An Investigation into Sustainable e-Government in Saudi Arabia

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Abstract: Sustainable e-government has become an important consideration for governments. However, existing e-government literature on sustainability is sparse. A quantitative empirical study was conducted to survey the perceptions of Saudi Arabian citizens with regard to the characteristics of sustainable e-government. Survey data gathered from 442 respondents were analysed to investigate their understanding of the importance of each of these characteristics, allowing the identification of a set of key characteristics likely to influence citizens’ utilization of sustainable e-government services. The study also investigated users’ perceptions of three key barriers to the ability of policymakers to develop and adopt sustainable e-government systems. The results indicate that the characteristics perceived to be the most significant were usability, security, performance, transparency and flexibility, whereas respondents were relatively unconcerned with the social, environmental and economic dimensions of the impact of the software used in e-government systems. This study has also shed new light on experts’ perceptions by investigating sustainable e-government features from their perspective. Data gathered from 83 respondents affirms the importance of sustainable e-government, the importance of cooperation between software development department and government agencies during designing and using sustainable e-government, and the influence of sustainability qualities on e-government. These results will be utilised in future as part of a framework for evaluating sustainable e-government.

Keywords: e-government, sustainability, sustainable e-government, software, characteristics, empirical study, end-users, experts, Saudi Arabia

1. Introduction

There is growing interest in sustainability and increasingly strong claims are made regarding sustainable development (Leyh, Rossetto and Demez, 2014). Many efforts have been taken to incorporate sustainability as a clear objective during systems development (Penztenstädler, 2014) which suggests the need for sustainability as an explicit objective within e-government development. The rationale comes from the high failure rate of these projects in developing countries arising from a combination of organisational, financial, human and infrastructure challenges. Recent studies, although limited, show that a potential solution is to see sustainability as an aspect of e-government, specifically as one of the success factor for e-government initiatives (Lessa et al., 2015; Kischewski and Lessa, 2013). Due to the limitation of studies, Lessa (2019) calls for more studies to examine the integration of sustainability and e-government (Lessa, 2019) as well as sustainable e-governace. This is a challenge due to the fact that complexity of sustainability and the lack of practical evaluated frameworks for sustainable e-government implementation, co-operation and integration hinder the efforts toward developing sustainable e-government.

E-governance and e-government are often used interchangeability in academia (Alcaide Muñoz and Rodriguez Bolivar, 2018) and are difficult to distinguish (Vasiu and Vasiu, 2006). However, while there are subtle differences between the concepts, discussion on this is outside the scope of the paper, and for the purposes of this paper e-government will be used throughout.

The most frequently cited definition of sustainability is that of the UN Commission on Economic Development in the Brundtland Report (Kates, 2010; Venters et al., 2014) which states that sustainable development is “development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs” (Sheldrick, 2015, p.17). Sustainable e-government is defined as “the ability of government organizations to continuously operate and use e-government systems over a long lifecycle to provide continuous benefit values for both government organizations and stakeholders” (Nurdin, 2018; Nurdin, Stockdale and Scheepers, 2014) however, this definition is oversimplified, and generic. It ignores sustainability dimensions and future generation’s needs. The study motivations for this paper are to fill the knowledge gap on sustainable e-government, and respond to the growing call in the e-government field to include, understand and

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characterise sustainability within e-government projects, and highlight the implications of sustainable e-government adoption among users in KSA context. Dzhusupova et al. (2011) state that the scoping of sustainability and e-governance is still in the early stages, while Larsson (2014) reports that sustainability has not been discussed before in relation to e-government research.

In 2005, the Kingdom of Saudi Arabia (KSA) initialised a programme of e-government services called ‘Yesser’, which interacts with over 170 organisations (Yesser, 2018; Alfayad and Abbott-Halpin, 2017) and whose aim is to deliver a national e-government programme (Alfayad and Abbott-Halpin, 2017). Alghazi et al. (2017) report that a national government strategy for 2030 has been launched by the KSA government for all government arms and public-sector bodies, aiming to improve performance. A digital transition plan has been launched in support of this 2030 Vision, with sustainable development a key consideration (MCIT, 2018).

E-government systems play an important role in the KSA’s transformation toward good governance, providing more transparency, efficiency and effectiveness. It will involve the use of artificial intelligence and big data in risk management and in ensuring efficient and accurate decision-making. Greater awareness of the benefits of ICT sustainability, including software sustainability, would enhance Yesser. However, setting sustainability as a high-level strategic goal in ICT development would not by itself ensure sustainable solutions and could prove problematic if practical guidance is not provided.

Sustainable e-government helps to avoid e-government failure in the short and long terms (Lessa, 2019) which increases e-government longevity (Nurdin, 2013), and is reflected in cost reduction. Katz et al. (2014) state that money is not the main issue when adopting software sustainability by government projects, though other benefits could be achieved, encompassing such elements as cost reduction, facilitating maintenance, society involvement and allotting channels. It also helps to decrease bureaucracy and saves time, utilising e-government development for sustaining the economy (Stoiciu and Popa, 2012), and enhancing maintainability of e-government hardware and software to keep up with upgrades to avoid failures, as well as optimising resources in terms of hardware and software and equity (Kumar and Best, 2006), and achieving good governance such as cooperation, coordination, sharing responsibility, involvement and partnership (Nurdin, 2013). Thus, implementing a sustainable e-government system can bring more benefits for internal and external stakeholders. With this background, this study seeks to respond to the following three questions, with the purpose of exploring the relationship between sustainability and e-government with respect to users and expert:

RQ1. What are the characteristics of sustainable e-government and to what extent are they important?
RQ2. What are the barriers to adopting sustainable e-government?
RQ3. To what extent do the current sustainable e-government aspects influence developing an e-government system?

The paper structure starts with an introduction in Section 1, then has a review of literature regarding characteristics and the current situation of e-government sustainability in developing countries in Section 2; next, the research methodology is introduced in Section 3; then, the research findings and discussion are presented in section 4 and Section 5 respectively. Section 6 concludes the paper.

2. Literature review
2.1 Importance of sustainability within e-government

Pade, Mallinson and Sewry (2009) assert that the vast majority of sustainability research focuses on financial sustainability and the cost recovery of projects, while the concept is broader than that, covering other aspects such as political acceptance, and social, cultural and technological sustainability. Mursu (2002) explains the relationship between development and sustainability by noting that development which depends on modern IT cannot be achieved unless new computerised systems are sustainable and free of negative implications for the environment. Since software is a component of ICT, it contributes to the success or failure of ICT. Sustainability failure is counted as one of the three categories of ICT failure in developing countries (Gichoya, 2005). As a result, whenever the failure rate of sustainability increases, the software and ICT failure rates rise. According to United Nations Department of Economic and Social Affair (2016, p.130) “The SDGs provide a framework to orient efforts to advance e-government and keep them focused on the overarching objective to profoundly improve the lives of all people and improve our world for the better.” E-government is a way to improve national development (Khamis and van der Weide, 2017) promoting integrated services, considering economic, social and
environmental dimensions of sustainable development and supporting integration across these dimensions (Alcaide Muñoz and Rodriguez Bolivar, 2018).

2.2 Characteristics of sustainable e-government

Calero and Piattini (2015) state that risk, security and safety are strongly related to sustainability. Moreover, Dečman (2003) affirms that without user trust, e-government systems can become unsustainable. Abu-Shanab and Al-Quraan (2015) studied the factors that influence e-government project continuity, asserting the importance of complying with national plans, goals and objectives for sustainable development. Their findings indicate that availability, participation and awareness are predictors of sustainability, whereas trust is not. Moreover, they affirm that citizens’ participation makes a major contribution to e-government sustainability. Contrary to these findings, trust is generally considered an important candidate characteristic of sustainable e-government.

Razavian, Procaccianti and Tamburri (2014) state that to be sustainable, government e-services must address the economic, social, environmental and technical dimensions. Koziolek (2011) argues that system sustainability cannot be achieved unless the system is cost-efficient, maintained and supports evolution over its lifecycle. Ashaye (2014) empirically studied e-government evaluation and implementation in developing countries, identifying sustainability and transparency as important criteria during implementation.

To achieve sustainable e-government, several models and frameworks have been proposed in literature such as Quality Framework of Sustainable e-Government Development (Chutimaskul, Funilkul and Chongsuphajaisiddhi, 2008) and Sustainability Framework for e-Government Success (Lessa et al., 2015). Other models consider the wider perspective by proposing sustainable e-governance (Dzhusupova et al., 2011; Estevez and Janowski, 2013; Larsson, 2014), whereas other models propose economic sustainability as one of the evaluation aspects for e-government policies (Stanimirovic and Vintar, 2013); however, the author has not specified the exact meaning of sustainability in terms of evaluation, and social dimension indicators are ignored. Razavian, Procaccianti and Tamburri (2014) propose a model for sustaining e-services which covers four dimensions; however it lacks a way to resolve a trade-off, clear guidance, metrics and support.

All these models suffer from common issues including a narrow understanding of sustainability, which leads to dimensions such as social being overlooked, a lack of guidelines or documentation for implementation, discarding of negative impacts, lack of clear metric characteristics, lack of consideration for identification of stakeholders or trade-off mechanisms.

2.3 Sustainable e-government in developing countries

There are several reasons for using KSA as a case study for this research. Since it is a developing country (Saxena, 2018), Sæbø (2012) makes a connection between e-government and improved sustainability, asserting that introducing e-government in developing countries impacts sustainability in those countries. Furuholt and Wahid (2008) argue that in developing countries, e-government research tends to focus narrowly on the success or failure of system development, with little research into sustainability within e-government systems, affirming little research into e-government sustainability exists. Lessa et al. (2015) report that many e-government projects become unsustainable, indicating their failure to meet stakeholders’ aspirations and needs. Moreover, a qualitative study by Mkude and Wimmer (2015) comparing e-government design and implementation in developing and developed countries found that all respondents considered sustainability an important and significant factor which must be addressed appropriately. Dzhusupova et al. (2011) note that few studies have addressed the challenges which face developing countries and influence sustainable e-governance initiatives, in both identification and mitigation.

