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Abstract: To complete e-government projects successfully, various stakeholders with different interests need to be taken into account. So far, stakeholder models in the e-government context focus on individual stakeholder perspectives. They do not show or analyze interactions between stakeholders in detail. However, taking stakeholders' interactions into account is important, since stakeholders influence each other - which can result in a change of their perspectives. Hence, our contribution illustrates how a stakeholder interaction model helps identifying different stakeholder perspectives. Therefore, we reviewed literature on existing stakeholder models. Besides, we conducted a stakeholder analysis in an e-government project in Germany and elicited stakeholders, assigned them to corresponding categories and modeled a stakeholder interaction model. Finally, we compared the findings of the literature review with the developed model. This contribution enlarges the theoretical foundations of the e-government research field. The stakeholder interaction model can be used by practitioners to identify stakeholders and their interactions.

Keywords: stakeholder analysis, stakeholder interaction model, e-government project, public sector, public administration.

1 Introduction

Many electronic government (e-government) projects are not completed successfully or not at all [1, 2]. One reason for this is the fact that the project's success is compromised by issues evolving during the collaboration between e-government project partners. These issues are mostly based on the involvement of a large number of different stakeholders. Examples thereof include decision-makers of different federal or local public administrations or intermediaries (e.g. software companies or consultants). In particular, these stakeholders often have different, conflicting interests and priorities depending on their perspective on the project and the project phase [3, 4]. This hinders the consideration of all their requirements. Hence, a detailed and structured stakeholder management is a prerequisite for implementing e-government projects successfully [5]. Therefore, all stakeholders need to be identified and their concerns, interests and

requirements regarding the e-government solution need to be analyzed and prioritized using stakeholder analysis techniques [6, 7].

Addressing those issues in our paper, we follow the widespread definition of Freeman et al. and define a stakeholder as "any group or individual who can affect or is affected by the achievement of a corporation's purpose" [8]. Besides identifying the stakeholders and their needs, interactions between them need to be considered, as stakeholders can significantly influence each other through their interactions. This can result in a change of the stakeholder's perspective on the e-government project. For example, stakeholders having a strong lobby can influence the project management. In consequence, the project staff needs to consider specific requirements of these particular stakeholders. This is the case even if other previously planned requirements cannot be taken into account any longer. In summary, we understand interactions as communication between stakeholders in order to exchange resources, like information or funds [9, 10].

So far, existing stakeholder models only consider the perspective of individual stakeholders without showing interactions between them in detail. However, in order to understand changes in the stakeholders' perspective, it is necessary to consider and analyze interactions between them. Until now, there is a lack of research on who the stakeholders in complex e-government projects are and how they interact with each other. In our paper, we present findings of a literature review on already existing stakeholder models. Furthermore, we perform a stakeholder analysis on the example of the pre-filed tax filing system in Germany[1]. This e-government project is conducted by one German public administration designing an e-government solution to be used by other public administrations. We aim at identifying and categorizing the stakeholders of this particular e-government project as well as modeling stakeholder interactions. This is the first step to design and conduct e-government projects as closely to all stakeholders' benefits as possible. Finally, our contribution compares the derived stakeholder interaction model with the stakeholder models found in literature. For this purpose, our research is guided by the following questions:

- What does a stakeholder interaction model in e-government projects look like?
- Taking into account the stakeholder models identified in literature, to what extent does the stakeholder interaction model enrich the existing body of knowledge?

The remainder of this paper is structured as follows: First, the research methodology is explained. Second, the findings of the literature review are presented. Third, we illustrate and explain the derived stakeholder interaction model. Afterwards, our findings are discussed and compared. Finally, a conclusion is made and further research is outlined.

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2 Research Methodology

A literature review according to Webster and Watson [11] was performed in order to identify already existing stakeholder models. Using the keywords "stakeholder" and "e-government", we searched databases, e-government specific conferences and journals. Our initial search yielded 66,846 results, including duplicates. In a first step, we screened titles upon relevance to our research goals. In case a title was considered relevant, we screened the corresponding abstract as well. Hence, we were able to identify 48 papers as input for the third step of a comprehensive paper review including the full text content. These papers were read and categorized using the following categories:

(i)   *no stakeholder enumeration or classification*,
(ii)   *only stakeholder enumeration* and
(iii) *stakeholder model*.

