedding of a policy in regards to the existing laws.

The description for these five stages of the PM process is just an outline, which is more explained in the above mentioned literature. In this paper we primary focus on the detailed description of the model proposed by Howlett et al. (2009), which contains an aggregation of most of the existing and established researches in that domain and describes the PM-process stage in a clear shape.

ICT- Based Policy Modeling Processes

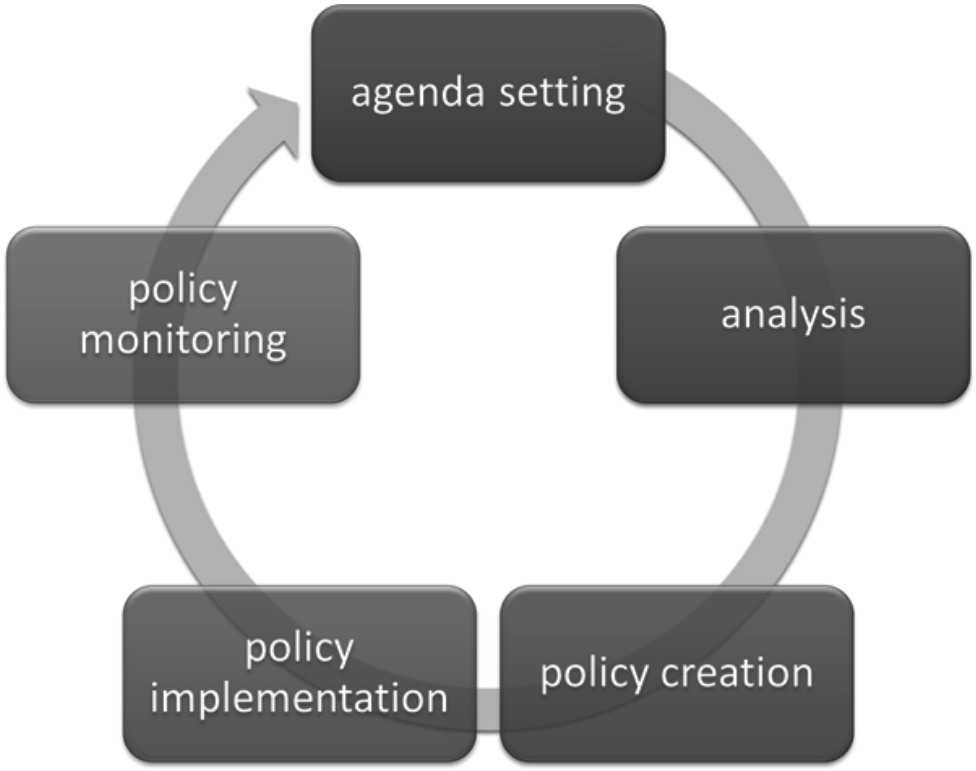
A more recent approach to define the PM-process is the inclusion of ICT-tools in the entire process. In particular the involvement of citizens and their opinions can be supported in a more sufficient way. These process models adapt the conventional PM-process to include ICT-tools.

Overview and Classification

There are two established and equal PM-process definitions that investigate ICT in the process model: The well-known definition of ICT-based policy making by Macintosh (2004a, 2004b) and published model proposed by the OECD (OECD Publication, 2003; OECD Brief, 2003) and other literature (Young, 2010) to reinforce eDemocracy. All these processes define a canonical five-stage PM-process model (see also Figure 3):

1. **Agenda Setting:** The Agenda Setting defines the need for a policy or a change to an exist-

Figure 3. An example (canonical) representation of an ICT-based policy modeling process that consists of the 5 major phases



ing policy. It further clarifies the problem that triggered the policy need or change.

2. **Analysis:** The Analysis clarifies the challenges and opportunities in relation to the agenda. This step's goals are examining the evidence, gathering knowledge, and a draft policy document.
3. **Policy Creation:** The Policy Creation aims to create a good workable policy document, taking into consideration a variety of mechanisms such as risk analysis or pilot studies.
4. **Policy Implementation:** The Policy Implementation involves the development of legislation, regulation etc.
5. **Policy Monitoring:** Policy Monitoring might involve evaluation and review of the policy in action.