3. Methodology

This study represents the first large-scale quantitative survey in the KSA on e-government sustainability. Groher and Weinreich (2017) warn of a lack of understanding of how professionals in the software industry consider sustainability within software development projects; therefore, the study also identifies how sustainability is integrated with e-government and its influence on e-government projects. This empirical investigation is exploratory and forms part of a larger ongoing PhD study aimed at the development of an e-government framework for sustainable development.
Surveys were used for data collection; therefore, two different questionnaires were developed and distributed, namely users’ and experts’ surveys. Questionnaires were based on spotting gaps in literature and formulating questions to determine users’ and experts’ responses. The users’ questionnaire was split into four main sections: namely software sustainability section which tests dimensions and their ranking, users’ beliefs, intention, attitudes and perceptions regards sustainable software; sustainable e-government characteristics; barriers for adopting sustainable software and sustainable e-government; ranking of technical dimension characteristics and finally ranking of sustainable e-government characteristics. The experts’ questionnaire was split into nine sections: namely policy and management systems; software sustainability dimensions; relationship between software quality and sustainability; software sustainability impact and influencing factors; ranking of technical dimension characteristics; sustainability and project management; software sustainability barriers; enterprise architecture framework; sustainable e-government aspects. In this article, a subset of both surveys is reported due to space constraints. Respondents to the users’ survey were asked to evaluate the characteristics of sustainable e-government discussed in Section 2.2 and prioritised evaluating barriers to adopting sustainable e-government, whereas respondents to the experts’ survey were asked to evaluate sustainable e-government aspects.

Surveys were distributed in KSA context by choosing the Ministry of Justice (MoJ) as a case for an expert survey and its private arms due to MoJ has big project, called Najiz which is part of Yesser, for developing e-government services within MOJ e.g. e-notarization system. Users are investigated since they are a main stakeholder for sustainability and e-government systems. Both questionnaires are self-administered avoiding bias such as interview bias; however, the distribution method was different. Users received an online questionnaire using Survey Monkey, and expert questionnaires were distributed as hard copy with human assistance for distribution and collection within the MoJ and the private sector due to individual email address not being available. Both questionnaires were distributed in Arabic and English languages in order to engage with residents ‘users’ or employees that do not speak Arabic, prefer responding in English or where their mother tongue is English.

The majority of the 88 items in the users’ survey\(^1\) and 151 items in the experts’ survey\(^2\) were of the closed type. Participants were asked to evaluate their level of agreement or disagreement for each item on a five-point Likert starts with 1=strongly disagree and ends with 5=strongly agree. Ranking questions were adopted for three questions in users’ survey and two questions in experts’ survey. Some open questions were also included, to explore respondents’ opinions beyond the limits of fixed responses. However, the scope of this paper is limited to the analysis of a subset of the results for both surveys.

The reliability and internal consistency of the both surveys were assured by two methods: experts (ten for the expert’s survey and Four for the users’ survey) from different field and knowledge levels were asked to assess its face validity and the Cronbach’s alpha internal consistency test was applied. Alpha values for the users’ survey ranged between .828 for the three items on barriers to adopting sustainable e-government systems and .874 for the nine items on sustainable e-government systems. The expert survey Alpha values for this scale, discussed in 4, is .583. These are well above the 0.5 cut off value below which Cronbach (1951), Helmstater (1964) (as cited by Bowling and Ebrahim, 2005) and Nunnally (1978, as cited by Field, 2013) suggest that consistency is problematic.

Ghazi et al. (2017) report that translation is the usual issue for globally conducted questionnaires; therefore, since both surveys were provided in English and Arabic to engage with KSA residents or employees of other nationalities who may speak just English, translations were proofread by linguistic professionals. For clarity, in the users’ survey, a definition of sustainability, based on the UN Brundtland Report was introduced over each item and on each page; green software, open source software whereas sustainability definition only provided in experts’ survey. An e-government sustainability definition was deliberately omitted for both surveys to extract the participants knowledge i.e. understand population (Wohlin et al., 2012) without influencing their understanding.

### 3.1 Data collection and Analysis

Data collection for the users’ survey started in December 2017 whereas the experts’ survey was in Oct 2018. SPSS was utilised for data analysis and descriptive statistics including mean and frequencies, non-parametric

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\(^1\) https://bit.ly/2ITYncg  
\(^2\) https://bit.ly/2nuajlC
Friedman, Spearman's, a Mann-Whitney U test, Kruskal-Wallis test and Cronbach's alpha coefficient tests were utilised. Friedman is used for analysing ranking as nonparametric equivalent of one-factor repeated measures ANOVA (Hinton et al., 2004). Spearman's was used to assess the strength of the relationship between two variables (Saunders, Lewis and Thornhill, 2009) which is an alternative to Pearson correlation; however, the use of the former was due to one of the independent variables not being normally distributed (Hinton et al., 2004). A Mann-Whitney U and Kruskal-Wallis test was used to test and investigate the difference between groups, where the former is an alternative to the unpaired t-test and the latter is an alternative for the one-way ANOVA. The previous tests were used because the assumptions for a normal distribution test are uncertain. Cronbach's alpha coefficient was used to test reliability and internal consistency of questionnaires.

Non-probabilistic sampling was adopted in the data collection phase, because these are beneficial characteristics of exploratory research, particularly when seeking to understand a new situation (Cummings and Sibona, 2017). Since the study is oriented to a particular case context, claiming random sampling for the whole universe can be impossible; however, random sampling can be achieved for merely the target sample for a study context. Multiple sampling strategies were used, in order to improve the quality and quantity of the responses. Regarding users' questionnaires, there were 442 responses in total, but no response rate could be calculated because the questionnaire was deployed online, using snowball, convenience and volunteer sampling utilising email lists related to the author and social media, such as Twitter, Facebook and WhatsApp groups oriented to KSA citizens in Arabic language only. For example, WhatsApp Saudi programmers groups, Telegram Saudi researchers groups such as Data science, AI, software modelling and others field such as social science and medicine, employees groups within Saudi sectors (public and private) were all utilised and Twitter accounts for Arabic Saudis were tweeted with the link of the study, asking only people in KSA for responses. An email list was also used. However, in all social media utilised, a combined message explained the reason for the study and why it was being conducted, and how to answer was explained. As indicated by Cummings and Sibona (2017), the popularity of social networking sites (SNSs) is increasing among the research community for recruiting survey participants. Since only a subset of the results are explored in this paper.

Exploratory Factor Analysis (EFA) was conducted to explore the dataset, reduce complexity in dataset to identify latent factors and find meaningful interpretation. Preliminary tests such as KMO and Bartlett's Test showed greater suitability for EFA since the KMO index is over the minimum value for a good factor analysis ( Pallant, 2011). Twelve questions in the users’ questionnaire relating to sustainable e-government characteristics and barriers were analysed. The analysis of EFA yielded three factors where factor 1 and factor 3 are cross-loaded in seven items for the same construct, therefore retaining one factor needs to be conducted based on accurate method robustness across alternatives for these other decisions. Parallel Analysis (PA) is one of the most accurate methods to determine the number of retaining factors (Hayton et al., 2004) excluding factors due to chance (Wood, Akloubou Gnonhosou and Bowling, 2015). PA is conducted based on O’connor’s (2000) programme and the results show two factors retained from PCA which have a higher Eigenvalue than PA factor 1 and factor 2, whereas factor 3 has a lower Eigenvalue; therefore, factor 3 could be due to chance and it was not retained. PCA was repeated with a fixed number of factors, equal to two as suggested by PA and the result shows the validity, reliability and unidimensionality of these two constructs namely sustainable e-government characteristics and barriers. Ranking questions are excluded to be tested for EFA since it is based on an ipsative measure (van Eijnatten, van der Ark and Holloway, 2015) which produces biased results for factor analysis (Hino and Imai, 2019).

The distributed copy was by hard copy for expert survey; the response rate was 62%. Non-probabilistic sampling was utilised by using convenience sampling. There were 83 responses to the expert survey, with support from Ministry of Justice (IT dept.) and its arms from the private sector in distributing and answering this survey. EFA has not been conducted since the sample size is less than 150 observations (Swanson and Holton, 2005).

4. Findings
In this section, findings are presented for both surveys followed by discussion. Users’ response are presented firstly, which answers research question 1 & 2 followed by the experts’ response which answers research question 3.

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4.1 Demographics

Demographics questions were asked to assess basic demographic information, and to determine whether results were affected by the way that respondents answered questions dependent on age or income, etc. the demographic questions asked in the two questionnaires differed, due to the nature of the questionnaires, such as job role. The key finding for the independent variables for the users’ questionnaire can be seen in Table 1 whereas the experts’ questionnaire can be seen in Table 2.

Table 1: User’s questionnaire independent variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Classification</th>
<th>N</th>
<th>Variable</th>
<th>Type</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nationality</td>
<td>Saudi</td>
<td>407</td>
<td>Gender</td>
<td>Male</td>
<td>342</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>35</td>
<td></td>
<td>Female</td>
<td>100</td>
</tr>
<tr>
<td>Age</td>
<td>Less than 20</td>
<td>12</td>
<td>Qualification</td>
<td>Below or high school</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>20-30</td>
<td>134</td>
<td></td>
<td>Diploma</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>31-40</td>
<td>202</td>
<td></td>
<td>Bachelor</td>
<td>204</td>
</tr>
<tr>
<td></td>
<td>41-50</td>
<td>73</td>
<td></td>
<td>Higher degree</td>
<td>176</td>
</tr>
<tr>
<td></td>
<td>Over 50</td>
<td>21</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experience</td>
<td>1-2</td>
<td>51</td>
<td>Income</td>
<td>Under2000</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td>3-5</td>
<td>55</td>
<td></td>
<td>2000-5000</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>6-10</td>
<td>80</td>
<td></td>
<td>6000-9000</td>
<td>62</td>
</tr>
<tr>
<td></td>
<td>Over 10 years</td>
<td>187</td>
<td></td>
<td>Over 9000</td>
<td>230</td>
</tr>
<tr>
<td></td>
<td>No experience</td>
<td>69</td>
<td></td>
<td>I would rather not say</td>
<td>77</td>
</tr>
</tbody>
</table>

The demographic information for users’ questionnaires showed 92% were Saudis and 77% were male, which shows the results can be semi-biased to male due to the nature of the distribution method (online) and participation strategy (voluntary). The average age is 20-40 years and 85% were qualified with a degree and have job experience. The Spearman’s rank-order correlation coefficient ($r_s$) was calculated to determine relationship between gender, job experience and income, which showed a statistically positive correlation between gender and experience where $r_s= .100$ and $p= .035$. The result showed females have higher job experience than males. There was a statistically significant negative correlation between gender and income where $r_s= -.157$ and $p= .001$ which showed that males have higher income than females. Another point of interest is that there was a statistically significant positive correlation between qualification and job experience where $r_s= -.159$ and $p= .001$, which showed when the respondents have higher qualifications they have less job experience.

