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An Evaluation of the State of Local e-Governance in Bangladesh

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Abstract. The government of Bangladesh has during the latest 5 years espoused ambitious goals for digitalisation. As a result, many services of local government are now online, and all the districts, many municipalities, all city corporations, many Upazilas in the Bangladeshi nomenclature, some union parish-ad have now established web presence. This paper presents an evaluation of the state of e-Governance in three of these districts. We report the self-assessment of Bangladeshi ICT professionals who are working with the implementation of the services, as well as the citizen's evaluations. The method is mainly quantitative. This evaluation sheds important light on Bangladesh's progress, and is useful for further comparative work with Bangladeshi governmental levels, or comparisons with other countries. The result is that the perceived usefulness of Bangladeshi e-government is rather good, which complements the picture of Bangladesh as frequently low scorer on e-readiness indexes.

Keywords. Local government, evaluation, developing countries, expert systems

1. Introduction

Governments in many countries are investing vast resources into e-government with an aim to, for instance, acquire increased efficiency, new business models and support democratization. So does Bangladesh. For the latest 10 years, 'digitalisation' has been high on the political agenda. Many new services have been developed on national and local levels. The context for designing services is also rapidly changing. Bangladesh is becoming more electrified, there are large investments in backbone internet, and the citizens of Bangladesh get inspired by the changes globally in online matters.

However, it is necessary to evaluate the efficiency and effectiveness of the e-government of a country, because there exits little knowledge on the impact and results associated with e-government projects and their capacity for real fundamental transformation of relationship between governments, citizens, businesses and employees [1,2]. Benchmarking may be a useful tool for the improvement of government. Since the development of e-government is a continuous process, projects needs continuous assessment of its nascent stage or the transactional stages, in order to achieve its aims

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and for the stakeholders to take appropriate decisions [3,4]. Bangladesh's recent projects are criticized even from within government not to be sufficiently evaluated [5]. Bangladesh is regularly monitored in various e-readiness indexes in comparative research. However, while useful for national policy-making, it is still a relatively crude measure, whose results will not be very helpful for the individual stakeholder in specific projects. Moreover, as we will argue in Section 2, the extent of local e-governance studies is limited. By local governance, we mean tasks such as local government web presence, and services such as information on rules and regulations such as country's present ICT act, the right to information act of Bangladesh, basic online submission and contact for further inquiries. A gap in knowledge about such matters is crucial, as local e-government is very important. The research question of this paper is therefore: What is the overall usefulness of the local e-government of Bangladesh? In particular, we concentrate on various aspects of its usefulness. The aim of this paper is to shed light on Bangladesh's progress as of today's date, and to provide basis for further comparative work with Bangladeshi governmental levels, or comparisons with other countries.

2. Related Work

The state of e-government in Bangladesh in general has been studied to some extent, as is befit for a country of over 150 million citizens. Various national comparisons have been conducted between nations. Empirical studies that detect barriers, challenges and success factors for e-government in general have been published. United Nations [6] rate Bangladesh at 150th place, lagging, and in the middle in the region of Southern Asia. ITU's ranking IDI is much less flattering from 2008, and there are speculations in the popular press that the Bangladeshi authorities deliberately avoided getting rated in order to avoid bad press [7]. Khan et al. [8] overview the evaluation of Bangladeshi e-government. While the country on the national level cannot surprisingly compete with the most developed countries, Bangladesh is considered one of the leading countries amongst the Least Developed Countries.

