

Communities: with open-source software towards a vivacious civil society

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Abstract Local communities in Germany are under great pressure to modernize their services: high depth rate, increasing expectations concerning the quality of the services, socio-demographic change, environmental issues, regional competition—to name only a few of the challenges. In a society based on a federal structure and the principle of subsidiarity, it is almost natural to demand a vivid community with active citizens. Today, with the advent of social media and the new channels of communication, the question is how to leverage the benefits of this concept for local issues. More precise: How can the competence of the citizens be activated to make conditions of living in the neighbourhoods more attractive? In this paper, we discuss technical requirements for an open government. The SAGA standard of the Federal German Government strongly supports the notion of open-source software. With OpenSAGA, we introduce a new, performant and SAGA-compliant framework for the implementation of web applications for e-Government. Consequently, OpenSAGA is the platform for an OpenGovernment Suite, an extended prototype for affordable and interoperable open government solutions.

Keywords Open government · Social media · Open-source software · Software standards · SAGA

1 Introduction

Local communities are the most significant administrative units in Germany. Responsible for schools, traffic, cultural activities and the implementation of an unknown number of legal rules and regulations, communities have a deep impact on the quality of life. It is estimated that more than 90 % of all administrative issues address local governments.

Times have become increasingly difficult for local governments. Budget restrictions, service quality, socio-demographic distractions and environmental issues are only some of the challenges they have to cope with.

More than in the previous years, local politicians and administrators need sensitive “antennae” for the demands, concerns and troubles of their citizens. “Open Government” labels all efforts which target a much closer interaction between local administrations and residents. The core idea is to endow all citizens with flexible and barrier-free access to the many facets of government (the Federal Government 2010; 5th National IT Summit 2010). It is expected that a direct, smart interaction between administrations and citizens strengthen regional identity (psychological effect), encourage new business models (i.e. by open data) and support a local agenda setting (making use of the knowledge of locals).

While facing the advent of social media, public institutions have even more reason to discuss the challenges and opportunities of an open government agenda. Driven by social media, we are witnessing a decisive shift in private and business communication towards more openness and transparency in lightning speed.

Many local governments in Germany discuss and experiment with a strong, citizen-centric policy based on the options of social media. Regrettably, the simplicity of

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the open government concept contrasts with the political, organizational and technological complexity. This document addresses software-related dimensions of open government and suggests an innovative open-source platform for open government applications to bridge the gap between local government and its citizens with an affordable, flexible and easy-to-customize tool.

2 Local communities and the pressure to perform

The pressure for change is a well-known experience for local communities in Germany. In the 1960s and 1970s, their territorial borders and responsibilities within the administrative multi-layer architecture (“Gemeinden”, “Kreise”, “Regierungspräsidien”, “Landesverbände”) were re-designed. These reorganizations led to considerable intra-organizational changes and absorbed significant energy—for the long-term benefit of the citizens. The 1980s had been a decade of experiments with one-stop-shop approaches, bringing more openness and a human touch to the offices. With the advent of the Internet in the 1990s, a new era began with websites as information portals and access points for specific services. Soon, it became obvious that the Internet technology is a powerful tool to connect citizens with their local government. The overall goal today is to digitalize as many services as possible. Software has become a driving force for productivity, service quality, process speed and information accessibility.

A total of 10,000 communities in Germany are the resilient ground for democracy. Barrier-free administrations and an open political system are the fertilizer for the quality of life and the identification with the region. However, at the end of the day, they all have to lift the power of software that is affordable, interoperable, sustainable and customizable according to every day’s political agendas. Only when German communities keep pace with technical options, they can remain what de Waal would term high-performing organizations (de Waal 2010).