Table 2: Expert’s questionnaire independent variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Classification</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nationality</td>
<td>Saudi</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>56</td>
</tr>
<tr>
<td>Age</td>
<td>20-30</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>31-40</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>41-50</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Over 50</td>
<td>1</td>
</tr>
<tr>
<td>Experience</td>
<td>Less than a year</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>1-2</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>3-5</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>6-10</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>Over 10 years</td>
<td>24</td>
</tr>
<tr>
<td>Qualification</td>
<td>Diploma or below</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Bachelor</td>
<td>62</td>
</tr>
<tr>
<td></td>
<td>Higher degree</td>
<td>14</td>
</tr>
</tbody>
</table>

The expert questionnaire demographic information showed that 67% were non-Saudi, which shows a sample diversity which could be beneficial in terms of adding experience to work and support organisation capability. This is proven by Spearman’s rank-order correlation coefficient ($r_s$) which showed a statistically positive correlation between nationality and job experience, i.e. when the nationality is non-Saudi, the years of job experience were higher where $r_s= .218$ and $p= .048$. Moreover, 67% of the respondents had gained more than six years’ job experience and 91% have a degree qualification. 85% were aged between 20 and 40 years.
4.2 Research question 1

In order to answer the first question, Figure 1 ranks the results for nine questions on sustainable e-government systems. The results are shown as means in rank order for brevity.

![Figure 1: Sustainable e-government characteristics](image)

Responses showed a positive relationship between the level of sustainability within an e-government system, especially its software, and its adoption. Trust and security were found to be respectively the second and third most important characteristics of sustainable e-government systems. This is consistent with Choi et al. (2014), who found that security and privacy must be considered in order to achieve a sustainable e-government system.

An exploratory study by Condori-Fernandez and Lago (2017) identified satisfaction in terms of trust as a very important requirement for social sustainability in software-intensive systems. Similarly, Almarabeh and AbuAli (2010) state that trust is an important factor affecting the success of e-government systems. However, our results contradict those of another recent exploratory study, by Abu-Shanab and Al-Quraan (2015), who concluded that while the perception of trust is an initial factor attracting people to use a system, it does not contribute to the sustainability of e-government projects by making them more likely to continue to use it. They nevertheless argue that trust is a social belief which could evolve in future. Unlike the findings by Abdelhafiz and Amer (2014) which show Saudi users need to be aware of trust, security and privacy, our result conflicts with these findings as showing high levels of awareness among users. A Kruskal-Wallis test showed that there was a statistically significant difference in interest in trust and security among users’ qualifications, as seen in Figure 1, where trust was reported as \( \chi^2(3)=8.519, p=0.036 \) and security as \( \chi^2(3)=9.183, p=0.027 \). The mean rank for trust among users’ qualifications (Below or high school, Diploma, Bachelor and Higher degree) is (164.9, 247.6, 225.3 and 220.5) and for security is (186.5, 265.5, 226.8 and 211.8) respectively. The result shows users who holds diploma qualification pay higher attention to trust and security more than other qualifications which shows a good level of awareness among users, even if the qualification is lower than an undergraduate or postgraduate degree. Lessa et al. (2015) report that many e-government systems become unsustainable because they fail to satisfy stakeholders’ needs (explored in question ranked 4; see Figure 1). In view of the importance of meeting stakeholders’ requirements, which can evolve over a system’s lifespan, system flexibility is an important characteristic of sustainable e-government. The fifth most important characteristic of sustainable e-government, according to the current survey, is performance. Rodrigues, Sarabdeen and Balasubramanian (2016) found that the adoption of e-government increased when the performance expectancy of e-government services was high.

The sixth most important characteristic was reliability, indicating a positive relationship with the level of sustainability within e-government systems. Usability was ranked seventh, indicating less importance compared to other studies, such as that of Venkatesh, Chan and Thong (2012), who found usability to be a significant factor.
Sustainable e-government characteristics

<table>
<thead>
<tr>
<th>Sustainable e-government characteristics</th>
<th>$r_c$</th>
<th>$P$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trust</td>
<td>.152</td>
<td>.001</td>
</tr>
<tr>
<td>Performance</td>
<td>.119</td>
<td>.012</td>
</tr>
<tr>
<td>Resource consumption</td>
<td>.118</td>
<td>.013</td>
</tr>
<tr>
<td>Usability</td>
<td>.163</td>
<td>.001</td>
</tr>
<tr>
<td>Flexibility (Changing needs)</td>
<td>.111</td>
<td>.020</td>
</tr>
<tr>
<td>Sustainability increases adoption</td>
<td>.106</td>
<td>.026</td>
</tr>
<tr>
<td>Reliability</td>
<td>.175</td>
<td>.000</td>
</tr>
</tbody>
</table>

The results in Table 3 show that trust, usability and reliability were the most strongly correlated with e-government experience. Two characteristics, namely energy consumption and security, are absent from Table 3 because they were not significantly correlated with experience of e-government use.

Spearman’s $r_c$ was also calculated to determine the relationship between each sustainable e-government characteristic and the strength of respondents’ knowledge of sustainability (none, poor, moderate, good, very good). There was a strong, positive and statistically significant correlation between sustainability knowledge and five characteristics, according to their $r_c$ and $p$-values (Table 4).
Table 4: Spearman’s rank-order correlation results for sustainability knowledge and sustainable e-government characteristics

<table>
<thead>
<tr>
<th>Sustainable e-government characteristics</th>
<th>$r_s$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trust</td>
<td>.171</td>
<td>.000</td>
</tr>
<tr>
<td>Performance</td>
<td>.138</td>
<td>.004</td>
</tr>
<tr>
<td>Resource consumption</td>
<td>.117</td>
<td>.014</td>
</tr>
<tr>
<td>Usability</td>
<td>.211</td>
<td>.000</td>
</tr>
<tr>
<td>Reliability</td>
<td>.129</td>
<td>.007</td>
</tr>
</tbody>
</table>

Table 4 shows that the characteristics most strongly correlated with e-government experience were trust, performance, usability and reliability. Overall, the results confirm the importance of awareness of the sustainability concept and its relation with e-government.

4.2.1 Ranking

Overall mean values were calculated and a non-parametric Friedman test was conducted, allowing the characteristics to be ranked by total mean scores as shown in Figure 2.

Figure 2: Total mean scores for sustainable e-government characteristics

Figure 2 shows that participants considered usability more important than users’ security, contradicting the results reported earlier. The contradiction can be justified as the previous question asked respondents how important a specific characteristic is for sustainable e-government, whereas in this question, respondents rank a characteristic against one another. Abdelhafez and Amer (2014) indicate the complexity of the e-government system for Saudi users due to the system design, as information and services are linked together in the portal. Other highly significant characteristics were performance, transparency and flexibility, while sustainability standards and compliance with software engineering guidelines during the development of e-government systems were more important for respondents than compliance with conditions established by regulators, which indicates users’ awareness of sustainable e-government. It is notable that respondents were not greatly concerned with the impact of sustainable e-government software on social, environmental and economic factors but that they were somewhat more concerned about its social impact.

Finally, the study identified gender differences in the responses. According to the results of a Mann-Whitney U test, males ranked usability and flexibility higher than females did to a statistically significant degree: $U = 13702$, $p = .002$ and $U = 12955$, $p = .000$ respectively. Conversely, females ranked software impact on society and cost-effectiveness statistically significantly higher than males: $U = 13918$, $p = .004$ and $U = 13544$, $p = .001$ respectively. The mean rankings of these characteristics also differed by gender in that the first priority for males
was usability, whereas for females it was security. Usability has greater influence in sustainability literature than security does (Aljarallah and Lock, 2019a). Differences between genders for e-government software requirements can be critical to e-government social sustainability, i.e. equity. A Kruskal-Wallis test conducted shows there was a statistically significant difference in flexibility and complying with sustainability standards, guidelines and SE development methods among users’ job experience as follows: flexibility \( \chi^2(4)=15.079, \ p=0.05 \), complying with sustainability standards and guidelines and SE development methods \( \chi^2(4)=11.996, \ p=0.017 \). The mean rank for flexibility shows whenever the job experience (no experience, 1-2, 3-5, 6-10, over 10 years) increases, the interest in flexibility increases as (173.5, 207, 218, 232.4, 239.4) respectively. The mean rank for complying with sustainability standards and guidelines and SE development methods shows that users with a low number of years of experience, 1-2 years, have an interest in complying with sustainability standards and guidelines and SE development methods over other groups, as (180.3, 252.3, 241.5, 217, 224) respectively.

4.3 Research question 2

The study investigated three main barriers to the adoption of sustainable e-government, identified from the literature, as seen in Figure 3 which answers the second research question. The first barrier is related to policymakers’ mission to improve public awareness of the benefits of using sustainable e-services, including e-government. Dzhusupova et al. (2011) found that there had been little research into the challenges, including low levels of awareness, facing developing countries in their efforts to undertake sustainable e-governance initiatives. Abu-Shanab and Al-Quraan (2015) report a significant positive relationship between citizens’ awareness of e-government projects and sustainability. Related research indicates that in order to ensure sustainable software engineering, it is essential to raise awareness among business analysts and developers of the benefits of sustainability in the software industry (Penzenstadler, 2014), as is also indicated within the KSA context (Aljarallah and Lock, 2019b).

Meeting users’ future generation needs was considered the second barrier, with considering the current users’ requirements the third barrier which arises when developing sustainable e-government systems. Al-Khoury (2013) argues that existing practice in the e-government field reflects the difficulties of ensuring that such complex systems meet current needs. Considering the Brundtland (Sheldrick, 2015) definition of sustainability, sustainable e-government systems must be designed to meet the next generation’s needs. However, it is unclear how they can be expected to do so if their development does not satisfy current needs and take account of their dynamic nature. These considerations highlight a number of issues which are critical to the sustainability of e-government systems, namely predicting future needs, identifying the effects of existing e-government systems in the short and long term and mitigating the negative influence of e-government services on the sustainability dimension.

![Figure 3: Mean ranking for sustainable e-government barriers](image)
Calculation of mean scores on survey items related to the above barriers reveals little difference among them in their perceived importance. While failing to distinguish clearly among them in terms of importance, the results are consistent with findings in the literature that these are three key barriers to sustainable e-government.

4.4 Research question 3

Experts were asked to evaluate aspects of sustainable e-government to answer the third question. Figure 4 shows the responses for the six questions on sustainable e-government systems. Respondents show a positive relationship between software sustainability and successful e-government system services. Software sustainability is seen as a contributor to e-government projects; however, this result could be debatable since understanding of software sustainability differs among the study sample.

Supporting sustainability in e-government models and frameworks is questionable, since the result shows 41% have no opinion whereas 42% favour sustainability support; however, results can be subject to respondents’ interpretation. Arguably, sustainability can be partly but not explicitly supported, as reflected in respondents’ results. Stürmer (2014) affirms that digital sustainability is still a challenge for e-government. A study by Chitchyan et al. (2016) shows some barriers to sustainability within SW originations, including lack of methodology and tool support. Penzenstadler (2014) warns the lack of sustainability policies and standards could prevent inclusion of sustainability requirements within any developed system. Aldabian, Haines and Jay (2016) affirm the lack of guidelines to achieve software sustainability. Within low infrastructure countries, Khamis and Weide (2016) report no sustainable solutions for e-government systems. This reflects a lack of framework, methods and tools that support sustainable e-government implementation. Wolffram, Lago and Osborne (2017) report lack of official standards and models that support sustainability within the software industry. This can be applied in e-government in its software context.