Next to the above described process definitions, there are very similar definitions with a deviation in the number of stages. They address the same issues, similar to the parallel existing process definition for the conventional PM-processes. The process definition of Mashinini (2008) consists of four phases. His model combines the first two stages of Agenda Setting and Analysis in one stage. Another PM-process definition was proposed by the World Bank (2010). It describes a more structured PM-process with an assessing and coordination responsibility within the governments.

All of these kinds of process definitions do not describe the process in a detailed form. Neither the concrete tasks are named or described, nor are the possibly useful ICT-tools defined for supporting the tasks. Nevertheless the mentioned processes

are for many eDemocracy project-ideas a well foundation, even if they are just defined on a very abstract level. The breach of a detailed description makes it difficult to use such a PM-process definition in planned concrete implementations. Concrete implementations needs to be developed for specific tasks to ensure that it help users. In consequence a detailed defined ICT-based PM process is also essential to determine appropriate visualizations for each PM-stage. This canonic process model is also often criticized as misleading, because of their non-discrete of the policy-making stages (Sabatier, 1999; Young, 2010) and the sometimes not well fitting process steps (Young, 2010).

Application in Public Governance

Nowadays no ICT-based policy making process is used or established in public authorities. To integrate some ICT just minor changes on the conventional policy making process were made, so that the main character of the process has not been changed. In the politic sciences and in some projects with inclusion of computer sciences some very canonical ICT-oriented policy making processes do exist (as introduced in the section above).

Therefore they generally describe the use of ICT in the agenda setting phase, to provide a more effective and efficient problem finding. Hereby they consider different strategies, beginning by techniques to analyze and explore social media to gather opinions of citizens, and finalizing with analysis and exploration of objective data, such as open government data. The high bandwidth of technical opportunities to extract problems from existing heterogeneous data-sources and kinds of data, do ensure the provision of a much higher spectrum of problems and problem reasons as the conventional methods do allow. Through the combination of different technical approaches, e.g. opinion extraction of social media and analysis of open data, a cross-validation of a determined problem can be done at an early stage of the policy making.

After problem definition, the analysis phase starts. The goal is to identify problem reasons and solution ideas. In contrast to the conventional policy making processes, where no explicit analyze phases exists, analysis tools are here considered explicitly. This should also indicate that the analysis is a very important stage where most technical abilities will be included to define an optimal solution approach. Similar to the agenda setting phase, the consideration of most available techniques to analyze a problem and to find a solution is also required in that phase.

Since the policy creation phase, the ICT-based processes become quite similar to the conventional processes. The traditional methods to discuss and making decisions are considered as well as new methods, which allows for instance a discussion with citizens on the web, e.g. with forums or other debating platforms.

In the policy implementation phase ICT can be involved to ensure an optimal anchoring within existing policies and laws. There are some technologies available that allow identifying conflicts with existing policies and laws. That helps to change new policies and to make them conform to the existing policies or it indicates which other policies need to be changed to ensure the full operate ability of the policies.

Policy monitoring, to observe the effectiveness of a made policy or to indicate occurring problems in an early stage, becomes more effective by the use of ICT. Instead of waiting for updates of government data, also data from social media can be considered, e.g. where small and medium size enterprises discuss about negative developments. But also the direct observation of government data can help to indicate economic changes, e.g.

beginning crisis, more preciously so that political programs can be planned and initiated early enough to allay the full consequences of a crisis.

Technology-Driven Policy Modeling Processes

The third group of PM-process definitions is defined for the use of specific technologies in the policy making. Some technologies allow the definition of specific processes, which addresses the challenges for this single type of technology. Therefore the PM-process is abstracted and adapted on the requirements of the technology. The goal of these technology-driven PM process is not to define a global process for public authorities, even more these definitions are focusing on the behaviors of a technology and thereby to ensure an optimal exploit of the technology's benefit. Thereby we can divide these kinds of approaches into *system-oriented* policy modeling processes and *domain-oriented* policy modeling.

Overview and Classification

A less number of approaches address general technical issues. On examples is the three-phase process of Misuraca et al. (2010). It provides a general idea to include technologies in the decision making process. The goal is not establish the inclusion of a concrete technique, even more it acts as a motivation factor to create more ideas and techniques that possibly can be considered by decision makers (Misuraca et al., 2010).

Another approach to support the analysis in the analysis is described by Ruppert et al. (2013). He adopted the process of Howlett et al. (2009) in regards to the tasks of analysis. Furthermore they defined the sub-processes and task in clearer shape- The benefit of this approach is better picture of the tasks for policy analysts and to develop analysis tools that support the analysts' behaviors in a better way.