However, these studies are mostly based on data and public discourse regarding the *national* e-government. Bangladesh's governance is divided in a number of levels; Division, divided into districts, divided into upazilas. Our literature search has not found any work that reports the state of affairs of the Bangladeshi districts or sub-districts. ***There is very little research on evaluation of local e-government in general*** **in the area.** However, this work is, while valuable, not focused on e-governance per se, but rather on telecenters, rural use of ICT or other issues where the local e-government is part of the context but not the central topic. Bhuiyan [9] is a literature study on eGov in Bangladesh. But a lot of the literature is from other countries, whose claims are inferred to Bangladesh, with context in mind. In particular it focuses on "two case studies namely the OPEN of Seoul Metropolitan Government in South Korea and the Gyandoot (purveyor of knowledge) Community Network in Madhya Pradesh in India, so as to identify any relevant lessons that could be learned from them in the context of Bangladesh." The study of Gyandoot is, although being from India, perhaps the case where we from literature can learn the most about local governance in Bangladesh. Bhuiyan describes qualitatively many features of Bangladeshi conditions for e-government, such as underlying civil laws, the current policy goals, organisational issues, and corruption. There more academic work in India published on this issue, which is probably the con-

text that is most similar to Bangladesh, with their common legacy in British colonial rule, relatively similar culture (compared to e.g. Myanmar) and economic conditions. Yet there are enormous differences as well; political structure, India's stronger ICT industry, Bangladesh's NGO prevalence. And local governments have historically been very much subordinate to the central administration of Bangladesh [10]. But this just makes it interesting – will the centralisation allow for fast dissemination or to stifled, fossilised administrative practices?

Naturally, Bangladesh has a political history of its own of the growth of its e-governance. During the nineties and millennium, Bangladesh was not very pre-occupied with ICT. ***But In 2002, the government started to focus and invest more heavily in ICT with*** "ICTs Policy 2002". However, the programme had severe problems to meet the expectations. The digitalisation of Bangladesh got renewed energy with the Digital Bangladesh Vision 2021 (championed by the newly elected Awami league) in 2009. Leading bureaucrats, such as Nazrul Islam Khan use the rhetoric that ICT and ICT-mediated services can replace garments as Bangladesh's largest export sector [11], which would indeed be radical. So while Awami league was not the first to focus on it, but they and the administration reinvigorated it, and were able to implement the initiatives with increasing success. Perhaps this was also helped by generally larger e-readiness, lower hardware costs and inflow of proven technologies and best practices from abroad. The flagship of Bangladeshi e-government has so far been the Web portal of Bangladesh (http://www.bangladesh.gov.bd). Here, a lot of information from the government can be found. But Bangladesh's e-government is still largely static and one-sided [8]. However, we are interested in evaluating the local government sites of Bangladesh.

The internet penetration in Bangladesh is about 23%, i.e. about 36 million people [12] out of 156 million (http://www.bbs.gov.bd/home.aspx). However, this can be misleading. Many citizens act "by proxy", telecenters, more capable relatives & friends, or even "info-ladies" (for the latter, see [13]) and utilise the e-government services. So while low levels of internet access and literacy is problematic, and proxy use brings additional problems of their own, the demographics **should not lead us to the conclusion that e-governance is a peripheral phenomenon**.

While Bangladesh's governmental presence has certainly become more digitalised during the last decade, it is not only a question of 'more'. Khan et al. [8] depict the development of Bangladesh's electronic government–citizen interaction as overshadowed by elitism, corruption, and the lack of accountability and transparency. They go on to say that "The way technology is shaped in such processes seems to reflect more government interests and even sponsors' views than those of citizens, which will be a problem especially in those aspects of Web portal that are tailored to citizens" [8, p. 259].But are such tendencies equally prevalent at the local level? Nobody knows empirically.

We see one aspect of the local government as particularly interesting. UNDP's A2I programme, one of the main efforts to reach a "Digital Bangladesh" has concluded that in the first phase of it:

> "Monitoring and evaluation, has not been undertaken as a regular activity of the project management. Quantifiable, measureable and time-bound output and outcome targets need to be included in the annual work plan of the programme and an M&E system needs to be instituted to support project management tasks to help demonstrate the impact of e-services on social/economic development."