![Figure 4: Experts' response for sustainable e-government aspects](image)

Nearly half of the sample agrees that complexity of designing sustainable e-government system hinders their organisation from engaging with it. More than one-third have a neutral opinion that reflects mid-level uncertainty. In the software context, Cabot et al. (2009) and Venters et al. (2014) describe dealing with sustainability as a complex multi-stakeholder problem, whereas Mahaux and Canon (2013) describe dealing with complexity in software projects as an overlooked topic. In the software industry, Roher and Richardson (2013) report an intellectual barrier as the software industry might not be keen on adding significant complexity in software development by including sustainability because complexity increases cost.
Indeed, services integration considers one of the major challenges in the e-government literature that covers several stakeholders (Sarikas and Weerakkody, 2007; Chourabi and Mellouli, 2011). Similarly, integrating sustainable e-government services with other e-government services, which may be unsustainably implemented, could make horizontal integrations far more complex. As’ad et al. (2018) propose eight factors for achieving service integration in electronic government implementations, namely availability, consistency, accessibility, security, customization, reliability, maintainability and usability. Sustainability is not mentioned in this model; however, all these factors fall under sustainability, particularly the technical dimension.

Agreement towards co-operation between ministries and software development departments or other agencies is high compared to other previous responses. The result reflects the importance of cooperation in achieving sustainable e-government design. Kumar and Best (2006) discusses that a failure to sustain e-government can stem from failure to involve all engaged stakeholders, as well as the lack of collaboration and response of private partners for government, and changes in its environment. A study for sustainable e-governance in South Korea shows that trust in government is a reflection of quality e-government services, stressing the importance of policy existence to manage information-sharing for privacy protection, as well as managing cooperation and collaboration between government entities (Myeong, Kwon and Seo, 2014). This shows how e-government quality ties to sustainability, and the impact on one social characteristic, such as trust, on e-government systems. Other characteristics such as equity, right, privacy, etc. can have an enormous impact on e-government systems. This leads to the importance of the cooperation of government agencies and software development department on design and usage stages.

5. Discussion of the findings

Fisher (2006) reports that in order to have a sustainable, successful e-government system, the system should be adopted by a critical mass of users; otherwise, it ends up an unsustainable system which shows a relationship between adoption and success of e-government. Moreover, Heeks (2002, 2003a, 2003b, as cited by Kumar and Best, 2006) classifies e-government project failures under five aspects, namely total failure, partial failure class 1 (unattained goals), partial failure class 2 (sustainability failure), partial failure class 3 (success in specific group or region and failure in others) and success. Users’ results showed showed that a high level of sustainability will increase the adoption rate of e-government systems, which reflected on the success of the system which is confirmed by experts’ results; therefore, sustainability was considered an important factor in increasing users’ adoption and gaining their trust by maintaining their security, and privacy and making them utilise the system with high levels of satisfaction in terms of reliability, usability and performance. Users’ results proves the importance of such values (security, usability, transparency, performance and flexibility, etc.) to users who are considered major stakeholders for e-government systems as well as sustainability; however, without increasing the level of awareness which is indicated as a major barrier, consideration of sustainability concerns could become an issue since an appropriate trade-off should be made which may be influenced by user experience.

An interview with 10 software development project leaders in Austria shows no explicit efforts have been made to address sustainability in software projects – processes, metrics, guidelines or best practices (Groher and Weinreich, 2017). Moreover, there are no clear explicit standards, guidelines and tools for software sustainability (Rosado de Souza et al., 2019; Aldabjan, 2016; Chitchyan et al., 2016). Our findings from experts’ results support these findings; however, they showed a wider perspective since the investigation of current models and frameworks went beyond software toward whole e-government systems which showed a shortage of sustainability incorporation. As the private sector can form part of e-government projects, the previous argument shows a clear lack of efforts towards sustainability, caused, as the author indicated, by lack of sustainability awareness which was shown as a major barrier and the experts’ perspective as incorporating sustainability to increase complexity. Since current e-services are not designed to be sustainable (Razavian, Procaccianti and Tamburri, 2014), e-government e-services are more likely to be unsustainable, whereas our findings from the experts’ results show 42% considered current models support sustainability. The KSA e-government system is not unique compared to other e-government systems, which reflects its need for standards, frameworks or models to adopt sustainability in the project process or the usage stage. The existence of sustainability policies, framework, models and standards is important to the software industry to enhance sustainability within societies (Penzenstadler, 2014; Penzenstadler et al., 2014). Similiary, e-government in its software context needs to be sustainable to meet the 2050 vision of sustainability, which could be done by overcoming some barriers such as increasing the awareness and meeting present and future generations’ needs and developing the current models and framework, supporting integration, incorporating sustainability within
e-government projects and promoting cooperation among stakeholders toward achieving sustainable e-government system as shown in expert findings.

The majority of software sustainability research is at the conceptual level (Aljarallah and Lock, 2018b; Saputri and Lee, 2016). In the same context, since ICT covers many components including software and ICT empowers e-government to be sustainable (Ndou, 2004), achieving sustainable e-government needs more effort than sustaining software. As a result, to move toward sustainable e-government systems, the research community of e-government should shed light on this topic and move it from a conceptual level to providing a practical solution as tools, standards, frameworks or models for evaluation and testing which will help to reduce the complexity level reported from the experts’ results.

Further, increasing awareness among e-government users of sustainability benefits is a barrier for users related to policy-makers in e-government, as this study reports; however, sustainability awareness is considered a barrier for end users in KSA to adopting sustainable software, whereas policy-makers’ commitment to developing sustainable software is seen as the lowest barrier from an end user perspective (Aljarallah and Lock, 2018c). As a result, awareness needs to increase among users and government of the benefits of sustainability in e-government (Aljarallah and Lock, 2018a). For the sake of reduced complexity, standards, models, frameworks and tools should be developed to meet the new challenges which will witness the integration of sustainable e-government with smart sustainable cities. Understanding the impact of sustainability in e-government development projects (process level) as well as on the final product (product level) should be investigated.

6. Conclusion

This paper reports an exploration of sustainability from the perspective of e-government service users and experts in the KSA. A survey method was used to garner information from users and experts on the characteristics of sustainable e-government, the barriers to adopting sustainable e-government, and the extent to which the current sustainable e-government aspects influence developing an e-government system. The research differs from previous studies by focusing on a software context. On the other hand, the study complements the previous studies regarding e-government sustainability in its major scope, highlighting key differences between priorities reported in the literature on green-ability, in terms of both resource and energy usage, and those identified within the KSA.

Considering the users’ findings regards the characteristics of sustainable e-government, addressed in RQ1, users pay significant attention to social sustainability since the findings showed trust, security and usability are usually top ranked. Flexibility or meeting current needs is one of the top characteristics for sustainable e-government, which stands clearly in the Brundtland sustainability definition. This leads to the importance of sustainability for e-government systems. The environmental dimension was ranked low among other dimensions based on its characteristics ranking, which shows the need to raise awareness of sustainability, which is also considered the top ranked barrier, and provide policies and framework to promote sustainability. This ties well with findings from the experts’ survey which show the need for framework and models that incorporate sustainability during design and implementation which helps to reduce complexity. The research also investigated the importance of key barriers, addressed in RQ2, identified in the literature with regard to sustainability in the study context, confirming the importance of raising awareness of sustainable e-government benefits which are considered a major barrier followed by predicating future generation needs and meeting the needs of current stakeholders.

Findings from the expert survey, addressed in RQ3, show the importance of sustainability for e-government success; however, it also shows the need for a framework and models that support designing and implementing sustainable e-government, which is proven also in the lack of engagement from organisations to design and implement sustainable e-government due to its complexity. Cooperation between government parties can help to reduce complexity and engaging with sustainability very well which can facilitate integration between ministries toward sustainable e-government system.

In terms of future work while the suggested characteristics are limited to software and do not cover all ICT components, the proposed characteristics need to be tested and included in an e-government development framework to examine their robustness and coverage of the software aspect in sustainable e-government. Secondly, surveys data should be examined in more depth using statistics methods such as group variances,
correlations etc. which discarded in this paper due to the scope and space of this paper. Thirdly, even if the ranking scale can provide reliability and validity of the findings, it is still region-specific and the order could differ from one region to another; however, it may share the order of some of the top ranked characteristics.

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The Possibilities of Internet Voting in Jamaica: Moving from Convenience to Fixing the Problem of Voter Apathy among the Youth

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Abstract: Recent scholarship recognizes the importance of information and communication technologies (ICT), particularly the Internet, in helping to overcome challenges to political participation. The advent of Internet voting or I-voting in encouraging youth political participation has been framed within the context of convenience voting which can help to strengthen democracy by encouraging voting, especially among the more technologically-savvy youth population. This paper explores the relationship between Internet voting and youth political participation in the Jamaican society through a survey of 600 youth. The findings suggest that while it may not substantially reduce apathy, which is more generally linked to perceptions of political efficacy, Internet voting holds the potential to improve voter turnout among Jamaican youth. While convenience was not a major factor driving political apathy, it was an important factor in encouraging participation at the polls.

Keywords: Youth Participation, ICT, I-voting, Political Apathy, Democracy, Elections

1. Introduction

While political participation through voting is not the sole determinant of a functioning democracy, it remains a vital component of the democratic process and is considered “the gold standard form of political participation in liberal democracies” (Cammaerts, et al., 2016, p. 46). In fact, no true democracy can exist without a fair and effective electoral system as this is considered a prerequisite for the establishment of a legitimately constituted authority guided by the law (Scharfagel and Šgurai, 2005; Orum and Dale, 2009). Indeed, the right to vote ensures that governments are justifiably appointed and reflects the collective will of the people.

The act of voting also allows citizens the opportunity to elect and re-elect the officials of the state, which has intervallic (term in political office) and futuristic (particular policy direction) implications. Through this democratic exercise citizens are able to hold their elected leaders accountable, by insisting that they deliver on campaign promises (Johnson and Ryu, 2010). Voting is summarily a just and equitable way for all citizens to contribute to policies at the local and national levels of government. Thus, due to the universal recognition of the importance of voting to a well-functioning democracy, the growing phenomenon of voter apathy is of obvious concern to pundits and political scientists. Of particular concern, has been the phenomenon of low voter turnout among youth globally.