Papers classified into the first category are not relevant for our further analysis. These papers are either not e-government specific or refer to the importance of stakeholders without a further enumeration or classification. Hence, 26 papers are seen as relevant, as they contain a stakeholder enumeration or a stakeholder model. Analyzing them in more detail, we found that 18 out of the 26 papers contain a stakeholder enumeration and only eight papers describe a stakeholder model. These papers were analyzed in more depth in regard to their categorization, interaction and scope. In order to guarantee reliability and validity, the papers were classified by two researchers.

Moreover, we conducted a stakeholder analysis on the example of an e-government project within a German state administration. This project aims at upgrading the German tax filing system ELSTER by the possibility of automatically loading tax relevant information into the system. In order to identify and categorize the stakeholders of this project, we conducted a semi-structured interview with three members of the project management team of the e-government solution. Further, we participated in a workshop, where information about the e-government solution was communicated to so-called ELSTER deputies. We also searched through official websites for information about this e-government solution. On the basis of this information, we identified and categorized the stakeholders and, consequently, derived a stakeholder interaction model. Afterwards, this model was examined and approved by the project leader. Finally, we compared the developed stakeholder interaction model with the stakeholder models found in literature.

3 Findings

3.1 Literature Review

The papers were analyzed using the mutually exclusive categories *stakeholder enumeration* and *stakeholder model*. 18 out of the 26 relevant papers were grouped into the first category. This category contains, for example, project-related papers, e.g. [12-14], listing rather specific stakeholders. Other exemplary papers in this category

demonstrate stakeholders by using a graphical representation [4, 15, 16]. Since these approaches contain only enumerations of stakeholders without defining further categories, we did not include those models into our further analysis. Reviewing the literature, we identified exemplary stakeholders like citizens, enterprises, officers, local government agencies, local government staff, media, steering committees or politicians (e.g. [12, 15, 17-19]). We also found research work based on case studies similar to the one we focus on, e.g. Tan, Pan and Lin (2005) analyze stakeholders of e-government projects on the example of the electronic tax filing system in Singapore. They present government, tax officials, taxpayers, employees and the Inland Revenue Authority of Singapore (IRAS) as stakeholders of an electronic tax filing system [20]. However, they do not illustrate a further categorization of these stakeholders or interactions. Furthermore, three papers comprise a stakeholder model whose classification is based on the rating of the stakeholders [21-23]. As our focus is on the identification and categorization and not on the rating, we also excluded these papers from our analysis.

In a second step, the eight remaining papers presenting a stakeholders' categorization were analyzed by using three attributes (Table 1). The attribute *categorization* explains the composition of entities in each model in more detail. As we aim at designing a stakeholder model which also considers the interrelationships between stakeholders, we added the attribute *interaction* in order to take note of the awareness of interactions between categories. The attribute *scope* informs if there is a relation to a particular project (project specific) or not (generic). The findings of this analysis are shown in Table 1.

The stakeholder models are characterized by varying numbers of categories, ranging from two to seven categories. Besides, five out of eight models relate to a specific project. Additionally, five models show interactions between categories. In the following, we will describe the stakeholder models in more detail.

Flak and Rose [28] focus on a governance and management perspective regarding stakeholders in the e-government domain. Their findings are rather generic. The authors clearly state that their model shows no interaction between the categories. They point out initial priorities in future research in order to cover the existing research gap. In a further study, Flak, Sein and Saebo [24] identify two main categories, link stakeholders to these categories and show interaction types between them. However, their categories are still rather generic. De [25] also identifies two categories - a demand side and a supply side. He allocates the project-related stakeholders to these two categories, based on the direction of their interactions. We found that the categories of Flak, Sein and Saebo [24] are similar to those of De [25], as the category *government* can be seen as the *supply side* and the *citizens* present the *demand side*.

Johannessen, Flak and Saebo [29] focus on e-government stakeholders at a municipal level. The interactions are analyzed in regard to the communication needs between the resulting categories. We noticed that their categories extend those of Flak, Sein and Saebo [24] by a political category. Beside this, the *citizen* category of Flak, Sein and Saebo [24] is divided into *business* and *organizations / citizens* [29].