3 The path from E-government to open government

When the Internet began to unfold its potential, the German Government decided to frame a comprehensive ICT agenda for Internet-based e-Government. Initially, e-Government was a fuzzy concept vaguely labelling a more agile public administration. This in mind, the Federal Government initiated the Initiative Bund-Online 2005, a project for a comprehensive modernization of federal services. With a financial investment of 1.65 billion Euros,

350 different services in more than 100 federal units became “Internet-ready” (Zypries 2006).

Despite the success of Bund-Online 2005, Germany’s e-Government is not a European role model (IT-Planungsrat 2010). In December 2010, representatives of politics, administration and industry opted for a faster expansion of e-Government and open government. One pivotal aim was to ease interaction between governments and citizens to strengthen local identity and to encourage new business models with local data (5th National IT Summit 2010). Also in 2010, the IT planning council outlined the objectives for a national e-Government strategy by addressing eight key areas and a number of targets within. The ambitious objective is to establish standards for an effective and efficient administration covering the complete federal structure. Three projects are outstanding:

1. an “E-Government Law” to set the legal framework for secure electronic administration (electronic files, electronic payment and access) (www.gesetze-im-internet.de/bundesrecht/egovg/gesamt.pdf),
2. the “Process Data Accelerator” to fully automatize reporting duties from companies to public administrations (10,000 reports per year, 50 billion euros in total per year for companies) (p23r.de 2013),
3. an explicit open government strategy leading to more transparency, participation and innovation (5th National IT Summit 2010).

4 Social media and open government

Social media platforms penetrate our daily life and transform our communication. Facebook, Twitter, LinkedIn, Xing, YouTube, Pinterest, Skype—to name just a few—have changed the expectations of people in terms of a fast and less formal exchange of data and information, unrestricted by space and time. According to an official German analysis (Franke 2012) that quantifies the social networks usage,

1. 53 % of all citizens have used social media in 2011,
2. 29.6 Mio. (10 years and older) communicate via social networks,
3. 91 % of people between age 16 and 24 are active in social networks,
4. women of all ages use more heavily social networks,
5. only 9 % of the relevant population use business networks like Xing and LinkedIn (Germany is average while states like Nederland with 21 % and Finland with 20 % lead the statistics).

Many companies have responded to the success of social media quickly. Marketing expenditure in print media is

decreased in favour of faster, more dynamic communication with potential customers on social media platforms. These companies are re-defining communication and learn from user statistics (big data) and the experience of information tsunamis.

Citizens' expectations are going to move in a similar direction when it comes to local government. Citizens who are used to express their views and experiences on e-commerce platforms like amazon.com, booking.com and the like and to communicate with their friends on facebook.com expect similar options regarding the access to government. Recent polls indicate that they prefer more transparency: 71 % expect greater satisfaction with their administration if there are additional options to contact local officers available. Only 29 % are currently satisfied with the communication channels on the Internet (Stemper and Schulz-Dieterich 2012; Forsa 2011).

Similar to companies which use the knowledge of employees, local governments should leverage the know-how of their citizens. Citizens are constitutive and the first and final authority when it comes to initiating new projects and to evaluate decisions. With social media technology at hand, citizens can get involved much easier as "experts for the daily life" and become drivers for local innovations. Consequently, open government targets a much stronger interaction between administrations and local residents. The basic concept is to enable all stakeholders with a flexible and barrier-free access to governmental affairs. Three different dimensions are essential:

1. transparency concerning political decisions-making,
2. direct participation in relevant issues by enabling comments, suggestions and voting mechanisms,
3. fast communication and collaboration.

What may initially sound abstract can easily become a tangible value. The city of Bonn, as one of many examples, used brochures, meetings and questionnaires to identify critical topics related to budget decisions. On average, only approximately 40 people per year commented on the budget. In January 2010, Bonn started an Open Budget project. Focused on budget-relevant activities in the fields of sports and nature/environment protection, the citizens were encouraged to suggest and comment on possible investments. Using a web-based social media-like platform, more than 12,000 citizens registered on the website and suggested almost 1500 actions which stimulated 14,000 comments (Stadt Bonn 2012). Although an evaluation still has to be conducted, it seems obvious that infrastructure-related projects (like re-building a railway station, area extensions for business parks or forest protection activities) are most appropriate for a constructive dialog.