2. The Youth Vote and Democracy

In developing and industrialized countries around the world, youth represent between 40 percent and 60 percent of the total voting age population (International IDEA, 2016). Thus, this group constitutes a strong collective voice with the capacity to legitimize or delegitimize democracy. For example, the strong performance of the British Labour Party in the 2017 elections was partly due to an unexpected surge in youth votes, which has been termed a “youthquake” (Sturgis and Jennings, 2019; Harrison, 2018). In spite of this recognition, however, low voter turnout among youth, as a specific focus of studies on voter apathy, is well documented and is considered to be symptomatic of more underlying deficits within democratic systems (Jowell and Park, 2003; Bessant, 2004; Scharfagel and Šgurai, 2005; Farthing, 2010; Moeller, Kuhne and De Vreeese, 2018). The emerging consensus is that low voter turnout among youth poses an acute long-term threat to the renewal and sustainability of democratic governance if the trend is not urgently reversed. In the absence of effective remedial strategies, these patterns of political apathy are likely to become entrenched as youth proceed through their life course (Dermody, Hammer-Lloyd and Scullion, 2010). For the purposes of this research, youth is operationally defined as persons between the ages 18 and 24.
Based on the literature, a number of social, economic, and political factors have been identified in an attempt to explain voter apathy among youth. These include: lack of knowledge about the electoral systems, policies, and political candidates; the inability of youth to connect with 'old' political candidates and/or the ideologies of parties; disillusionment and distrust in politics; the trans-temporal nature of young people (shifting from one location to another, thereby failing to develop and form any registration/voting pattern); other life distractions and inconveniences of traditional electoral procedures (Kimberlee, 2002; Wattenberg, 2016). Over the years, various suggestions have been made to address this particular democratic deficit.

One of the fastest-growing strategies to increase voting participation among youth, especially in larger democracies such as the United States, has been to link public education with both popular and digital culture. In many parts of the world, public education campaigns incorporating elements of popular and digital culture have been designed to encourage young people to vote. Examples of these include: The ‘Framework of Citizenship Education’ in Scotland; ‘Rock the Vote’ in the United States; ‘Bite the Ballot’, ‘Swing the Vote’, ‘Generation Vote’ and ‘MyVote2014’ in the United Kingdom; ‘Elections Canada Online’ in Canada as well as the ‘Rock Enrol’ campaign in Australia. These projects and programmes combine more traditional strategies such as door-to-door canvassing, use of flyers and leaflets, and radio and print ads with newer strategies such as phone banks and robocalls, dance parties at the polls as well as the use of social media.

Barrack Obama’s 2008 and 2012 presidential campaigns are considered seminal cases of the effective use of digital and popular culture to “make politics cool” to appeal to young voters. His campaigns incorporated the endorsements and active participation of influential North American pop icons including Beyoncé and Jay-Z, Oprah Winfrey, as well as actors Matt Damon and George Clooney. Similarly, in the UK, Tony Blair’s connection to the Britpop movement as well as photo-ops with Oasis and Blur also constituted a similar approach. In Italy, Berlusconi also used international pop band U2’s lead singer Bono in a political marketing brochure. In addition to using popular and digital culture, I-Voting/E-voting has also emerged as a strategy for encouraging increased voter participation among youth (Howland and Bethell, 2002; Christian Schaupp and Carter, 2005; Bochsler, 2010; Muneer and Shamail, 2013; Merz, 2015; Pickard, 2015; Cammaerts, et al., 2016). I-Voting is linked to the phenomenon known as convenience voting.

3. I-Voting: Exploring convenience and apathy

Convenience voting has become a popular approach linked to reducing voter apathy among youth. Convenience, both in terms of the registration process and in accessing polling stations, is widely considered an important factor for increasing voter turnout especially in the digital age (Stein and Vonnahme, 2008; Pammett and Goodman, 2013). Studies have shown that online voting is particularly promising among the youth population because it encourages convenience in political participation (Alvarez, Hall and Trechsel, 2009; Goodman, 2014). In fact, the broad concept of electronic democracy covers a range of conceptual frameworks such as e-parliament, e-legislature, e-government, e-procurement, and e-voting or I-voting. It is well established that ICTs, and particularly the Internet, can contribute to the democratic process by facilitating political participation generally and among young people specifically (Krueger, 2002; Norris, 2004; Mossberger, Tolbert and McNeal, 2008; Mossberger and Tolbert, 2010; Vissers, Stolle and Mahéo, 2010).

The experience of Estonia (with remote voting) has often been cited in the literature as a pioneering case study on the effectiveness of I-voting (Alvarez and Hall, 2004; Maaten, 2004; Alvarez, Hall and Trechsel, 2009; Bochsler, 2010). Kitting (2011) notes that, “Estonia is the only country in the world where citizens have voted online in the municipal, national, and European elections” (p. 58). One of the primary lessons learnt from the Estonian experience has been that online voting is perceived to remove the bureaucracy from voting (Alvarez and Hall, 2004; Kitting, 2011). It has also been observed that Internet voting improved access to voters who lived far from the polling stations thus allowing them to participate in elections (Bochsler, 2010; Cammaerts, et al., 2016).

Similar impacts of I-voting were also observed based on the experiences of developing countries such as Pakistan (Muneer and Shamail, 2013).

Beyond the Estonian experience, there has been significant published works on the use of ICTs to improve political participation, especially among youth. These include: the use of online election campaign to encourage youth participation in the electoral process (Ward, 2005); the mobilization of youth participation (Hirzalla, van Zoonen and de Ridder, 2010); the re-engagement of young people that are disenchanted with politics and civic life (Banaji and Buckingham, 2010); the exploration of how online political activities influence off-line political
participation (Hirzalla and van Zoonen, 2011; Rice, Moffett and Madupalli, 2012); an understanding of how online news consumption influences political participation among young people (Xiaoming, Nainan and George, 2014); the use of internet to empower young ethnic groups (Spaiser, 2011); the interplay between technical and social aspects of the voting process (Prandini, Sartori and Oostveen, 2014); and the use of the internet to provide citizens with the opportunity to conveniently cast ballots quickly via electronic mail or over an internet server – Internet or Electronic Voting (e-voting) I-voting has also been noted as an accurate way to record election results, a tool that allows for the efficient tallying of absentee ballots and an innovation that has the potential to reduce the cost of elections in the long-run (Solop, 2001; Done, 2002; Hall and Alvarez, 2004). I- voting can also increase citizen participation in the democratic process because this approach facilitates flexible, versatile and easy participation (Mohen and Glidden, 2001; Krueger, 2002; Norris, 2004; Trechsel, 2007; Mossberger, Tolbert and McNeal, 2008; Vissers, Stolle and Mahéo, 2010; Andel and Yasinsac, 2012; Carter and Bélanger, 2012).

As it relates to the youth vote, there is strong agreement among I-voting proponents that this process can play an important role in motivating and mobilizing the young people. Convenience was a strong factor that enhanced the attractiveness of this approach to target youth voters (Howland and Bethell, 2002; Christian Schaupp and Carter, 2005; Merz, 2015; Cammaerts, et al., 2016). In this regard, I-voting does not only offer the promise of greater convenience but it also proposes to fix the problem of voter apathy among the youth by using an innovation that is aligned with their preference since most are already active in cyberspace and are “technologically-savvy” (Christian Schaupp and Carter, 2005, p. 587; Bochsler 2010; Hirzalla and van Zoonen, 2011).

The aforementioned observations are also valid in Jamaica for three main reasons: First, the government’s commitment to facilitating the expansion of ICT has engendered a strong culture of internet usage within the country, especially among the younger population. Second, there is the growing practice of I-Voting for non-political activities such as participation in online entertainment polls and the virtually universal presence of young people in cyberspace via various social media platforms such as Facebook, Twitter, Instagram, and others. Finally, the utilization of electronic transactions, such as online shopping and banking may encourage the technological acceptance of convenience voting among the “computer savvy” younger generation (Christian Schaupp and Carter, 2005, p. 587; Bochsler 2010; Hirzalla and van Zoonen, 2011).

Outside of the scholarship highlighted earlier, there is also a growing body of non-scholarly work which also suggests that I-voting can reduce voter apathy among young people (Dougherty, 2011; Posadzki, 2011). Such ideas appear to be significantly influenced by the observation that millennials are naturally pulled to ICTs and the observation of their widespread participation in I-voting for non-political activities such as participating in online entertainment polls.

The overall scholarship on the effectiveness of I-voting in reducing voter apathy, while growing, has not been very convincing. This has made generalization problematic and has contributed to the slow rate of implementation of I-voting initiatives in democratic spaces around the world. Although the benefits seem to far outweigh the concerns, some of the common issues raised as challenges to the use of I-voting systems include trust, confidence, reliability, privacy, and access (Van de Donk and Tops, 1992; Fairweather, 2002; Haythornthaite and Wellman, 2002; Henry, 2003; Benoist, Anrig and Jaquet-Chiffelle, 2007; Beaucamps, et al., 2009; Volkamer, Spycher and Dubuis, 2011; King and Hancock, 2012; Olsen and Nordhaug, 2012).

This work therefore is intended to address the need for further empirical research in this area by exploring the possibilities of I-voting to address voter apathy among the youth in Jamaica.

4. Jamaica

Historically, the black population, who are the racial majority of the post-colonial Jamaican society, were disenfranchised until Universal Adult Suffrage was declared in 1944. This was a watershed moment in Jamaica’s political history as it represented the strengthening of this young democracy and a significant change in the system of governance (Buddan, 2004). The country gained political independence from Britain in 1962; in that year the voter turnout was 72%. Five years later, the parliamentary election that followed in 1967 saw one of the highest turnouts in the nation’s history at 82%.
In 1976, when the voting age was lowered from 21 to 18 years there was strong youth participation in the elections held that year; so much so that the youth vote was thought to have significantly influenced its outcome (Stone, 1986; Buddan, 2004). The voter turnout in that 1976 election was 85.21%. Four years later, the general election of 1980 became the most historically significant election in Jamaica’s history. Although this election recorded the highest voter turnout in the country’s history (86%), the election was marred by widespread political violence and is documented as being the country’s bloodiest and most compromised election (Figueroa and Sives 2002; Gray 2004). The system of political clientelism that emerged in the Jamaican society created a bipartisan political culture in which militarized political enclaves known as garrisons emerged with tacit support of politicians (Figueroa and Sives 2002; Gray 2004; Figueroa, Harriott and Satchell, 2008; Sives, 2010). This garrison phenomenon fostered a political culture that was both violent and intolerant of dissent. Therefore, especially among the urban poor, there was little effort to develop individual efficacy and political consciousness as the act of voting became linked to a homogenized community identity forged through authoritarian, and clientelistic relationships between the communities and politicians.