Table 1. Analysis of stakeholder models

Author	Categorization	Interaction	Scope
[24]	2 categories: *government, citizens*	yes	generic
[25]	2 categories: *demand side, supply side*	yes	specific
[26]	3 categories: *government* (divided into *decision maker, management* and *service provider*), *citizen* (divided into *user* and *engaged user*), *business* (*consultant / vendor*)	yes	specific
[27]	4 categories: *data controllers, data subjects, data providers, secondary stakeholders*	no	specific
[28]	4 categories: *internal stakeholders, other governmental agency stakeholders, citizens, organizational stakeholders*	no	generic
[29]	5 categories: *political, government administration, civil society* (divided into *business* and *organizations / citizens*)	yes	specific
[30]	5 categories: *inspection zone, limitation zone, collaboration zone, orientation zone, legitimacy zone*	no	specific
[31]	7 categories: *drivers, constructors, owners, sources, recipients, third parties, operators*	yes	generic

The model by Fedorowicz, Gogan and Culnan [27] is designed for the tax domain. It aims at addressing privacy concerns and its categories are related to the procedures conducted in this special privacy case. Further, this model does not show any interaction.

A stakeholders' influence analysis on managers at a municipal level was conducted by Gomes and Gomes [30]. They conclude that the type of influence is more important than the number of stakeholders. The authors elicited eleven stakeholders and categorized them according to the kind of influence they carry out on decisions. Based

on this categorization in regard to the influence, they found five categories. We noticed that the authors focus on decision-making by a single institution, driven by bidirectional interaction with each category of stakeholders. However, they give no information regarding the interactions between individual stakeholders or between categories.

A generic, but rather comprehensive view on stakeholders in the e-government field is provided by Heeks [31]. His model emphasizes the inclusion of interactions in detail, i.e. between different stakeholder groups. However, this model contains only categories without naming stakeholders in detail. Further, interactions are only shown between one particular stakeholder category (*operators*) and all other categories. This approach is similar to the model proposed by Axelsson and Lindgren [26]. They analyze stakeholders in the context of e-services by building categories with more specific subcategories. Furthermore, they describe interactions between stakeholders and one particular organization. Still, they do not show the various interactions that take place between the stakeholders.

In summary, we found some stakeholder models which are used to identify, structure and analyze stakeholders. The categories in these models have different levels of detail depending on the context in which they are designed. Besides, some stakeholder models show interactions. However, these interactions are not analyzed in detail or are only shown for one category in the stakeholder model. Finally, we noticed that almost all categories can be allocated to a supply side and demand side. Some models partly align the categories to the lifecycle of e-government projects [25, 31]. This can help to identify all stakeholders of each phase of the lifecycle and to derive the requirements, interests and concerns of the stakeholders depending on the particular project phase.

3.2 Case Study

Before presenting our findings of the case study, we will briefly give some background information: In Germany, tax filing is situated on the federal state level. The federal states are cooperating in developing and running the electronic tax filing system ELSTER. Hence, a large number of different decision-makers is involved. These decision-makers are both internal, i.e. within public administrations, and external (e.g. consultants). Further, they are located on different levels, e.g. federal, state or regional level. The exemplary project (called pre-filed tax system) aims at upgrading ELSTER by the possibility to provide tax data to citizens and to load this data automatically into the system. The project is characterized by a hierarchy with several levels and decision-processes within the project team and between different federal states. Besides, there are many intermediaries (e.g. software companies or consultants) who have influence on the project's success. Moreover, the e-government solution has heterogeneous target groups, as every citizen aged over 18 years should be able to use it. This e-government solution can be accessed by citizens on a voluntary basis since January 2014.

Figure 1 shows the stakeholder interaction model identified by conducting a stakeholder analysis. During the literature review, we noticed that the categories of many existing models can be divided into a demand side and a supply side. We applied this

classification as a basis for the stakeholder interaction model and extended it in detail by adding further categories. Besides, we allocated the categories to phases of the lifecycle of an e-government project, starting with the assignment (*strategic project owner*), over the design and implementation (*operating project owners* and partly *supporters*) to the usage and application (partly *supporters*, *external users* and *internal users*).