Most of these PM process definitions are addressing a certain topic. Through the combination of multiple technologies, a new service is obtained that aims to improve a part of the policy making process. The resulting process definition does not always correlate with conventional or ICT-based PM-process, but this is also not the primer proposed goal. The goal of such PM-processes is to provide a beneficial process to improve a concrete aspect. An example for such a PM-process definition is the Policy Making Lifecycle of the European project ePolicy (Milano, 2012; Kohlhammer et al., 2012).

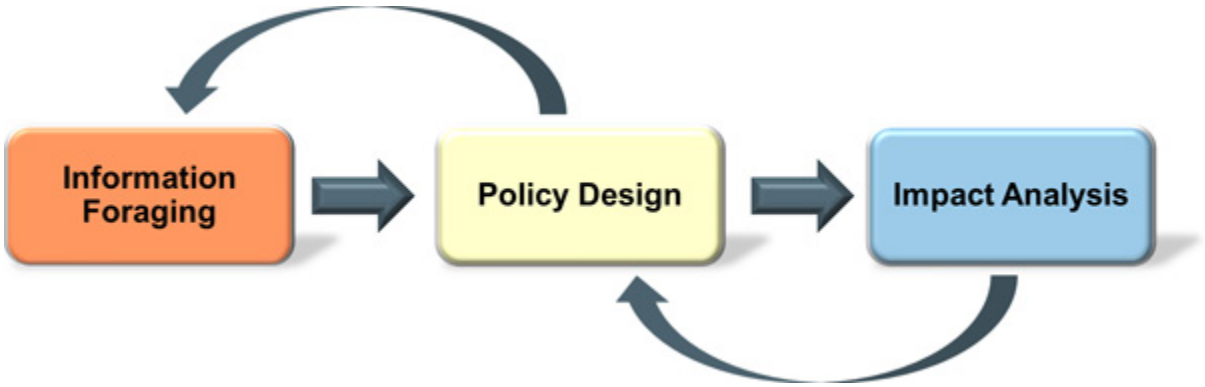
According to previous type, there are also process definitions that are defined for a specific technology type, i.e. for information visualization (Kohlhammer et al., 2012) or simulation techniques (Pahl-Wostl, 2002). The idea is to provide a process definition for this type of technologies, based on an abstracted and adapted general PM process definition that considers the technology's specific behaviors. An example of such a technology-driven process is the visualization-process of Kohlhammer et al. (2012). For this exemplary visualization purpose, they reduced the entire PM process on the relevant parts for the visualization on: (1) Information Foraging, (2) Policy Design, and (3) Impact Analysis.

Application in Public Governance

This kind of policy making processes is not designed for an explicit implementation in public authorities. They are just designed to make a technology more effective usable in the policy making process.

To integrate a technology beneficial in the policy making process, an existing policy process definition will be adapted to the technology's requirements. In consequence a step of the technological policy process covers one or more steps, or perhaps enriches the established policy making process by multiple additional sub-steps.

Figure 4. The technological process for visualizations in the policy modeling process (based on Kohlhammer et al. 2012)



The defined phases of the policy-making cover one or more phases of the conventional or ICT-based policy making process.

In contrast to the conventional or ICT-based processes, the technology-driven processes are acting primary as an application process. They are normally not presented to the user. They build the technical data flow in background of such a technology. Therefore next to the technology policy process, also a conventional or ICT-based process has to be used.

REQUIREMENTS FOR ICT-BASED POLICY MODELING PROCESSES

The introduced types of policy modeling processes in the previous sections showed the different perspective how policy making can be taken into account. Based on the viewpoint different aspect are more important than others. Also the consideration of stakeholders plays a different role for each of the policy modeling process types. The specification of requirements for ICT-based policy modeling process is in fact a challenging issue. Based on the fact that the conventional policy modeling processes are minor focusing on ICT, we can ignore them so far. Even more we want to use ICT for the entire process of policy making, which should be valid for all aligned technologies, which means that also the technology-driven policy modeling processes are not appropriate.

