Potential of Language Technology to Support Public Organizations and Their Communication Channels in a Developing Country

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ABSTRACT
Language technology can improve the efficiency and quality of the services provided by public organizations, first of all, the communication with citizens. So far, this has been investigated in the context of Western countries. We do not know, however, how beneficial such application of language technology could be for the so called developing countries. In order to find this out, we explored the communication between ten public organizations and the citizens in Rwanda. We discovered about 20 communication channels; 12 of them could benefit from various applications of language technology. Furthermore, we explored the potential of language technology for analysis of digital communication in order to better understand the citizens' needs and opinions and, hereby, increase the level of e-participation, participatory decision and policy making.

CCS Concepts
• Applied computing~E-government

Keywords
Language Technology; Communication Channels; Participatory Decision and Policy Making; E-Participation; Government 2.0; ICT for Development

1. INTRODUCTION
A number of IT applications support public organizations' communication with citizens: case management systems organize formal cases; systems for internal communication within the organization help resolve the cases as well as share knowledge; systems for contact centers support communication via telephone, email, and social media; self-service systems save time and human resources. Still, this communication experiences a number of challenges: long telephone queues, long time to get the answer to a written inquiry, different employees may give different answers to the same inquiry, valuable human resources involved in answering simple inquiries, organizations are late in discovering external problems and trends, etc.

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A set of techniques that help address these challenges are various techniques referred to as language technology [13]. Henkel et al. [14] have developed a map of IT systems that support the communication between public organizations and citizens. Furthermore, the authors have placed five business cases for language technology, which address the challenges in the communication, onto this map. The business cases aim at improving the *efficiency* and *quality* of the communication between the public organizations and the citizens, as well as increase the *citizens' participation in the decision making process* of the organizations. In this context, the business cases are opportunities for the technology, they describe the benefits that language technology can bring to the user experience and the business processes in the organization. The monetary value and return on the IT investment are not calculated. For public organizations, monetary gain of an IT investment is not the goal but a secondary concern [3].

The business cases for language technology for public organizations were designed having the developed, a.k.a. Western, countries in mind. In the developing countries, the technical infrastructure is different and the national and organizational cultures, that influence the adoption of information technology [1][16], are different. Would the same business cases hold in the developing countries? In order to find this out, we examined external communication and input into decision making at ten public organizations in Rwanda, a country in Central Africa. The contribution of this work is:

- Examination of the communication *channels* used by public organizations in a developing country for receiving and broadcasting information, and for internal communication.
- Identified *opportunities* for using language technologies to support the communication.
- Identified *future channels* that the public organizations want to use.
- Examination of the *information sources* that public organization use for decision making, and how language technology can help process such sources.

The paper is organized as follows. The next section describes the business cases central for this paper and discusses them in the context of communication channel management. Section 3 presents the research method and the data sources. Sections 4 and 5 contain the results. Section 6 concludes the paper.

2. BUSINESS CASES FOR LANGUAGE TECHNOLOGY
This section presents seven business cases for language technology that support public organizations [13][14]. The business cases were

developed in Sweden, no adjustment for specific needs of Rwanda has been made. The business cases were developed in close cooperation with a few public organizations and therefore represent the organizations' perspective. We find the organizations' perspective important because it is the organization, not the end user, who makes the decisions regarding technology adoption at the organization.

2.1 Description of the Business Cases

A business case is presented as (i) the problem to solve, (ii) a possible solution, (iii) the effect of the solutions. The technical state of the art, risks, and examples of applications of the first six business cases are detailed in [13][14]. The last business case represents an off-the-shelf product.

BC1: Automatic and semi-automatic message answering

Problem. Public organizations spend a considerable amount of resources answering simple inquiries from citizens. Furthermore, different employees may answer the same inquiry differently. The quality of the answers differs. Citizens expect instant answers; instead, they often must wait for the answer for several days. The contact center is not available outside its office hours.

Solution. Sneiders [28] presents a review of various approaches to message answering. The most feasible solution of (semi-) automated message answering is retrieval of standard answers either from a database or from the organization's website. Knowledge-intensive solutions offer fully-automated message answering that can deliver instant answers directly to the citizens. Statistical text retrieval resembles search systems; it can be used internally at the contact center (semi-automated message answering) or as a service on the organization's website.