5 Technical requirements

The pervasive concept of open government has significant political, organizational and technical implications. One of the critical dimensions is a specific persistence of public administrations—while open government is about the acceleration of communication, a more flexible responsibility of public employees and a distinctive liability in cooperation. It is not a surprise that in this early stage of open government, the results are mixed: sometimes the participation of citizens is too small, sometimes the initial investment is too high, and sometimes a wise implementation strategy is missing.

In terms of technology, local policy needs software tools that respects the scarce budgets, and enables a stepwise, flexible implementation of open government. In terms of a more political perspective, a solution must be "controllable", and neither exclude nor prefer minorities.

The acceptance of open government largely depends on a constant flow of information. The software architecture of the system must be open and guarantee a flexible, topic-driven discussion. Comments, recommendations and voting mechanisms must be adaptable to the specific topics. Usability and user experience have to be designed with greatest care.

The technologies used today—mainly CMS systems like Drupal, CKAN—have serious restrictions when it comes to the implementation of open government. It is imperative rely on a technological approach which accounts for total cost of ownership (TOC), educational restrictions in the IT departments of the communities and the process character of every sustainable open government application. When digging deeper into the requirements, the complexity of a comprehensive technical approach becomes evident:

1. enabling access to local data (socio-demographic, shopping patterns, traffic data, etc.) and background information about community-related issues (information from the local council, etc.),
2. encouragement to tap citizen's creative ideas and recommendations (open innovation),
3. stimulation of a stronger participation in the local agenda setting with voting mechanisms,
4. assembling of applications instead of too much programming,
5. seamless integration into IT landscapes with interoperable standards and connectors (ERP, GIS and beyond),
6. manageability with single sign-on for all modules, a homogeneous concept for administration, among others,
7. expandability to emerging technologies like mobile and cloud computing,

8. automatic updating and cross-linking of data—linked data; budget, traffic, pollution, demographic, economic, etc., and an automated, machine-assisted enrichment enhancement.

Without an adequate software framework, the design of the many dimensions in real-world applications remains critical. Furthermore, a technical concept should address communities of all sizes and follow the concept of “start-small-then-grow”.

6 Standard architectures for government applications (SAGA)

In order to carry on with the Federal’s e-Government initiative beyond Bund-Online 2005, an E-Government Manual was prepared under the leadership of the German Federal Office for Information Security. This manual is a reference book and central exchange platform for issues related to e-Government (Federal Minister of the Interior 2008).

In 2003, SAGA—an acronym for Standards and Architectures for e-Government Applications—was included. SAGA defines a comprehensive standardization initiative for Germany’s public administrations (Federal Minister of the Interior 2008), primarily the Federal Government in order to:

1. define technical standards and architectures for e-Government applications, covering all levels and institutions relevant for e-Government, and
2. standardize the implementation of processes and data in order for significantly more interoperability and compatibility (Federal Ministry of the Interior).

In technical terms, SAGA has five objectives:

1. interoperability, i.e. warranting co-operation between various e-Government applications in order to effectively exchange information between the Federal Government, citizens, businesses and partners of the Federal Government,
2. reusability, i.e. re-use of process and data models, systems, services and components in various e-Government projects in order to generate synergies,
3. openness, i.e. inclusion of open standards in e-Government applications in order to promote their long-term usability,
4. reduction in costs and risks, i.e. considering investment-safe developments on the market and in the field of standardization,
5. scalability, i.e. ensuring usability.

The standards undergo a strict evaluation process: from the examination of proposals to the discussion by expert

groups to a classification of the proposals into categories like “under observation”, “recommended” and “mandatory”. Extended classifications refer to the life cycle of standards and affect a “List of Suggestions”, a “Right of Continuance List” and “Negative List”.