Voter turnout in Jamaica today is in a state of crisis. Jamaica, like many places around the world has seen a steady decline in electoral participation since the general election of the 1980 although the number of electors has increased. In 2011, 53% of the enumerated population and 46% of the adult population participated in the elections held that year (International IDEA, 2016; Electoral Commission of Jamaica, 2015, 2016). The lowest voter turnout in the nation’s history was recorded in the 2016 general election when 48% of the electors voted (Electoral Commission of Jamaica, 2016). The lack of participation among the youth has been highlighted by local political scientists, politicians and researchers as contributing to this trend (Waller and Satchell 2016). Voter apathy among the youth is a noticeable trend in the Jamaican scenario, and represents a distinct shift from past active youthful involvement in the political process in the 1970s.

5. Research Design

In this study we explore the contributive value of online voting in encouraging voter turnout specifically among the youth. This is done through the use of a national survey of 600 youth living in Jamaica. The study is guided by the following overarching research question—Can online voting encourage apathetic young Jamaican youth to vote?

The research is a part of a larger study that probes political development in Jamaica. It is an exploratory study, which uses a cross-sectional case study approach to determine whether online voting could encourage young people in Jamaica who are apathetic, to actually vote. Apathy in this research refers to a lack of political interest and non-participation in the political process (DeLuca, 1995). The concept is viewed as having both behavioural (enumeration status) and attitudinal (intentions of participating in future elections) dimensions. Several specific sub-research questions guided the analysis:

1. What is the level of apathy among the Jamaican youth?
2. Can I-voting encourage youths who have no intentions of voting to do so?
3. What are the possibilities of I-voting encouraging apathetic youths to vote?
4. Is convenience a major factor driving the prospects of I-voting?

A quantitative approach was used to gather the data. A total of twenty-seven (27) open and closed-ended questions were administered to achieve the intended objectives of the study. Data collection lasted for approximately two weeks between March 25, 2019 and April 10, 2019. Data were collected across all fourteen (14) parishes.

The Jamaican youth (i.e., 18 – 24 years old) formed the unit of observation for the study. A sample size of 600 youth was used for the study with a margin of error of approximately 3.5% and a confidence level of 95%. A probability sampling procedure was used to identify respondents. More specifically, the stratified random sampling technique was used. Youth were categorized by parish and gender. A total of two hundred and fifty-six (n = 256) males and three hundred and forty-four (n = 344) females participated in the study. EXPRESSLY, males accounted for 42.7% of the sample and females 57.3%. Majority of the sample (53.6%) has secondary-level education. Since the research question probed the issue of convenience, a distinction was made between convenience voting and the broader phenomenon of internet voting, which includes methods that require the use of a personal computer with landline, internet connectivity or Internet kiosks, and mobile voting done via a smartphone or other handheld devices through a mobile application.

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1 The enumerated population are those who are eligible to vote and appear on the national voters list
The survey results were analyzed using the Statistical Package of the Social Science (SPSS) in accordance with the stated aims and objectives of the project. Descriptive analyses were generated to provide basic fundamental information about the respective populations being studied. Bivariate analyses were done to make inferences about the populations being studied.

6. Results
Several themes were explored in an attempt to systematically examine the research question. These included: voting behaviour, political apathy, political victimization, and finally the possibilities of ICT to solve political apathy.

7. Youth and Political Apathy
Two main indicators were used to determine political apathy. The first was behavioural, measured by enumeration status, and the second was attitudinal, captured by the participants’ intention to vote in the next general election. On the first measure, the findings show that the majority (71.8%), of the youth interviewed were enumerated. Those who were not registered were asked to provide reasons. The results indicated that among the 28.2% who were unregistered, 47% were disinterested in politics while 47.7% reported experiencing systemic and personal problems in navigating the process involved in getting registered, including challenges with the new National Identification System recently introduced by the Government of Jamaica.

On the attitudinal measure, respondents were asked if they would be voting in the next election when the date is announced. A large proportion of participants, (57.5%, n=335), indicated that they do not intend to vote in the next election. The study further probed the reasons for non-intent to vote and received reactions from 287 participants. The findings show that most of those who reacted, (53.7%), were disinterested in politics and 35.5% reported having a feeling of disillusionment and a general discontentment with the current state of politics (see Table 1). The responses that informed this thematic area included feelings that their vote will not make a difference. Additionally, these participants reported that the ideological stances of the two major parties as well as the behaviours of their political candidates were indistinguishable leaving them with no real choice. Although not statistically significant, it should be noted that 55.82% of those who do not intend to vote in the next elections are females and 44.18% are males, p>.05.

Table 1: Reasons youths were not registered or did not intend to vote

<table>
<thead>
<tr>
<th></th>
<th>Why participants are not enumerated %</th>
<th>Why participants have no intentions of voting %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disinterestedness</td>
<td>47.0</td>
<td>53.7</td>
</tr>
<tr>
<td>Disillusionment/no perceived political choice</td>
<td>1.3</td>
<td>35.5</td>
</tr>
<tr>
<td>Lack of political efficacy</td>
<td>4.0</td>
<td>1.7</td>
</tr>
<tr>
<td>Not enumerated/problems with the NIDS</td>
<td>47.7</td>
<td>6.6</td>
</tr>
<tr>
<td>Lack of convenience</td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td>Concern about corruption</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>About to migrate</td>
<td>1.0</td>
<td></td>
</tr>
</tbody>
</table>

A composite variable of apathy was developed using a two-tiered measure. The first isolated youth who were not enumerated while the other isolated those with no intention to vote in the next election. All measures indicating “apathy” were given a score of 1 and those with “no apathy” a score of 0. The computed variable therefore ranged between 0 and 2, with 0 reflecting “no apathy” and 1 and 2 representing that there is some level of apathy on either the attitudinal or the behavioural measure or on both indicators. The findings revealed that 62.6% of the youth interviewed are apathetic. This level of apathy is embedded in the affective, that is, thoughts of not participating in the elections rather than in the behavioural, which is measured by preparation for participation vis-a-vis the process of enumeration (Figure 1).
8. The Possibilities of I-Voting

The main purpose of the paper is to determine the extent to which voter apathy among Jamaican youth can be reduced through the introduction of I-voting. Respondents were asked, “Would you vote in the next election if you were allowed to use the Internet to vote for your political representative?” Over a half, 51.3% or 308, of the respondents indicated they would (see Figure 2). An open-ended question, which asked participants to provide reasons explaining why they would or would not use this method, found that convenience was the main pull factor for the overwhelming majority, 87.5%, of the participants.

Participants were generally less enthused about the prospects offered by the use of mobile phones. More than forty-seven percent (47.2% or 283) stated that they were opposed to using this method to vote (see Figure 2).

For those who were favourably disposed towards the idea of mobile voting, 93.1% also cited convenience as the main pull factor (see Figure 3).
The attitudinal dimension was used to explore the possibility of I-voting to stimulate youth participation in the electoral process. It was found that 25.4% or 85 of those who originally stated that they would not vote in the next elections indicated that they would change their minds if they were allowed to use the Internet. Among the youth who had intention of voting 85.9% or 213 said they would vote using the Internet ($\chi^2(1, n=568) = 208.007$, $p=.000$). Slightly fewer were, however, persuaded by the prospect offered by using a mobile phone. Only 24.2% or 81 of the youth who reported that they had no intention of voting in the next election indicated that they would change their minds if allowed to use a mobile phone to vote ($\chi^2(1, n=566)=195.217$, $p=.000$).

9. Political Apathy and I-voting

To further interrogate the main research question, the study conducted a more focused examination of 365 apathetic youth and the potential of convenience voting in solving the issue; using the computed apathy score. Just over one in every 3 youth (31.1%) would be persuaded to vote if they were allowed to use the Internet ($\chi^2(1, n=568)=172.397$, $p=.000$) and an almost equal number, (30.5%), would vote if they were allowed to use their mobile phones, $\chi^2(1, n=566)=153.851$, $p=.000$) (see Figure 4).
The study also explored the possibilities of the Internet to solve the problem of apathy along the attitudinal and behavioural measures. On the attitudinal measure, 26.2% of youth who were apathetic would vote if they were allowed to use the Internet while 87.9% of youth (χ²(1, n=568) =208.077, p=.000) who were not apathetic to voting said that they would vote if they were allowed to use the Internet. On the behavioural dimension, 41.6% of those who were apathetic would use the Internet to vote if they were allowed to. This is compared to 57.1% of those who were not apathetic (χ²(1, n=583) =11.227, p=.001).

Regarding the use of mobile phones to improve voter turnout, on the attitudinal dimension 25.2% of those who have no intention of voting would be opened to voting if they were allowed to use a mobile phone while 84.5% of those who were not apathetic would use the mobile phone to cast their ballots (χ²(1, n=566)=195.217, p=.000). This medium of voting was, however, more promising for youth who are apathetic along the behavioural dimension. Almost 41.6% of those who were not registered to vote, indicated that they would use a mobile device to cast votes. The findings also revealed that 55% of those who are registered would vote using platform (χ²(1, n=581) =8.346, p=.004).

The select case option was also used to explore more deeper feelings among the participants towards voting using the Internet and mobile phones. Although most view I-voting favourably, sentiments of disinterestedness were expressed by 47.4% of those who stated that they would prefer to use the Internet and 43.9% of those who would use a mobile phone. Convenience was the main reason why 36.4% of apathetic youth would use the Internet to vote and why 35.3% would use a mobile phone. The issue of trust was a cause for concern among 10% of those who stated that they would use a mobile phone (see Figure 5). A central theme in the open-ended responses was the question of who would manage the online system and whether or not the votes could be traced to a single user. Only 2.4% of those who would use the Internet to vote and 1.4% of those who would use their mobile phone saw I-voting as an improvement to the current system.

**Figure 5:** Reason apathetic youths would use the Internet to vote

10. Discussion

The main goal of this research is to explore the possibilities of ICT in reducing voter apathy among the Jamaican youth. The study found that majority (62.6%) of the Jamaica youth are in fact apathetic; indicating that they either have no intention to vote (the attitudinal measure) and/or they are not enumerated (the behavioural measure). Overall, most of the participants were, however, enumerated. While this signals interest in political participation, the act of enumeration has wider value since the process also provides Jamaican youth with an affordable form of national identification. Less than a half (42.5%) of the youth interviewed, however, intended to vote in the next national election. This is consistent with the low turnout among youth in the last general elections held in 2016 in which 44.8% of the entire voting age population participated.