Effect. Fully automated message answering provides instant answers, if any, at any time. Both fully automated and semi-automated message answering work with uniform and complete answer texts. The organization saves human resources; it can redirect the resources from solving trivial tasks to solving more complex issues.

BC2: Phone call summation

Problem. If a phone call is not documented, there is no information left for future reference or aggregated analysis of citizens' needs and opinions. In some organizations, the staff member writes a summary of the conversation during or after the conversation, which consumes the human resources.

Solution. The result of speech-to-text conversion is not a perfect piece of text but good enough as a summary.

Effect. The staff member can concentrate on his or her main task – the conversation – and gets less tired. The quality of the conversation is likely to increase. Processing of one phone call takes less time. The summaries are used as a reference in contact with a particular citizen, as well as for aggregated analysis of citizens' needs and opinions.

BC3: Case routing

Problem. Staff members in an organization have their own domain of expertise. In a larger organization it may be difficult to find the right person to route the case to. The person in charge of dispatching the cases becomes the "bottleneck" in the process. Manual assessment and dispatching of the cases consumes human resources.

Solution. Typically, case routing is based on a set of flexible rules assigned to specific competencies. The rules are often based on interpreting metadata and may include free text categorization and message answering techniques for processing text documents.

Routing has been a research challenge during the first six TREC conferences [30] but only recently has it become a commercially viable application of text analysis technology, showing that the path of technology adoption can be decades long.

Effect. The case is quickly assigned to the right staff member without a human "bottleneck". The total case handling time is reduced.

BC4: Monitoring citizens' needs in electronic media

Problem. Modern organizations depend on their external business environment. Because public organizations work on behalf of the general public, they need to adjust their business to the citizens' needs, which are reflected in public discussions, they need to properly react to rumors and complaints. The organizations need to constantly monitor the public opinion and where appropriate influence it.

Solution. Competitive intelligence is a broad concept. In a narrower sense, competitive intelligence systems analyze text documents, extract key concepts and their relationships, and create a basis for conclusions. The sources of such intelligence are electronic media, phone call summaries, messages (email and social media).

Effect. The organization is well-informed about the needs of the citizens and the public opinion, can adjust its business to the needs and can pro-actively react to the opinion. Monitoring public discussions allows short-term planning of resources at the contact center, as hot topics in the information space tend to increase people's interaction with the concerned organizations.

BC5: Sentiment analysis

Problem. Ordinary categorization of cases gives a structured way of sorting and analyzing data based on what the case contains. However, when using traditional categorization, it is easy to miss how customers express values and opinions about offered services and it is easy to miss details in the cases.

Solution. Sentiment analysis is the process of identifying values and details in a customer interaction. The analysis can be performed automatically by the competitive intelligence techniques.

The application of sentiment analysis is currently moving from simplistic positive-negative models, which have shown themselves to be of little utility, to more elaborate models, tailored to domain, task, and customer objectives. This requires somewhat more introductory effort at launch time, but the insights from a model which tracks attitudes such as "interest", "curiosity", "skepticism", "charisma" are more actionable than the first-generation models allowed for [15].

Effect. By applying sentiment analysis, it is possible to get information about how customers view the organization and its products. Thereby, the organization and its case handling practices can be adapted to become more customer oriented. Sentiment analysis is thus an instrument for business improvement, rather than aiming at improving a single case.

BC6: Scanned document completeness validation

Problem. Even though electronic documents and services are becoming more prevalent, there is still a need to handle traditional paper forms and letters. When paper documents are converted into

digital documents there is a risk that the conversion process, the scanning, introduces errors. Detecting and correcting these errors manually is time and labor consuming.

Solution. Scanning error detection makes use of language technology to automatically detect errors that were introduced during scanning. Assuming that the software solution knows what the scanned document should look like, the software solution ensures that the scanned copy has no missing parts.

Effect. By detecting errors early in the process it is possible to correct them before the staff starts working with the documents.