I.e. there is a need to monitor, and for formative as well as summative evaluation of Bangladesh's new e-government [5, p. 18]. **We concur with the evaluation, and our main contribution is to evaluate the present state of government, in line with this related work.**

E-government is very complex since it involves intricate relationships between technological, organisational, institutional and contextual variables [14]. These variables play an important role to determine the characteristics variables such as quality of user environment, electronic management, e-services etc. [2]. For example, the quality of e-government applications (personalization, usability, accessibility and so on) are related to a series of determinants such as institutional and organization frameworks, as well as on the technological infrastructure. High quality applications will produce expected results and benefits such as transparency and accountability, efficiency and effectiveness, citizen participation, effectiveness and program policy, and ultimately high quality of public service. The above variables can be grouped into three categories, namely Determinants (D), Characteristics (C) and Results (R); and they are complicatedly interrelated. Therefore, in order to capture the complexity of e-government, an evaluation model should be developed based on these three categories of variables [2]. This approach would allow the evaluators to perceive how the results are produced and to identify the contributing role of each variable in the overall evaluation of the e-government in an integrated way. Other approaches [4,15–20] don't allow such an evaluation. We consider that an overall evaluation establishes a measure of the usefulness of the system [21], who defines it as "*Usefulness* is the issue of whether the system can be used to achieve some desired goal." [ibid, p. 24]. Such an approach would allow the decision makers to develop an appropriate policy, enabling the enhancement of future e-government initiatives of a country. It is interesting to note that many of the variables that e-government literature deals with, and which we will delve more into below, cannot be measured with precision or with 100% certainty. The reason for this is that most of the variables are subjective in nature, for example, usability, which can"t be measured with 100% certainty. Hence, any approach to evaluate e-government should consider this uncertainty phenomenon.

Since e-government evaluation is a problem that ultimately involves human judgement (e.g. of perceived quality or political trade-offs), purely algorithmic solutions cannot be considered. The problem of this nature is often handled by developing an expert system. An expert system consists mainly of two important parts: The knowledge-base and the inference engine. The next section will introduce the method to develop the expert system, enabling the handling of uncertainty issues of the e-government variables as discussed. A brief discussion on the data collection procedures will follow this.

2.1. Evaluation Baseline

We have considered 21 variables under the above mentioned categories i.e. Determinants (D), Characteristics (C) and Results (R), drawing on [2]. The main determinants as identified in the literature consist of quality of the information and existing data to feed the systems (QoI), technological infrastructure and compatibility (TI), organisational and management characteristics (OC), existing legal and institutional framework (ELF) and potential demand (PD). The variables related to Characteristics component consists of quality of information available on web sites and in systems (QoI), privacy

(PRV), security (SEC), interaction (IR), integration (IG), personalization (PRS), accessibility (ACC), usability (US) and services (SER). The main e-government result (R) variables as identified in the literature are the followings: statistics on systems usage (SU), quality of public services (QPS), efficiency and productivity (EP), effectiveness of programs and policies (EPP), transparency and accountability (TA), citizen participation (CP) and changes in the regulatory framework (CRF). These variables are in one way or another subjective in nature and hence inherit various types of uncertainties [22].

3. Method

A Belief Rule Base (BRB) is a knowledge representation schema, which allows the capturing of various types of uncertain information. Evidential Reasoning (ER) is used as the inference methodology in the Belief Rule Based Expert System [23,24]. ER is mainly used to aggregate the rules in the BRB either in a recursive or analytical way. This approach is widely known as the RIMER methodology. A BRB can capture nonlinear causal relationships under uncertainty between antecedent attributes and the consequent, which is not possible in traditional IF-THEN rules.