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10.1 Political Apathy and I-Voting

While the lack of convenience in the voting process was not a major factor driving apathy, the finding from this study support conclusions by previous theoretical and empirical research about the possibilities of using I-voting as a tool for encouraging voting among youth. More than a half (52.8%) of the youth were willing to use the Internet to vote; representing a potential 10.3% increase in voter turnout among youth if internet voting were introduced. Convenience was also explored in relation to the modality of voting. While I-voting is usually carried out from an internet-connected computer or kiosks, mobile phone would allow for even greater access. The study found that (51.3%) of youth would use their mobile phones to vote. This method of voting would therefore increase voter turnout among Jamaican youth by 8.8%. These results confirm the postulations from the literature reviewed that convenience voting would have a modest impact on voting behaviour (Magleby, 1987; Karp and Banducci, 2000; Southwell and Burchett, 2000; Southwell, 2000; Peters, 2003; Dyck and Gimpel, 2005; Luechinger, Rosinger and Stutzer, 2007; Gronke and Toffey 2007; Kousser and Mullin, 2007; Gronke and Miller, 2007; Gronke, et al., 2008).

Among youth who were apathetic, 31.1% would vote if they were allowed to use the Internet and 30.5% if they were permitted to use a mobile phone. While literature suggests that convenience voting would not be able to solve the underlying issues that drive apathy (Oostveen and Van den Besselaar, 2004; Berinsky, 2005; Christian Schaupp and Carter, 2005; Cammaerts, et al., 2016), convenience was, however, the main reason why apathetic Jamaican youth would be motivated to utilize I-voting services. This was true of 36.4% of those who would use the Internet and 35.3% who would use a mobile phone. However, while apathetic youth were willing to embrace the use of ICT, 47.4% expressed disinterestedness in politics and another 5% expressed feelings of disillusionment. They also did not see this potentially representing an improvement to the current electoral system.

The study therefore confirmed that I-voting may encourage apathetic youth to participate in elections, however the wider systemic challenges and general disinterestedness suggests the need for greater mobilization and engagement among this population. There was, in fact, large scale support for the technology among those who were not apathetic which supports Berinsky’s (2005) findings that voting reforms of this nature serves those who are already politically engaged. The question of how to reach the youth population to create both attitudinal and behavioural change to reduce apathy are therefore beyond the scope of convenience.

Certainly, under-participation is often a symptom of deeper problems or conditions that cannot be resolved solely by the introduction of ICTs. The voting patterns among the youth are not distinct from the broader voting population. Among the general voting population still remains, more serious concerns about embedded dysfunctions in the country’s political system related to political culture, representation, performance and effectiveness that serve as dissuading factors (Figueroa and Sives 2002; Gray 2004; Figueroa, Harriott and Satchell, 2008; Sives, 2010). Nearly, 60 years after its Independence, it is evidently time for Jamaicans to be empowered to express their individual preferences to repel the country’s bipartisan political culture.

The findings suggest that our youth are not a-political but rather there is a general disconnect from representational politics. This disconnect may be related to the broader political climate and inadequacies of the institutions of political socialization that fail to equip youth with the skills necessary to navigate the political system and to build political efficacy. Fixing the problem of apathy therefore requires innovative thinking that may include the convenience offered by the prospect of using ICTs as a voting tool. ICTs also hold great intrinsic potential to assist in the institutionalization of comprehensive educational programmes, civic engagement activities and mobilization in both physical and cyberspaces.

11. Conclusion

This article contributes to the theoretical and pragmatic discourse on ICT and political participation in small developing states such as Jamaica. The issues surrounding ICT and political participation were explored among the most technologically savvy population- Jamaican youth- who have already been disproportionately exploiting the benefits of this technology for engagement with popular culture. They are also coincidentally the group that is most deeply apathetic. Further investigation among the general population will deepen the narrative around digital literacy and general accessibility.

Although convenience was not a major factor contributing to political apathy, the youth population’s engagement with ICTs is promising from the standpoint of making I-voting a viable alternative to traditional
voting in order to attract more young voters. While convenience would modestly encourage higher voter turnout among youth, the potential that lies in its use to promote mobilization and engagement of youth should not be ignored (Howland and Bethell, 2002; Christian Schauupp and Carter, 2005; Bochsler, 2010; Muneer and Shamall, 2013; Merz, 2015; Pickard, 2015; Cammaerts, et al., 2016).

I-Voting is inevitable given the increasing use of the Internet and the new normal of digital culture in most countries and especially among youth. This study agrees with the general position that ICTs can help to facilitate greater political participation to overcome the widespread concerns about the defective and outdated political cultures and traditions that are held to be primarily responsible for fueling general apathy that is being transmitted to Jamaican youth. ICTs can facilitate improved mobilization and improved political discourse and interactions. ICTs can also aid in creating new platforms that give attention to problematic issues such as political victimization, trust, confidence in politics and political institutions, and the general challenges inherent in the processes of political socialization. These, however, will remain mediating variables to political participation if they are not systemically addressed. This research therefore supports I-voting and the use of ICTs as a part of the solution to fixing this burgeoning problem of political apathy among the youth.

Reference


Appendix
Voter Turnout in Jamaica 1962-2011

<table>
<thead>
<tr>
<th>Year</th>
<th>Voter Turnout</th>
<th>Total Vote</th>
<th>Registration</th>
<th>Voting Age Population Turnout</th>
<th>Voting age population</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>48.37%</td>
<td>882,389</td>
<td>1,624,412</td>
<td>44.79%</td>
<td>1,970,264</td>
<td>2,970,340</td>
</tr>
<tr>
<td>2011</td>
<td>53.17%</td>
<td>876,310</td>
<td>1,648,036</td>
<td>46.18%</td>
<td>1,897,725</td>
<td>2,868,380</td>
</tr>
<tr>
<td>2007</td>
<td>60.40%</td>
<td>808,240</td>
<td>1,338,146</td>
<td>49.56%</td>
<td>1,630,960</td>
<td>2,780,132</td>
</tr>
<tr>
<td>2002</td>
<td>59.06%</td>
<td>768,758</td>
<td>1,182,292</td>
<td>50.89%</td>
<td>1,510,580</td>
<td>2,680,029</td>
</tr>
<tr>
<td>1997</td>
<td>65.42%</td>
<td>773,425</td>
<td>1,182,292</td>
<td>48.77%</td>
<td>1,585,760</td>
<td>2,170,000</td>
</tr>
<tr>
<td>1993</td>
<td>67.08%</td>
<td>678,572</td>
<td>1,002,571</td>
<td>44.67%</td>
<td>1,518,930</td>
<td>2,411,000</td>
</tr>
<tr>
<td>1989</td>
<td>70.38%</td>
<td>645,485</td>
<td>1,078,760</td>
<td>58.96%</td>
<td>1,434,000</td>
<td>2,390,000</td>
</tr>
<tr>
<td>1983</td>
<td>73.73%</td>
<td>27,043</td>
<td>990,019</td>
<td>2.74%</td>
<td>1,284,480</td>
<td>2,258,000</td>
</tr>
<tr>
<td>1980</td>
<td>86.91%</td>
<td>860,746</td>
<td>990,417</td>
<td>74.74%</td>
<td>1,151,690</td>
<td>2,173,000</td>
</tr>
<tr>
<td>1976</td>
<td>85.21%</td>
<td>742,149</td>
<td>870,972</td>
<td>84.83%</td>
<td>874,860</td>
<td>2,083,000</td>
</tr>
<tr>
<td>1972</td>
<td>76.88%</td>
<td>477,771</td>
<td>605,662</td>
<td>57.27%</td>
<td>834,200</td>
<td>1,940,000</td>
</tr>
<tr>
<td>1967</td>
<td>82.24%</td>
<td>446,815</td>
<td>543,307</td>
<td>54.86%</td>
<td>814,500</td>
<td>1,810,000</td>
</tr>
<tr>
<td>1962</td>
<td>72.88%</td>
<td>580,517</td>
<td>796,540</td>
<td>73.65%</td>
<td>788,160</td>
<td>1,642,000</td>
</tr>
</tbody>
</table>

Adopted from: International Institute for Democracy and Electoral Assistance (International IDEA)
Do Municipal Facebook Performance and Citizen Satisfaction go Hand in Hand?

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Abstract: This paper examines the relation between municipalities’ social media performance and citizen satisfaction with the municipality. An observational study was conducted, based on four different Swedish national public data sources. The study shows that municipalities’ Facebook performance is correlated to citizens’ satisfaction with living in the municipality and with satisfaction with municipal service provision. There was however no significant relationship between Facebook performance and satisfaction with transparency and influence from a citizen perspective. In conclusion, one important implication of the study is that citizen perception regarding whether a municipality is a good place to live in or not is related to the use of social media for promoting the municipality. Furthermore, a relation between satisfaction and citizen perception of government service performance implies that social media could be valuable for interaction and co-creation. Finally, an implication is that usage of social media and the potential relationship to trust, influence and transparency must be further elaborated and studied. Overall, our recommendation is that municipalities and their citizens may benefit from well thought-out strategies of how to use social media for marketing, interaction and co-creating.

Keywords: Social media, Facebook, Municipality, E-government, Performance, Citizen satisfaction

1. Introduction

Digitalization of municipalities is expected to increase administrative effectiveness as well as bring benefits such as promotion of democratic values and inclusion of citizens (e.g. Bannister and Connolly, 2014; Cordella and Bonina, 2012). Furthermore, digitalization has the potential to improve the quality of public service, and success factors for its implementation have been articulated (e.g. Bernhard, 2020; Gil-Garcia and Pardo, 2005; Yun and Opheim, 2010; Norström, 2019). One of the latest initiatives is the use of social media by municipalities for information and communication with citizens, which has become increasingly popular (e.g. Norström, Bernhard and Lundh Snis, 2019; Bonsón, Royo and Ratkai, 2015; Mergel, 2013). Social media differs from previous technology in the sense that it is focused on user-generated content, enabling a more bottom-up, citizen-centered approach (Yates and Paquette, 2011; Linders, 2012). The familiarity of commonly used platforms such as Facebook also makes it convenient for citizens who can follow feeds of news and conversations without “going over to” the government (Ellison and Hardey, 2013; Hanna, Rohm and Crittenden, 2011). Using platforms that people like and already use decreases the distance to the municipal administration. Thus, social media is ideally a promising resource for constructing public discussion, encouraging knowledge exchange, and enabling informed citizens. As such, social media could be a part of a transformational process of government going from a top-down managed e-government to a responsive, bottom-up and citizen-initiated “we-government” (Linders, 2012).