BC7: "Browse aloud"

This business case has not been formulated in [13][14] because it did not pose a research challenge – there exists at least one good off-the-shelf product.

Problem. Public information must be accessible to all members of the society. Ordinary online content may pose difficulties for people with dyslexia, low literacy, the official language as a second language, and those with mild visual impairments.

Solution. Texthelp, an Irish company, has developed an advanced software solution – Browsealoud – that reads online text in multiple languages.

Effect. Online content becomes more accessible to people with dyslexia, low literacy, the official language as a second language, and those with mild visual impairments. Public organizations comply with equality, disability, and anti-discrimination policies.

2.2 Context of Communication Channel Management

A citizen's contact with a public organization is not a social call; the citizen has a need, and the citizen chooses a communication channel that suits that need best. Reddick and Turner [25] summarize four factors that influence the citizens' choice of digital channels versus phone and personal visits at the office. (1) The digital divide means that people of different gender, age, education and income level, etc. have preferences for the digital versus face-to-face channels. (2) For getting information, digital channels are preferred, while solving a problem is easier face-to-face. (3) A digital channel is a more likely choice if the citizen trusts the government. (4) Digital channels yield greater satisfaction because they tend to be readily available and empower the citizens to make their own choices for the needed information and services.

Ebbers et al. [9] introduce more nuanced factors for choice of the communication channel. The authors identify three channel types (web, phone, front desk a.k.a. reception), five channel modes (consultation, conversation, allocution, registration, transaction), and task/problem factors (complexity, ambiguity). The main mismatch between the organization's versus citizen's choice of the channel lies within the mode "consultation" (the citizen independently retrieves information) and "conversation" (the citizen requests and receives tailored information). In order to improve the channel management, the authors suggest three principles. (1) Front desk and phone are the preferred channels when it comes to removing problem ambiguity; the web and front desk are preferred to handle problem complexity. (2) Complex problems are handled via the consultation mode (a lot of information, instructions, time to think); ambiguous problems are handled via the conversation mode (many interpretations to clarify). (3) The conversation mode should be supported by the front desk and the phone; the consultation mode should be supported by the web and the front desk.

Both sources [9][25] suggest that digital channels are preferred for getting information, which is the Ebbers' consultation mode. In this mode, the business cases BC1 and BC7 are designed to assist information acquisition. Removing the problem's complexity can be assisted by BC1 if the complexity includes finding the information. Question-answering systems (written questions) provide a shortcut to the answer. Some systems are capable of correctly answering around 70% of all questions and not answering the remaining ones [27], which saves the time-to-answer and reduces the risk of moving from the consultation mode to the conversation mode in order to get the inquiry answered.

Trust in government (a Reddick and Turner's [25] facilitator of digital channels) increases if the government is well aware of the citizens' needs and opinions, which is the field of work for the business cases BC4 and BC5.

The above channel management discussion does not touch the concept of self-service, which is a trend not to be ignored. A report by Swedish Agency for Public Management [29] identifies 7 steps in a formal case management process. Two of the steps – preparation for the decision and making the decision – are manual for complex cases; the other steps can be to a large extent automated. Automated case management enables self-service and facilitates a scalable and cost-effective business model. The business case BC3 is recommended for automated case management.

Self-service mindset is also present in unstructured communication with an organization, which is the main opportunity for the business case BC1. Question [27] and email [28] answering systems may deliver immediate answers. Interactive Voice Response and the less frequent Voice User Interface enable a certain level of self-service via phone [24]. Email answering systems can help personnel at the contact center to compose the answer, which is not exactly self-service but does reduce the time-to-answer and the amount of involved human resources.

There are rather few studies about the channels of e-service delivery in the developing countries. A common form of communication in this context is government-to-citizen (G2C) where citizens get informed and government agencies deliver services electronically via TV, radio, websites, telephone and social media. The traditional printed magazines, front desk, formal meetings, workshops, and public exhibitions are also still used in many countries in Africa. Governments in East Africa are making an effort to introduce mobile devices as a new channel of communication with citizens and businesses [20]. Generally, government agencies from the developing countries tend to adopt online channels from the developed countries introducing variation in terms of culture, structure, and processes [26].