SAGA 4.0 was a recommendation to be considered in tenders of the federal administration. Whenever reasonable, ICT solutions for governments should be based on these standards (Jesse 2012a). SAGA 5.0 has become “mandatory” for federal organizations, i.e. whenever possible; software bids shall be compatible with SAGA standards.

SAGA is in strong favour of OSS. Minimum requirements for the openness are defined by:

1. the standard was published and the documentation of standard specifications is either free or, at most, available against a nominal fee,
2. the intellectual property (for instance in the form of patents) of a standard or of parts of a standard must, if possible, be accessible without being contingent upon the payment of a license fee,
3. the federal administration and the users of its services must be able to use the standard without restriction.

7 Open-source software (OSS)

The notion of open-source software has gained ground not only for financial reasons. There are numerous examples for the breakthrough impact of OSS; especially, the success of the Internet and the WWW depends on OSS (TCP/IP, HTML). OSS is strong in operation systems, infrastructure and networks (Unix, Linux, Apache and PHP) and gains ground in fields like CMS, DMS and ERP. Based on the notion of “wisdom of the crowds”, the open software concept has changed the software industry and some regard the advent of OSS as a new “Era of Enlightenment” (Uhl 2004). The success of OSS has initiated a serious political discussion in Europe about the overall advantages of open source compared to proprietary solutions. Four major dimensions were in the centre of the evaluation: dependency, cost, security and transparency (Gosh et al. 2002). The European Commission has initiated numerous activities to encourage open source, and it is no surprise that SAGA puts special emphasize on the openness of software applications.

Software is open source when the source code is freely distributed with the right to modify the code on the condition that redistribution is not restricted, and it is obtainable for only the reasonable cost of reproduction (Open Source 2011). Without discussing the many legal aspects of licensing issues, the basic criteria are:

1. the user is allowed to analyse how the program works and to customize the code according to his special needs,
2. the program can be improved (extensions, additional functionalities),
3. the program is allowed to be copied for whatever reasons and executed on an unrestricted number of computers,
4. copies can be distributed to any user.

In contrast, vendors of closed, proprietary software typically provide only executable binary code, and they usually place specific restriction on the redistribution of the software.

The success of OSS is not guaranteed at all. There are some essential requirements which are essential for the success of OSS (Schmitz and Castiaux 2002):

1. a sufficient number of institutions with the same or a similar problem,
2. an excellent support on how to understand the source code (beyond documentation),
3. a common pool of easy to understand core modules, i.e. modularized software, not a monolithic code,
4. clear identification of those code modules that are stable/saturated in contrast to those that still need further improvement,
5. availability of an agile community for the discussion of requirements, goals and priorities for future developments.

Referring to applications in the context of open government, it is evident that:

1. open-source software is much cheaper, and under specific circumstances, the follow-up costs are significantly lower,
2. open interfaces between open government modules can decrease additional costs (installation, customization, maintenance, support and operation) considerably,
3. modular concept scales the initial financial risks and enables further extensions on the basis of previous results (Table 1).

8 OpenSAGA platform

The mission of the OpenSAGA platform—officially released in May 2010 under the GPL V2 license—is to deliver an open-source framework for SAGA-compliant, Java-based web applications. The innovative concept is designed to generate SAGA-compliant applications for

e-Government from domain descriptions aiming at an 80 % automation level while programming an additional 20 % for more complex business logic (www.opensaga.org 2012, Biskup 2010).

With its strong reference to SAGA, OpenSAGA has demonstrated to be a first-choice platform for developing open-source-based Government applications (Fig. 1 refers to a project created for a consortium with all German state governments).