Overall just the class of ICT-based policy modeling processes is appropriate to define a general agenda to use ICT in the entire policy making. The introduced canonical five-phase process model provides a general overview, but to raise the entire governance on higher level, it is not satisfactory. The first requirement we can define at this point is, that a new ICT process is required with higher granularity to identify the task and techniques. Modern technologies can only be considered, as far as they can be aligned to the existing tasks and goals. However this can be very challenging, because new IT technologies provide new possibilities, and hence such a new technology can have impact on the process, which maybe needs then to be adapted.

Another challenge is the establishing and acceptance in public authorities. In these institutions processes are implemented that have been adjusted over many years, only to ensure a high effectiveness and efficiency. It considers the available resources as well as its interplay of them and the involved stakeholders, next to the validation and reciprocal control. To apply changes on the policy modeling process it is often an issue that can consume a lot of time, the implementation

of completely new processes can often not be considered. Therefore it is recommendable if new processes orient on existing process lifecycles to have the general chances to get considered in future policy modeling. Another aspect is the usefulness of a new process definitions and the necessary effort for process changes. Only if the expected advantages have a significant impact, it makes sense for applying a change on the current routine. Therefore the integration of (new) ICT must significantly support decision makers and stakeholders in general. This includes that the changes on the current policy modeling process will not limit any other part of the process. The better and useful a new feature and the better it can be integrated in the current process without producing limitations, the more realistic is the possibility that the process get changed. One of these possibilities is the increasing importance of inclusion of citizens' opinions (OECD. 2003) in the policy making, i.e. through social media analysis. Not less important is that the changes on the existing process model do not strongly orient on a single technology, because technology can (and for the future it needs to be possible to) change, but the process needs to be valid anymore.

The presented canonical requirements are just an overview, in dependence of the changes there are a couple of further (more detailed) issues that needs be ensured. But only if the basically mentioned requirements are given, the general ability to implement the changes are possible.

CONCLUSION

The paper introduced into the challenges of creating new policy modeling processes with focus on the inclusion of ICT. Therefore the major point of well-defined process, with less consideration of ICT and less well-defined processes, but major focus on ICT was given. After that each of the existing policy process types were explained and described in a clear shape. The focus laid on the weighting of well-defined process and use in public authority and their inclusion of ICT.

The overview about the different policy modeling methodologies should allow the development of new policy making process with the benefit of all of these three types. First the conventional processes, because of their sustainable definition and arrangements of resources and involved stakeholders. As second the ICT-based process, which are generally considering the ICT advantages, but unfortunately there is not definition existing that is defined in a clear manner. And the third type, the technology-based policy making process, which aims to align a single technology into the policy making process. Afterwards the general requirements on a new policy modeling process were specified to develop a process that targets the objective of a valid process for authorities, as well as the usefulness for the inclusion of ICT.

Such a new ICT-based policy modeling process allows anchoring of new technologies, e.g. social media analysis for opinion mining, beneficially into the policy making. This in facts should ensure that decision makers can consider citizens opinions in a better way and define policies in more transparent and also more effective way. Another advantage is that new developed policies have a higher acceptance by citizens, since their opinions and thus their expectation are better comprised.

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KEY TERMS AND DEFINITIONS

E-Government: E-Government is the modernized form of Government, but under consideration of Information and Communication Technologies (ICT).

E-Participation: E-Participation is the modernized form of Participation, with the goal of engaging citizens in policy making. Through the use of ICT it is aimed to allow citizens to influence the political agenda by their options. In contrast to the traditional form, by the use if ICT it is easier to organize in groups and to realize e.g. petitions.

Information and Communication Technologies (ICT): Under Information and Communication Technology technologies for information provision, sharing, using and visualizations are summarized. A major benefit lays in the exchange of data for the use with other technologies and therefore the use in a number of different use cases.

Open Data: Open Data is term that is commonly used for statistical data that are provided by governments and can be almost used for free. These Open Data (sometimes also mentioned as Open Government Data) consisting a number of indicator data about a country or a region. Such data are often provided and mentioned in relation to initiatives for a better transparency.

Policy Modeling: The term policy modeling deals with the making of (political) policies, which can result in the creation of new laws. Policy modeling covers all necessary steps beginning at the identification of a problem, analysis, decision making, implementation, end evaluation of a policy.

Policy: Under the policy a theoretical or practical instrument can be understood that aims to solve a specific problem. In the political domain, a policy can represent a new law.

Process: A process is logical aggregation of activities. A process is defined by an initial state and an (to achieve) end state. Through the processing of the activities, the transformation from the initial state to the end state will be realized.