3. METHOD

In order to test applicability of the seven business cases in a developing country, we interviewed ten public organizations in Rwanda. Before the interviews were carried out, the permission was obtained from the management of these organizations. The management gave its consent that the name of the organization is disclosed (Table 1), which reveals the mission of the organization. In fact, the organizations considered their participation in this research a valuable publicity. In the column next to the names of the organizations the reader can see the main communication partners. Besides the explicitly mentioned partners, all the

organizations communicate with business companies and non-governmental organizations. Cells, sectors, and districts are the subjects of administrative division in Rwanda.

The selection of these organizations followed a snowball sampling process [8], and we considered those which were more likely to have useful information for this study. Furthermore, the selected organizations have participated in e-government projects, which means they invest in their own development. In each organization, one person was interviewed in a range of 15 to 20 minutes. The competence and duties of the respondents were ICT director, database specialist, director of planning and monitoring, legal advisor to the minister, administrative assistant, the public relations and communication officer.

Table 1. Organizations that have been interviewed

Acronym	Organization	Communicates with
MIFOTRA	Ministry of Labor	Primarily public servants
MINEDUC	Ministry of Education	Students, parents, schools
RDB	Rwanda Development Board	Entrepreneurs, investors
MINALOC	Ministry of Local Governance	Citizens, cells, sectors, districts
MYICT	Ministry of Youth and ICT	Youth communities, ICT entrepreneurs
NIDA	National ID Agency	Citizens, refugees
REB	Rwanda Education Board	Students, parents, schools
RGB	Rwanda Governance Board	Citizens, cells, sectors, districts
RPPA	Rwanda Public Procurement Authority	Business companies, government agencies
RSSB	Rwanda Social Security Board	Employees with income, business companies

The interviews were based on a few questions; the interviewees could freely speak out their mind. This was not an in-depth assessment. Rather, we were looking for trends across the ten organizations: (i) which communication channels with citizens and other organizations are used so that we can match the business cases for language technology to each channel, (ii) whether the communication with the citizens is analyzed in order to obtain better understanding of the citizens' needs and opinions (the business cases BC4 and BC5), and (iii) whether the results of such analysis, if it takes place, are used in decision making.

Of the total 10 interviews, 8 interviews were recorded, during 2 interviews notes were taken because the respondents did not want to be recorded. Afterwards all the interviews were translated into English and transcribed. During the transcribing process, verification interviews helped to clarify details. The transcriptions were analyzed in order to address the above three subject matters, fill Table 2 to Table 7, and make conclusions.

4. CHANNELS FOR COMMUNICATION AND OPPORTUNITIES FOR IMPROVEMENT

The interviews reveal tree kinds of communication channels: (i) the channels for receiving information from individual citizens, (ii) the channels for broadcasting information to the general public, and (ii) the channels for communication with partners. The partners are governmental entities and non-governmental organizations, international organizations, companies, and other legal entities that are not customers.

Table 2 summarizes the channels for receiving information from individual citizens by each organization. The channels are labeled with the business cases for language technology as opportunities to make the communication more efficient (BC1, BC2, BC3, BC6) and user friendly (BC1), as well as to obtain new information from the communication (BC4, BC5). Please observe that the business case labels are the result of our own reasoning. The interviewees were not familiar with them.

Table 2. Receiving information from citizens

Channel	Organizations	Opportunities
Facebook	(9) MIFOTRA, MINEDUC, RDB, MINALOC, RSSB, MYICT, RGB, RPPA, REB	BC1, BC3, BC4, BC5
Email	(7) MINEDUC, RPPA, MIFOTRA, RDB, MINALOC, MYICT, REB	BC1, BC3, BC4, BC5
Face-to-face at the front desk or district tele-center	(5) MIFOTRA, RDB, NIDA, RPPA, MINEDUC	
Toll-free telephone	(5) MINALOC, RGB, RPPA, MINEDUC, RDB, MYICT	BC2, BC4, BC5
Suggestion box at the entrance	(3) MIFOTRA, MINALOC, RSSB	
Electronic and paper-based questionnaires	(3) MINEDUC, RGB, REB	BC4, BC5
Feedback/complaints on the website	(2) RDB, MINEDUC	BC3, BC4, BC5
Task-specific SMS/web application form	(2) RSSB, REB	BC3
Paper-based forms	(2) NIDA, REB	BC6
Paper letters	(2) RPPA, MINEDUC	BC6