OpenSAGA relies on standard web technology and separates content, visibility and behaviour. The framework guarantees a faster and more agile development of web applications. The concept follows a number of principles:

1. models are the central working artefact, i.e. developers implement exclusively models and strategy interfaces without access to generated codes,
2. the description format for the components is as technology independent as possible,
3. the level of abstraction for the description is as high as possible,
4. a top-down design encourages a step-by-step description of a complex context, and
5. the evolution of an application is possible without having to rewrite or extensively amend applications.

In architectural terms, OpenSAGA has four elements:

1. The *domain model* describes the application's domain. It declares the individual object types and their features, concentrating on the description of what, not on where and how. The declaration may be backed by a database, web service or an excel spread sheet.
2. The *process model* describes the behaviour of the application and its reaction to user input. Basically, it corresponds to a status diagram with access points, decision status and views which describe the user interface. Transitions connect the various conditions of a process and feature action lists which are executed when the transition is activated.
3. The *view model* describes the general structure and content of a view state within a process. It represents the connection between the input and output elements of the views and domain types and the connection among buttons, links and transitions.
4. The *generator* creates a runtime model from the XML files of the models. A runtime model is a graph of Java object instances. This runtime model is transformed into implementation artefacts—for example, Java classes are generated from domain models, and the processes are translated into Spring Webflow and JSF templates (Fig. 2).

Table 1 Benefits and weaknesses of OSS

| Expected benefits | Perceived weaknesses |
|---|---|
| Strong support for interoperability | Uncertainty as to what exactly constitutes OSS (legally, sustainability, ...) |
| Supplier independence, i.e. no problem if the original supplier disappear or withdraw support | Fear that support can be fragmented or difficult to obtain, particularly for niche products |
| Platform independence, i.e. availability of the source code tends to lead to a wider range of platforms | Misunderstanding of the licensing and implications for the intellectual property rights |
| Avoidance of a proprietary lock-in (high costs of migration from a proprietary solution to any alternative) | Difficulties in identifying appropriate OSS applications |
| Patches or updates to OSS tend to be produced very rapidly | Documentation often poor |
| No license costs | Licenses often only a small part of the total cost of ownership (TOC) |
| More security, i.e. it is believed that OSS is less vulnerable than proprietary software due to the openness, the awareness and the transparency of the community | Lack of real-world experience and support for migration from closed proprietary software to OSS |

**Fig. 1** Food emergency warning: website and intranet based on OpenSAGA (<http://www.lebensmittelwarnung.de>)

OpenSAGA implements consistent MDS (Model-Driven Software Development), i.e. the generated code artefacts cannot be modified directly but only through the

generation or amendment of individual OpenSAGA components or the entire generation process. OpenSAGA is based on the standards and libraries like Java Servlet

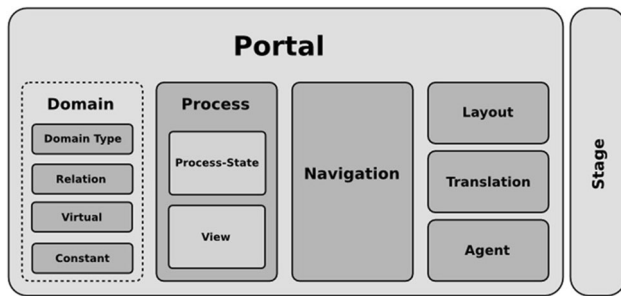


Fig. 2 Dimensions of OpenSAGA

API 2.4+, Spring Server Faces, Spring Webflow, JSF, Hibernate, JDBC, XHTML 1.0 transitional, CSS, JavaScript jQuery. The models are written in XML, simplified either through the OpenSAGA Eclipse plug-in or through an XML editor.

9 The OpenGovernment Suite (OGS)

9.1 Overall architecture

In technical terms, the OpenGovernment Suite is based on OpenSAGA and, hence, compatible with the SAGA standard. This suite is a first extended prototype towards an affordable and interoperable platform for open government. The OGS exploits OpenSAGA's innovative features (www.opengovernmentsuite.de 2012; Jesse 2012b). According to the architectural design of the platform, the OGS is a modular, comprehensive and configurable solution characterized by:

1. a consolidated user interface,
2. a single sign-on for all modules,
3. an homogeneous concept for the administration,
4. elements for voting and the evaluation of ideas.