The Belief Rule Based System consists of its input, inference procedures and output components. Inference procedures consist of input transformation, rule activation weight calculation, rule update mechanisms, followed by the aggregation of the rules of a BRB by using ER. This aggregation allows obtaining the distribution of belief degrees for the consequent (C) attribute for the given values of antecedent attributes (input data) of a BRB ($\boldsymbol{P_i}$). This aggregation allows the assessment of the main components of e-government evaluation, consisting of determinants, characteristics and results individually by taking account of their associated antecedent attributes. Thus, the assessment of e-government can be achieved at the top level as well at the mid-level. The assessment of the components mentioned can be considered at the mid-level, while overall evaluation or usefulness of e-government at the top level. Such an approach would allow for the identification of the variables playing important role in improving or degrading the performance of an e-government project. The RIMER methodology has been employed to develop expert systems to evaluate e-governance. The details of the methodology to develop the expert system to assess e-government will be found at [22].

3.1. Data Collection Procedures

A *multi-staged stratified sampling* technique has been employed in this research. The region of interest is divided into areas to ensure a precise sampling. For some surveys, there is always under-coverage, which contributes to the missing of persons from the sampling frame, which is a physical representation of all the elements in the population from which the sample is drawn [25]. To overcome this, the authors collected data from internal and external personnel or experts (people who are nominated by the Bangladesh government to execute the E-Government system with proper knowledge and training, considered as internal personnel while the people who are getting benefits or services from the E-Government System are called external personnel) through survey questionnaires which are quantitative in nature. This will also help to evaluate

Table 1. Sample Frame for Internal Experts/Personnel

Categories	Chittagong Division	Population	Subjects/sample
DC	Chittagong,	11	3
ADC	Cox's Bazar,	25	3
Programmer of DC Office	Bandarban	11	3
SP		11	3
Programmer of SP Office		11	3
CO: from 7 UP such as Cauchua, Garinga, Doddissar, HaliShahar, Madrasa, Rowshan Hat, Dholessari	Patiya (sub district of Chittagong)	80	7
Total		**149**	**22**

DC: Deputy Commissioner, ADC: Additional Deputy Commissioner, SP: Superintendent of Police, UP: Union Parishad (administrative unit under police station), CO: Computer Operator

whether BRBES (Belief Rule Based Expert System) can process data received from multiples stakeholders. Table 1 is the sample frame which was used for the internal personnel or experts.

In this research, three dimensional data (determinants, characteristics and results) from 454 internal and external respondents have been collected for the analysis, which were good enough because sample size larger than 30 and less than 500 are appropriate for most research [26]. The external respondents are users of the e-government systems.

4. Results

In this section, we present the perception of e-government of the districts as evaluated by internal and external respondents. The evaluation is made with emphasis of the aggregated perceptions into e-government usefulness.

Our data are an extensive set of quantifications of the complex e-governance practice, which is daunting to interpret, whether you are a user, a manager, an e-government expert or some other stakeholder. The BRB-RIMER methodology allows for an aggregation of the data. The above data is fed into the belief rule based expert system software (BRBES) to obtain the aggregated assessment grade on the three components (Determinants, Characteristics and Results) and also to obtain the aggregated overall grade on the performance of the local e-government service.

Here, we can see that e-governance is relatively evenly performing in Bangladesh. There is no large disparity between the determinants and the results. The values are also at a 0–1.0 scale, where 1.0 is the optimal value. The experts are inferred to rate the local e-government at a usefulness of 0.725. There is no objective translation of what that means qualitatively. There is not (yet) any comparative data for benchmarking (but we hope that further studies can provide that), but indicates that the e-governance is, for the experts, relatively satisfactorily. We will unpack that in the discussion section.

Does it make a difference with the BRBES software and its aggregating methodology? For comparison, a crude average of the data is provided below. It can be seen that the overall usefulness of the system is significantly lower. The difference lies in the handling of uncertainties and ignorance, which is dealt with in the next subsection.