As it might be expected, widely used are the non-digital means of communication: face-to-face meeting, a box for paper notes, telephone conversation. A telephone conversation can be digitalized and summarized (BC2), and the summaries used for extracting intelligence. Email and Facebook are the most common digital channels and accommodate more than half of the business

cases. We gave Facebook the same business cases that email has, assuming processing of text messages. We do not know, however, how to embed that processing into the Facebook's proprietary environment. Case routing (BC3) is useful wherever a case, a digital document, or a message require attention of a domain expert. Extracting new information from textual communication (BC4, BC5) is viable wherever digitalized text is available.

How useful are these business cases? Because much of the communication with the citizens is not digitalized, creating more e-services and reducing the number of face-to-face meetings and phone calls is likely to be the first priority of e-government in Rwanda. Making the communication more efficient is doomed to remain the second priority for a while. Monitoring the citizens' needs and opinions by analyzing the communication with them is another matter of political priorities.

In order to judge the real-life usefulness of the business cases in Rwanda we need to consider a number of factors. Political priorities and the monetary effect – low salary vs. high cost of proprietary software – should be respected. Some studies with a focus on developing countries have reported failure of e-government initiatives [7][12]. Heeks [12] distinguishes total and partial e-government failures. The total failures include those e-government projects that are only conceived but not implemented or discarded at the early stage of initiation. The partial failures are those e-government projects where the main goals were not attained or in some cases they ended up with unfavorable results.

Table 3. Broadcasting information to the general public

Channel	Organizations	Oppor-tunities
Twitter, Facebook	(9) MIFOTRA, MINEDUC, RDB, MINALOC, RSSB, MYICT, RGB, RPPA, REB	BC7
TV and radio	(6) RDB, MINALOC, RSSB, NIDA, REB, RPPA	
Website	(6) RDB, MINALOC, MYICT, RPPA, MINEDUC, RSSB	BC7
Printed public media	(5) RPPA, RDB, REB, RSSB, NIDA	
Official gazette, reports	(4) MINALOC, RSSB, MYICT, RPPA	
Press conferences	(3) REB, MINALOC, RGB	
Public exhibitions	(3) NIDA, RDB, RSSB	
Twitter, Facebook	(9) MIFOTRA, MINEDUC, RDB, MINALOC, RSSB, MYICT, RGB, RPPA, REB	BC7
TV and radio	(6) RDB, MINALOC, RSSB, NIDA, REB, RPPA	
Website	(6) RDB, MINALOC, MYICT, RPPA, MINEDUC, RSSB	BC7

A notable reason of the partial failures is scarce resources, the developing countries cannot gamble by investing big amounts of funds in such projects. Other common reasons why the e-government systems do not deliver the promised services are: poor planning and lack of coordination between government departments in providing services to citizens [2], too basic ICT infrastructure, human digital skills and capabilities, organizational culture, vision and mission, resistance to change, and the role and degree of involvement of the organization's leadership in e-government implementation process [22].

Table 3 summarizes the channels for distributing information to the general public, which means first of all citizens. Web-based channels are well represented here, along with the traditional TV and radio, and printed media. The web-based channels allow improving user experience for people with impairments (BC7).

Table 4 summarizes the communication channels with partner organizations and specific citizen groups. An example of a specific citizen group is students who study abroad; Rwanda Education Board keeps contact with these students. For communication with the partners, email and telephone are most popular. Web-2.0-based means of communication (Facebook, WhatsApp, Skype) are also well-represented. Table 4 confirms that Rwandan public organizations are familiar with and use ICT-based communication channels, although the tradition of personal meetings and official paper letters is much alive. Wherever paper documents are involved, the organization can optimize their management by scanning them (BC6) and using a document sharing system. Wherever an information system is used for case management, not only for retrieval of data, case routing (BC3) is likely to be useful.