The OGS currently features three core modules: the data catalogue (open data), budget participation and collaboration (Fig. 3).

Additional modules can be integrated during the evolution of the OGS (council information module, business process modelling, reporting, etc.). The general advantages of the OGS are controllability, openness to extensions, easy implementation and an approach following the principle of “start small, and grow according to experiences and needs” (Fig. 4).

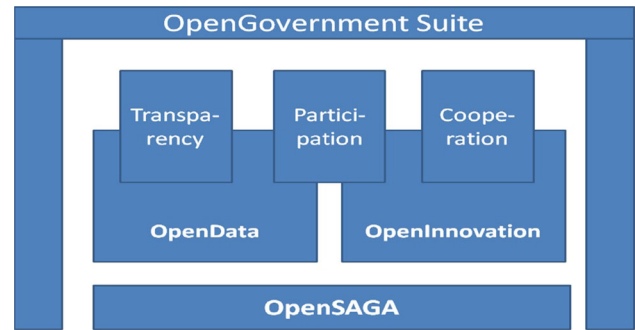


Fig. 3 OpenGovernment Suite (basic scheme)

9.2 Open data

Open data is currently the most important European open government topic (Schellong and Stepannets 2011; Shadbolt 2010). The Open data module of the OGS enables a well-structured compilation of local data. Users get a straightforward overview of available data, may submit suggestions to the administration to add further data to the pool or add relevant information (like links, assessments, Meta data).

Specific characteristics of the OGS:

1. simple uploading of data following the REST approach,
2. a variety of search filters.

9.3 Budget participation

A community's budget represents a political programme in terms of financial figures. An increasing number of German communities have started to experiment in this field by explicitly encouraging citizens to comment on carefully selected topics (burgerhaushalt.org 2012, Von Lucke et al. 2011).

Specific characteristics of the OGS (Fig. 5):

1. freely configurable categories (i.e. traffic, environmental issues, education),
2. filter concept to follow selected topics,
3. easy to contribute to discussions,
4. configurable voting procedures,
5. statistical functionalities,
6. transfer of the master data to the subsequent year.

9.4 Collaboration

The OGS includes a collaboration tool similar to a Facebook event stream. Users may enrol and contribute to