The derived stakeholder interaction model comprises five categories: *Strategic project owners* are stakeholders who decide to conduct a project and commission it. *Operating project owners* implement the project. *Supporters* help *operating project owners* by implementing and operating the e-government solution. Further, they also help the *external users* solving problems occurring during the usage of the e-government solution. Besides this positive influence, supporters can also have negative influences. For example, on the one hand software producers can promote the deployment and usage of the solution by integrating the provided functions into their product. On the other hand, they can evaluate this function as useless and hence, they will criticize or even hinder the project. The fourth category contains the already mentioned *external users* who use the e-government solution and may benefit from it. They do not belong to the public administration – contrary to the *internal users*. *Internal users* are stakeholders who interact with *external users* and receive the output of the e-government solution's usage. Each stakeholder, identified during the stakeholder analysis, is assigned to exactly one stakeholder category.
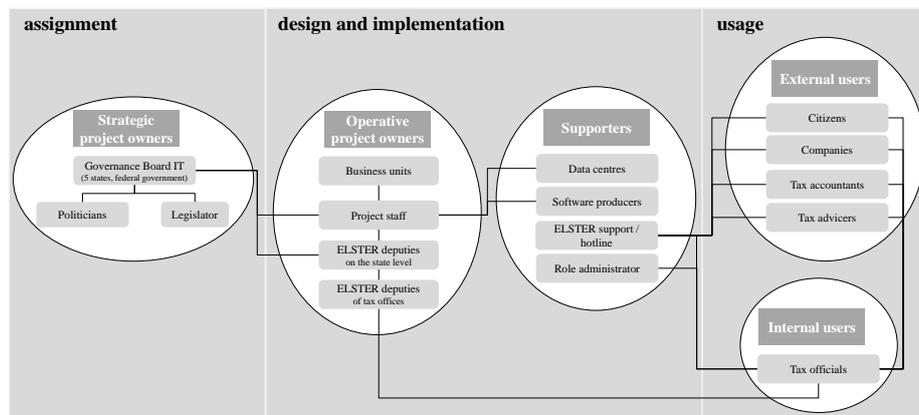

Fig. 1. A stakeholder interaction model for the German pre-filed tax system

In a first step, we derived the following interactions between the five categories:
- *strategic project owners* and *operative project owners*,
- *operative project owners* and *internal users*,
- *operative project owners* and *supporters*,
- *supporters* and *external users*,
- *supporters* and *internal users* as well as
- *internal users* and *external users*.

We noticed the absence of interactions between *strategic project owners* and *internal* or *external users*. Besides, *operative project owners* do not directly interact with *external*

users. Hence, neither *strategic project owners* nor *operative project owners* have knowledge about the *external users'* requirements regarding the developed system. This can result in an assignment for implementing an e-government solution which does not meet the *external users'* needs or which is not applicable in the *internal users'* daily work. Further, our interviewees did not mention the media as a stakeholder. However, in our opinion, the media can have a significant influence on the success of an e-government project due to their (positive or negative) reports.

In a second step, we analyzed the interactions between the stakeholders in more detail. The connecting lines in the stakeholder interaction model (Figure 1) represent various interactions between stakeholders:

- The *governance board IT* interacts with the *project staff* by commissioning them to develop the e-government solution and providing them with funds for the project.
- The *project staff* communicates with the *ELSTER deputies on a state level* in order to inform them about the e-government solution. Further, the *project staff* interacts with *business units* in order to exchange information about legal or functional requirements.
- *ELSTER deputies on a state level* communicate with the *project staff* and the *governance board IT* by exchanging information about requirements derived from the practical usage of the developed system. Moreover, they inform *ELSTER deputies of local tax offices* about what the developed system looks like and how it can be used. Hence, the exchanged element is the know-how about the e-government solution. *ELSTER deputies of local tax offices* need to interact with *tax officials* in order to help them to answer requests of *citizens*. In this case, know-how about the system is the exchanged element in the interaction between *tax officials* and *ELSTER deputies of local tax offices*.
- *Tax officials* communicate *external users'* requirements regarding usage and system to *ELSTER deputies*. Besides, *tax officials* interact with the *role administrator* by exchanging information about which *external users* need further authorizations for using the system.
- In case of problems concerning the pre-filed tax system, all *internal* and *external users* can contact the *ELSTER support* or *ELSTER hotline*. In this interaction, the exchanged element is information about current problems and know-how about the system.
- Employees in *data centers* and the *project staff* interact by exchanging technical requirements.
- *Software producers* communicate with the *project staff* in order to propose technical requirements, so that they can integrate the pre-filed tax filling function into their software product.

In sum, we noticed that various elements are exchanged during a huge number of interactions. Identified elements are for example know-how about the e-government solution or special technical or functional requirements.