Table 4. Contacts with partners and specific citizen groups

Channel	Organizations	Oppor-tunities
Email	(8) MIFOTRA, RDB, MINALOC, RSSB, MYICT, NIDA, RGB, REB	
Telephone	(8) MIFOTRA, MINEDUC, RDB, MINALOC, RSSB, NIDA, RGB, MYICT	
Meetings, workshops	(7) MIFOTRA, MINEDUC, MYICT, NIDA, RGB, RPPA, MINALOC	
Paper letters	(6) MIFOTRA, MYICT, NIDA, RGB, REB, RPPA	BC6
Groups on Facebook, WhatsApp, Skype	(6) RDB, MYICT, RGB, REB, NIDA, RSSB	
Visiting the stakeholder	(4) MYICT, NIDA, RGB, MINALOC	
Reports from partners, subsidiaries, etc.	(3) MINALOC, RSSB, MYICT	
Domain-specific information system	(1) MINEDUC	BC3

After the interviewees had talked about the existing communication channels, they were asked to reveal their future plans, the desired means of communication between the organization and the external environment:

- MIFOTRA: Online forms where citizens can send their requests and cases.
- MYICT: A web forum for discussions around reproductive health and condom use. It is easier to discuss online than face-to-face.
- MINEDUC: (i) Rwanda Online Platform – one-stop center for all the government services. (ii) Education Management Platform that connects the ministry, teachers, students, parents.
- MINALOC: A complaint management system at the sector level. If a complaint is not answered, the system reroutes it to the district and ministry level. So far such a web application works in Gisagara District.
- NIDA: (i) An e-service where citizens could track the progress of their ID request. (ii) An e-service where people could report lost ID, person passed away, change of address. (iii) A complaint management system.
- RGB: (i) A document sharing system to minimize use of paper. Paper-letters can be scanned and accessed from anywhere. (ii) SMS- or web-service where citizens can send information without coming to the headquarters.
- REB: A database of all the students who study abroad: specialization, completion time, progress report.
- RPPA: (i) SMS as a carrier because many people have mobile phones (the content of the possible services not yet specified). (ii) A system for procurement related complaints. (iii) An e-learning system, with video- and audio-lectures, to educate people about the procurement management process.

Table 5. Desired future communication channels

Channel	Organizations	Opportunities
Online self-service case management	(5) MIFOTRA, MINALOC, RGB, NIDA, RPPA	BC3
Content management system	(2) MINEDUC, REB	BC3
SMS as a communication carrier	(2) RGB, RPPA	BC1, BC3, BC4, BC5
Online discussion forum	(1) MYICT	BC1, BC4, BC5
Paper document scanning and sharing	(1) RGB	BC6
E-learning system	(1) RPPA	

Table 5 summarizes the wish-list of future communication channels. A simple self-service case management system is the top priority, followed by a content-management system. Table 2 and Table 5 complement each other nicely. While we see that currently the citizens use mostly non-ICT communication channels, the organizations look forward to structured online self-service case management. From the point of view of our business cases, most useful is case routing (BC3). If self-service systems become reality, document scanning (BC6) becomes redundant.

Notably, email is not among the future channels; SMS is preferred. Many countries have skipped the email era entirely. For example, in China exchange of personal electronic messages started with mobile phones and SMS [11].

Processing of text messages can be optimized by automated message answering (BC1). This applies also to online forums. There exist services like answers.com where the system attempts to find a suitable answer before the inquiry is posted for other forum participants to answer, which saves the time-to-answer and human resources. Wherever people make written inquiries, these inquiries can be analyzed in order to find out people's concerns, needs, opinions (BC4, BC5).