Table 2. Aggregated grading of the local e-government

Method	Determinants	Characteristics	Results	Overall E-government
BRBES	0.690	0.629	0.750	0.725
	CI (0.408–0.804	CI (0.450–0.824)	CI (0.432–0.790)	CI (0.501–0.86)

Table 3. Aggregated grading of the local e-government without RIMER methodology

Method	Determinants	Characteristics	Results	Overall
LRF	0.515)	0.559	0.5625	0.535
	CI (0.378–0.645	CI (0.397–0.693)	CI (0.320–0.607)	CI (0.368–0.612)

4.1. Variance Between Respondents

While the internal experts qualify all variables, the external users are *ignorant (*in the sense that they do not feel that they can rate many variables) regarding many variables. There are 8 variables (such as Technological infrastructure, and organisational infrastructure) that get consequently ignored. The users differ from the experts in many aspects on issues that they do rate, but what we are concerned with here is to report the *aggregation, i.e. the usefulness*.

The three districts of Bangladesh are quite different, one metropolitan, one rural and with indigenous people, and a third in a coastal area with quite different industry (tourism, fishing, etc.). However, the results are relatively homogeneous (Variance in usefulness).

The internal experts rate the usefulness of the e-government system similarly tothe experts. We will limit ourselves here to the Chittagong district. The experts rate it as 0.51, whereas the users score it as 0.47.

5. Discussion

The overall score of the usefulness of local Bangladesh e-government is 0.725. The common sense interpretation of that would be “rather good”, with place for small improvements, to achieve the most useful e-government imaginable. Now, with Bangladesh not being one of the recognized world-leaders of e-governments, and with functionality that is rudimental as compared other countries, that is quite surprising. Bangladesh has many determinant factors that limit its performance; e.g. electricity, illiteracy, and a relatively short history of digitalisation of government (where “child diseases” are reasonable to occur). Can the result be interpreted as “with the constraints given, Bangladesh is doing fine”? No, such reasoning should be indicated by low determinants and high characteristics and results. Rather, it indicates that the experts do not take foreign e-government as their “benchmark”. Instead, they compare the e-government with other national phenomena. Speculatively, it may be corporate IT. Furthermore, they may take a historical perspective. The state of e-government may have its flaws, but it may be perceived as a huge improvement with the state of information some years ago. Another possible explanation is that they are simply unknowing of the possibilities of e-government, and the shortcomings of the systems (caused not by lack of skills, but of immaturity and infrastructure). A third explanation is that Bangladeshi local e-government professionals are self-complacent and settle low, but we want to emphasize that we have insufficient data for such accusations – rather it illustrates that

there is a need for qualitative studies which can rule out such suspicions. Finally, we would like to remind the readers that earlier work in expert systems [22] seem to indicate that aggregating the perceptions by BRBES gives a more accurate picture than simply calculating the averages – that is a contribution of this paper.

The aggregated value (0.725) shows the usefulness. The question is: usefulness for whom? The e-government professionals are supposedly in the service of the people and the upazila, and hence evaluate the performance of the system as a combination of serving partly opposing interests. It measures the usefulness in the win-win situations between stakeholders of e-government.

This study has several limitations: We do not currently have historical data that allows longitudinal comparison of the tendencies. There is no qualitative data that complement the results. The external survey data are not drawn from a random sample (something which is very hard to do in Bangladesh).

6. Conclusion

The usefulness score has been found to be 0.725 out of 1.0 in the three sub-districts. What are the generalisation possibilities, given the limitations of the study? The results are possibly skewed in various ways. Still, they have a degree of verisimilitude [27] due to the methodology, and since there, as our reporting of existing literature shows, is very little empirical literature on local government level, our reporting is a substantial contribution compared to the present alternative that we are left to in Bangladesh – individual subjective judgement and what is stated in mass media. Therefore, we conclude that the present perception of local e-government is relatively good in Bangladesh – the exact reasons for this still lay open to interpretation.

6.1. Further Research

As mentioned, we have reported the overall score of the usefulness of local Bangladesh e-government is 0.725. We feel that it is an important first step for generating a baseline to which further research can compare itself. It would also be interesting with some comparative research between nations, where citizens from one nation could appreciate the services provided in the other nation.

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