4 Discussion

In the following, we will discuss the existing stakeholder models and the derived stakeholder interaction model regarding the categorization, the assignment of categories and interactions.

On the one hand, the categories of the existing models are specific, as they are based on a project context [27, 30]. Hence, they cannot be transferred to another e-government context in a meaningful manner. On the other hand, the existing stakeholder models are rather generic [24, 25, 28]. We noticed that the categories derived from our case study can be incorporated in some of the generic models (e.g. [24-26, 29]). For example, the categories *strategic project owners*, *operative project owners*, partly *supporters* and *internal users* represent the government side presented in the model of Flak et al. [24], whereas *external users* are the citizens in their model. We point out that using more specific categories is helpful for identifying and analyzing stakeholders. However, the categories need to be specific in such a way so that they can be transferred to different e-government projects. Consequently, a balance between too generic and too specific categories is necessary. We assume that the categories of the developed stakeholder interaction model consider this trade-off. Even if stakeholders vary depending on the project domain, the five categories are still applicable. Thus, the presented stakeholder interaction model can be transferred to other e-government projects.

Analyzing the existing models, we noticed a lack of approaches, in which categories are assigned to phases of the lifecycle of an e-government project. Only two models [25, 31] consider partly different project phases. However, all e-government projects pass through similar phases [32]. Hence, we argue that it is useful to assign the defined categories to these phases. This guarantees the independence of the categories from the project domain and that the categories can be applied to all e-government projects. Further, this assignment facilitates the analysis of (potential) stakeholders, since all stakeholders can be identified considering the lifecycle of an e-government project. Considering this, we designed our categories according to processes related to the e-government solution from the beginning on, over the implementation to the use and application (Figure 1).

Most of the existing stakeholder models represent punctual interactions between categories. Two of them have only two stakeholder categories [24, 25]. This limited number of categories complicates a more detailed analysis of interactions between stakeholders. One model lays a special focus on communication needs, which present a specific set of interactions between categories [29]. Thus, we interpret this focus as a limitation, since interactions are not only limited to communication needs. Heeks [31] as well as Axelsson and Lindgren [26] consider the interactions of one stakeholder category with all other categories. However, further interactions are not taken into account and exchanged elements are not described. In sum, except of these two models [26, 31], none of the models discusses interactions between the stakeholders' categories in detail. On the contrary, we found that it is important to analyze interactions between all stakeholders. We highlight the importance as follows: Interactions need to be identified

and analyzed, as stakeholders can significantly influence each other through communication and interactions. This can result in a change of the stakeholder's perspective on the e-government project. A stakeholder interaction model can help considering interactions between all stakeholders' categories as well as the stakeholders themselves. Thus, we enlarged the existing models by representing interactions on a stakeholder (e.g. between role administrator and finance officer) and category level.

5 Conclusion and Further Research

Our paper illustrates a stakeholder interaction model and analyzes to what extent this model can enrich the body of knowledge in regard to already existing stakeholder models. Thus, our aim is to contribute to the creation of a theoretical foundation of the e-government research field. Consequently, our paper gives a comprehensive overview over stakeholders of complex e-government projects as opposed to the narrow scope of stakeholder models so far. We identified five general categories in which stakeholders can be classified, namely *strategic project owner*, *operative project owner*, *supporters*, *external users* and *internal users* and allocated them to the lifecycle of e-government projects. The presented stakeholder interaction model shows various interactions which take place in this particular project. Hence, it sheds light on the interrelationships and the exchanged elements. We noticed that almost no stakeholder model identified during the literature review shows detailed interactions between stakeholders. Hence, we conclude that our stakeholder interaction model can extend the existing stakeholder models by illustrating various interactions. Finally, our contribution helps e-government practitioners to identify and categorize stakeholders and to understand stakeholders' interactions by designing an interaction model for their e-government project.

In terms of future research, a more extensive, empirical evaluation of the stakeholder interaction model is proposed in order to extend the model and to explore further implications towards stakeholder analysis. We aim at contributing to this goal by conducting semi-structured interviews with members of all stakeholders groups in our particular project. Hence, we focus on the identification of interaction directions by analyzing the kind of interactions in more detail. Moreover, we will elicit and further analyze concerns, interests and requirements of different stakeholder groups. Finally, we will derive guidelines for practitioners on how they can use the stakeholder interaction model in order to identify, classify and estimate the influence of their stakeholders on the project's success.

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