5. DO PUBLIC ORGANIZATIONS ANALYZE THEIR COMMUNICATION WITH CITIZENS TO MAKE BETTER DECISIONS?

Obama's memorandum on transparency and open government [23] spells out three obvious principles of any democratic state: transparency, participation, collaboration. The government shall inform the citizens about what it is doing, and the government shall consult the citizens in order to improve the quality of its decisions. The bottom-up policy formulation can be implemented by different means. Low-tech participatory policy making implies workshops, interviews, surveys [6][31], and citizen observatories [32]. The more high-tech concept of e-participation appeared as a reference to innovative use of ICT to provide access to policy information and request to comment on it [18]. Charalabidis et al. [4] distinguish three generations of e-participation tools: (1) Government controlled official websites that define the topics and the rules of all electronic discussions. (2) Government establishes its presence in social media which is a more natural habitat for the citizens. (3) Government uses advanced technology in order to search and analyze electronic media and extract opinions, arguments, issues, and proposals, and creates more socially rooted policies and regulations. The third generation analysis of electronic media and communication with the citizens, if it takes place at Rwandan public organizations, is a major opportunity for the business cases BC4 and BC5.

Table 6. Analysis or electronic and printed media

Who, for whom	Electronic media	Printed media
No analysis	(4) MIFOTRA, MINEDUC, NIDA, RGB	(4) MIFOTRA, MINEDUC, NIDA, RGB
PR and communication office. Results go to the concerned units	(5) RDB, MINALOC, RSSB, MYICT, REB	(5) RDB, MINALOC, RSSB, MYICT, REB
Administrative assistant in a unit. Results go to the boss	(1) REB	(1) REB

In order to find out how realistic these opportunities are, we asked the respondents who does media analysis, if any, and who uses the results of such analysis, if any, in their respective organizations. Table 6 summarizes the answers.

Two organizations regarded information in social/electronic media as not important/useful. Besides electronic and printed media, some organizations analyze other sources:

a) RSSB: Contact with partners is analyzed in the concerned units.

b) MINEDUC conveys its own surveys.

c) NIDA analyzes information from sectors.

d) MINALOC: Analyst stuff processes various sources of information regarding social protection, decentralization, good governance. A territory administration analyst is in charge of analyzing complaints from citizens.

e) REB analyzes information from students in order to detect financial fraud.

Communication with the citizens is explicitly analyzed in case (d), implicit analysis may be present in cases (c) and (e). Analysis of social media, if it takes place, means receiving implicit feedback from the citizens. We should also consider the fact that much of the contact between the organizations and the citizens takes place face-to-face (Table 2), which means that staff members possess tacit knowledge about the needs and opinions of the citizens, and we assume that this knowledge is discussed internally at the organization.

Discovery of people's needs and opinions itself bears little value unless it is applied in, for example, decision making. In order to discover the usefulness of the claimed analysis of media and explicit/implicit feedback from the citizens, we asked what sources of information the organizations used when preparing a decision. We separated political decisions from operational decisions regarding the design of public services (face-to-face and e-services) provided by the organizations. Table 7 summarizes the answers. Please observe that the previously mentioned sources of analysis and the input for decision making in Table 7 may not always overlap. For example, RDB said they used complaints from the citizens as a foundation for decisions, but did not mention that they analyzed these complaints.

At two state agencies, decisions and recommendations on regulations and policies are made by the management and passed up along the hierarchy. The information source for these decisions and recommendations is not mentioned.

We did not explicitly ask whether the organizations search for individual citizens' opinions when they prepare a decision. If we asked, the answer would probably be politically correct "yes". What we see in Table 7, the main source of input for preparing a decision is stakeholders, which normally means domain experts, governmental and non-governmental organizations (including lobby organizations representing groups of citizens), companies. Two interviewees mentioned staff as the source of input. Because the interviewed organizations experience a lot of face-to-face communication with the citizens, the staff members are likely to be knowledgeable about the needs and opinions of the citizens. Two other interviewees mentioned complaints from the citizens as the input. Any implicit citizens' feedback found in the media or in the citizens' communication with the organizations was not explicitly mentioned as input for new or updated policies and regulations, or the design of services.