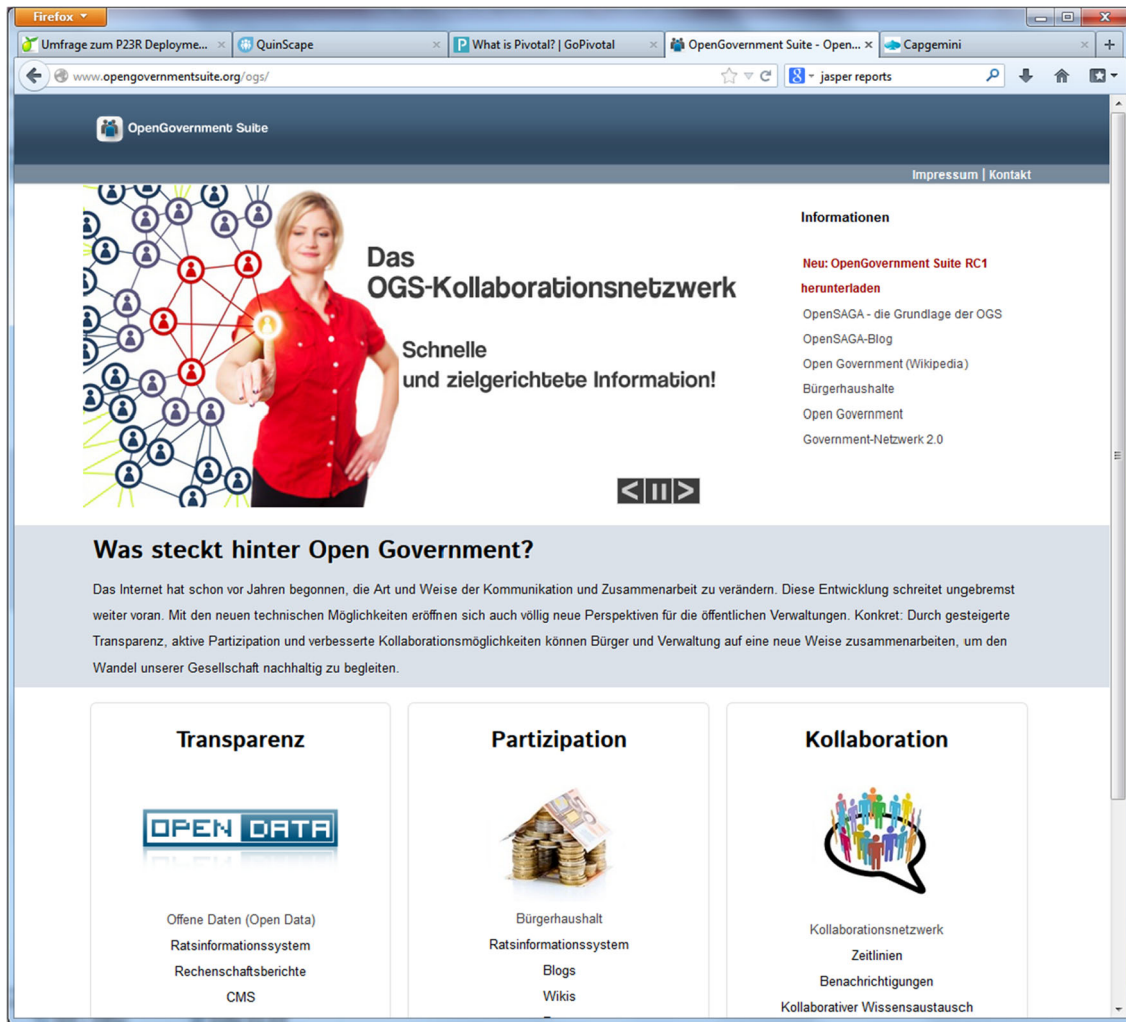


Fig. 4 OpenGovernment Suite: home page

topics. Whenever something “interesting” occurs on the platform (new information or data sets, new evaluations, votes completed, etc.), participants will be informed. Similar to modern social media systems, users may feed messages into that event stream at any time.

Specific characteristics of the collaboration module:

1. clustering of information into “streams”,
2. usability follows well-known standards for social media,
3. automatic information about new entries,
4. news-based information between participants,
5. tagging.

10 Conclusions

Local governments in Germany face difficult times. With the advent of social media, an increasing number of Germany’s local governments regard their citizens as a much

more active, stimulating factor in local policy. Labelled open government, the focus is on transparency, participation and collaboration.

The German Federal Government spreads SAGA as an open, interoperable and sustainable standard for e-Government applications. OpenSAGA is a SAGA-compliant framework for developing Java-based web solutions. Almost naturally, a comprehensive software tool for open government applications, the OpenGovernment Suite, is based on OpenSAGA. This suite is an extended prototype and freely available under the regulations of a GPL license.

From a much broader perspective, a direct, open, transparent dialog between local governments and citizens gains relevance: Many countries face an ongoing urbanization process which poses considerable pressure on politics. Concepts for “smart cities” evolve which include citizens as the last resort of a sustainable development. In times of social media and the omnipresence of mobile

Fig. 5 Citizens may contribute to selected budget issues (screenshot of the OGS, in German; relating to cleanness at bus stations)

Internet access, this “inclusion” has to be supported by truly supportive software standards.

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