Table 7. Information sources for making decisions

Source	Organizations
Decisions regarding policies and regulations	
Meeting the stakeholders, their feedback/requests	(6) MIFOTRA, MINEDUC, RDB, MINALOC, MYICT, NIDA
Concerned ministries are consulted	(3) RDB, MINALOC, RGB
Information from the National Institute of Statistics	(2) MINEDUC, RDB
Complaints from the citizens	(2) RDB, MINALOC
Consulting international organizations	(1) MIFOTRA
Data from a subject-specific information system	(1) MINEDUC
Desk research of governmental reports	(1) MYICT
Staff members consult each other	(1) RSSB
Decisions regarding design of services	
Meeting the stakeholders, their feedback/requests	(3) MIFOTRA, MINEDUC, MYICT
Experts are consulted in order to decide what the requirements are	(2) RDB, RPPA
Consulting international organizations	(1) MIFOTRA
Information is collected from the staff on different levels	(1) NIDA

Table 7 suggests that the business cases BC4 and BC5 would not contribute to the decision making process at the interviewed organizations, and this is no surprise. We found numerous publications on how public organizations could elicit citizens' needs and opinions from electronic media (e.g. [19]) and how beneficial for the society that would be (e.g. [5][21]), but there are hardly any reports with evaluation of actual cases of e-participatory policy making. On the same note, a researcher in opinion mining has told us that public organizations in Sweden do use services of opinion mining and sentiment analysis, but the reports created by these services end up lying on the shelf instead of serving their purpose.

We know that governments collect private data [17]. In Sweden, some public organizations monitor relevant discussions in social media in order to interfere when an explanation is needed, while some other organizations monitor the discussions but do not interfere because "we are not invited" [33]. A non-academic case study [10] tells how Swedish National Agency for Social Insurance monitors social media. Because the agency works with often underprivileged people, negative publicity involving the agency's decisions and services spreads quickly. The agency employs an early warning system that almost in real time alerts the personnel as soon as the system thinks an action is needed on behalf of the agency. Another dimension of social media monitoring is seeking leads that discover cheating with social benefits.

To the extent we can judge, public organizations analyze citizens' opinions and sentiments in electronic media in order to fulfill their operational goals. E-participatory decision and policy making is an opportunity yet to be utilized both in the developed countries and in Rwanda.

6. CONCLUSIONS AND FUTURE WORK

Previous research shows how language technology can improve the efficiency and quality of the communication between public organizations and citizens, as well as increase the citizens' participation in the decision making process of the organizations in the developed countries. This paper investigates the same in Rwanda, a developing country in Central Africa.

We started by exploring the communication channels between ten public organizations in Rwanda and the citizens (Table 2 and Table 3), and other organizations (Table 4). Around 20 channels were identified. Seven businesses cases for language technology (Section 2) could technically be applied to 12 communication channels and create value for the organizations and the citizens. Still, a lot of communication with the citizens is still face-to-face at the front desk or via telephone without any advanced ICT. Among the six future communication channels from the wish list of the interviewed organizations (Table 5), the top priority is self-service case management. Language technology can make case routing more efficient.

In order to explore how language technology could help increase citizens' participation in the decision making process of the interviewed organizations, we investigated whether the organizations analyze electronic and printed media, and the organizations' communication with the citizens in order to better understand their needs and opinions. Five of the ten organizations analyze the media (Table 6). Analysis of the communication with the citizens is less rigorous. We should keep in mind, though, that a lot of communication with the citizens is face-to-face, hence the personnel of the organizations possess good knowledge about the needs and opinions of the citizens; any application of this knowledge is not formal. Table 7 shows that the main input for decision and policy making comes from the stakeholders. Two of the ten organizations analyze complaints from the citizens for the purpose of decision making, and two other organizations consult staff members. Any implicit input from individual citizens or media is not used for decision and policy making, or the interviewed organizations are not aware of how much they might be influenced by that implicit input.

Usefulness of language technology in the e-government settings in a developing country depends on a number of factors. Political priorities, national and organizational cultures, the monetary effect – low salary vs. high cost of proprietary software – should be respected. Only high volume of the communication justifies an IT investment. The volume of digital communication is proportionate to the quality of the IT infrastructure in the country.

One of the directions of the future work, as we see it, would be development of the governmental e-services outlined in Table 5. And while working on these services, the public organizations should employ the concept of co-creation. There are numerous interest groups in need of governmental e-services that can contribute with their knowledge: youth communities, businesses, non-governmental organizations, other public organizations, and of course the citizens. At the moment, the public organizations in Rwanda rely pretty much on their own expertize.

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