Digitalization, especially the use of social media, clearly has potential. However, despite the growing literature on social media management there is still little known about and scarce empirical evidence of the effect of government social media use from a citizen perspective (Medaglia and Zheng, 2016; Medaglia and Zhu, 2017). Hence, we don’t know if citizens are aware of the potential described above and how they value their municipality in relation to aspects of quality of life (cf. OECD, 2013), e.g., whether the municipality is a good place to live regarding employment, housing, leisure, culture, safety and high quality services, and if it enables participation in the development of facilities and services. We also know that quality of life is frequently neglected when new innovative digital services are being implemented (Fischer, 2018). Consequently, increased understanding of citizen satisfaction is important as well as studies of municipalities’ service performance and of factors related to how citizens perceive this service performance.

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Municipalities still tend to focus on one-way communication of public services to citizens, retaining an approach which is not innovative and may fail to meet current and future societal challenges (Fischer, 2018; Susskind and Susskind, 2015). Remarkably, to our knowledge there are almost no large and rigorous published studies focusing on the relationship between digitalization, especially social media use, and citizens’ perception of service performance. One possible approach for measuring perceived satisfaction is to adopt concepts from quality management, where quality is defined as a service capability to fulfill or even exceed expectations (Deming, 1993). Adopting quality management principles originally developed for private industry, must however be adjusted when applied in the public sector, and account must be taken e.g. for rights, access, and equality (Elg, Wihlborg and Örnerheim, 2017).

Sweden is a forerunner regarding Internet access and social media, dominated by Facebook, which is commonly used by municipalities. Furthermore, Sweden has a long history of measuring citizen satisfaction and the instrument for measuring satisfaction was developed already in 1992 (Fornell, 1992). Consequently, Swedish municipalities constitute an adequate choice of study objects for evaluating correlation between digitalization and satisfaction. A previous study in Sweden shows that a high degree of digitalization in municipalities correlates with satisfaction with service performance, when adjusting for other essential factors related to citizens’ satisfaction with the service performance of the municipality (Bernhard et al., 2018). Thus, there is some empirical evidence that municipal digitalization may be beneficial from a service performance perspective. The digital technology in the study by Bernhard et al. (2018) was however limited to e-services, websites and apps, and not specifically social media. As pointed out above, social media may be an even more important resource in the development of a more participative government due to the bottom-up character of such media and since a majority of citizens are familiar with social media. Because Facebook is the dominant social media platform used by Swedish municipalities, our study is limited to only studying this platform.

In summary, using social media in municipalities has promising potential, but there is a lack of empirical evidence that the hoped-for benefits of social media usage are fulfilled, especially from a citizen perspective. We want to contribute to filling this research gap, and the aim of this study is therefore to investigate the relationship between municipalities’ social media use and citizen satisfaction.

2. Background and Hypotheses

Municipalities are undergoing a digital transformation that affects the organization, the individuals working there as well as citizens and other stakeholders, and social media has become an important part of that transformation. The transformation is driven by at least three different actors, each of which has their own agenda: social media platform providers (e.g. Facebook), citizens and municipalities. When these actors merge in processes of interaction on social media platforms they potentially affect the service performance of municipalities’ social media use and citizens’ perception of the municipality (Norström, 2019).

2.1 Social Media Platforms

Social media platforms differ from previous technology used in government in the sense that they are not government owned or designed for a certain government purpose. Instead they are external, private, or corporate platforms that allow users to create services, applications, and content, by themselves, independent of system designers and direct contact with service providers (Islind, 2018; Norström, 2019).

Partly because of this easy access to information and connections, social media platforms have become an everyday place to go for socializing (Davidsson, Palm and Melin Mandre, 2018) and subsequently potentially interesting spaces for civic participation and engagement efforts (Bonsón, Royo and Ratkai, 2015). The platforms can be understood as online communities of undefined groups of people where participants are seen as co-producers of knowledge (Konst-Laakso, 2017). In this way social media platforms support processes of collective action by helping to “discover and attract members with shared interests; exchange information; make group decisions at a larger scale; integrate individual contributions; supervise a group with less need for hierarchy; and manage group logistics due to elimination of time and space constraints” (Amichai-Hamburger, 2008; Linders, 2012, p. 447). Social media platforms have thereby been ascribed with the potential to support citizen participation and engagement (cf. Bonsón, Royo and Ratkai, 2015; Bonsón et al., 2012; Mergel, 2013).

Despite the co-creating and participatory character of social media platforms, concerns can be raised regarding issues related to privacy and power relationships, which may affect social media performance by the munici-
palty and citizens’ satisfaction with the municipality. Social media providers have their own agenda driven by business interests constituted by the idea to collect, extract and analyze user data which is then used for improvement of the service (Zuboff, 2019). According to Zuboff (2019; 2015), platform providers profit from people’s willingness to share their social lives online and from people’s ignorance about what the digital foot-prints they leave may be used for. The author further points to the asymmetric relationship that emerges between platform providers and their users based on the fact that: 1) the social media platform providers know more about people than people using the platforms know about themselves; 2) people have little, if any, in-sight into what the social media platform providers do with their data; and 3) people are dependent on social media services. The sharing of data has become part of people’s “everydayness,” hence, it is something people do to make their everyday lives work (Kallinikos, 2012). Users have built up a dependency on social media platforms that makes it difficult for citizens to criticize the service providers’ data production and use (Zuboff, 2015). From a government interest perspective, this asymmetry related to lack of transparency and freedom of alternative platforms may be problematic when social media platforms are used by municipalities.

2.2 Citizens and Municipalities
Civizens are valuable partners in processes of development of public administration (Konst-Laakso, 2017). They are the experts in the interaction with the municipalities because of their insight into culture and local affairs (Thapa et al., 2015). They also demand responsiveness from the municipalities to help their lives run efficiently, which forces municipalities to deliver information and service in a timely way (Bertot Jaeger and Hansen, 2012; 2012; Bernhard, 2014; Medaglia and Zheng, 2016). This expertise and these demands are of great importance for the municipalities in order to build up legitimacy (Gustafsson and Wihlborg, 2013) and to innovate public services (Norström, 2019; Konst-Laakso, 2017; Lampe et al., 2014). People have always participated and engaged collectively in civic issues and co-produced resources such as time, effort, and expertise, for example through neighborhood watching and as school crossing guards, teaching aides, etc. However, social media scales up this co-production (Linders, 2012) and challenges the municipalities to expand beyond defined boundaries and learn how to create valuable relationships to citizens (Norström and Hattinger, 2016).

In that way, the work with social media in municipalities challenges the role of public administration. New opportunities to inform and communicate put professionals in situations where they have to balance what they believe is a proper action as a public servant with what is possible to achieve with social media, often in relation to citizen participation and legitimacy (Norström, Bernhard and Lundh Snis (2019); Vallo Hult, Island and Norström, 2018). Only following the business logic of social media platforms and promoting topics and connections that are easily liked and shared in social media, may for example not be in line with the purpose of using social media for increased transparency of municipal activities. The challenge of using social media therefore lies in the tension between social media platform logics, government rationales and the willingness of citizens to participate. Social media platforms, citizens and municipalities are therefore all important actors in the creation of better public service (Norström, 2019).

2.3 Research Hypotheses
First, the quality of living in a municipality depends on access to crucial ingredients in our daily lives: access to workplaces, education, housing, communication, commercial premises, recreation and cultural events and public safety issues. We believe that a precondition for taking advantage of facilities, e.g. leisure activities and cultural events, is that citizens really are aware of and informed about these possibilities. Thus, the overall perceived satisfaction among citizens with the municipality as a place to live depends on awareness of access to important elements in daily life. Social media enables the possibility to inform and educate citizens about what it is like to live in the municipality, i.e., increase awareness. Research studies show that the topics most frequently posted by municipalities on their Facebook page are related to leisure activities such as “cultural activities and sports” and “city promotion and tourism” (Bonsón, Royo and Ratkai, 2015; Hofmann et al., 2013). Both these types of topics are also to some extent marketing related, which indicates that local governments first and foremost use Facebook for marketing purposes (Bellström et al., 2016). Previous research indicates that as much as nearly 70% (46/67) of posts from the municipality serve a marketing promoting purpose (Magnusson, Bellström and Thorén, 2012). In all, it is obvious that Facebook could serve the aim to portray the municipality as a good place to live and thereby influence citizen perception of what it is like to live in the municipality regarding several crucial elements in daily life. A conclusion from previous results is that the degree of digitalization in general in a municipality is related to how satisfied citizens are with living in the municipality (Bernhard et al., 2018). Since social media (Facebook) is a part of the overall digitalization with a focus on marketing the municipality as a good place to live, it is reasonable to expect a relationship between
social media and citizen perception. Moreover, as pointed out above, social media enables bottom-up, citizen-initiated “we-government” (Linders, 2012), which means that citizens could contribute understanding of what it is like to live in the municipality, find valued facilities, and also suggest improvements. In other words, our first hypothesis is:

H1: Social media performance is related to how satisfied citizens are with the municipality as a place to live in.

Second, the quality of daily living in a municipality is not only dependent on access to important elements, but also on the quality of these elements and services delivered by the municipality, e.g., schools, elderly and social care, emergency services, road maintenance, water and sewage services, environmental work, leisure, sport and cultural premises and communication. The citizens’ overall perceived satisfaction with the municipality’s service performance depends on awareness and perceived quality of these products and services.

In general, we are getting used to convenient online services for shopping, tax declaration, buying tickets, finding information, and nowadays more or less expect services with 24-hour online access. Citizens expect municipalities to be available when needed, which makes accessibility and efficiency an important aspect of social media. Having information flows and conversations constantly open and ongoing by using social media can help governments to be relevant and responsive and shape their tactics to enable efficient interactions with citizens (Mergel, 2013). The municipality could also use social media as an easy access forum for “fostering” citizens regarding specific services, e.g. how to recycle, which may lead to improved functionality and usage. Using a familiar platform such as Facebook decreases the distance between citizens and public servants, as pros and cons with municipal services could be discussed in a convenient well-known forum without “going over” to the government.

Thus, social media have the potential to increase awareness, allow citizens to discuss pros and cons of services, and have the municipality be responsive and act quickly when needed. Therefore, our second hypothesis is:

H2: Social media performance is related to how satisfied citizens are with the municipality’s performance regarding delivered services.

Third, in order to improve quality and fulfill expectations it is vital that the local government has a close relationship and interaction with its citizens. This includes offering transparent and easily accessible information, making it easy to contact the municipality, giving the possibility to influence, having one’s voice heard and building political trust. These factors are related to citizens’ perceived satisfaction with transparency and influence. Social media is believed to increase transparency, participation and collaboration with the aim to generate trustworthiness and accountability and to enable deliberation and community building (Mergel, 2013). Furthermore, as mentioned above, using a well-known platform decreases the distance between citizens (Linders, 2012). Thus, social media has the potential to increase transparency and support “we-government,” and therefore our third hypothesis is:

H3: Social media performance is related to how satisfied citizens are with the transparency and the influence they have on their local government.

3. Research Design

The methodology is to a large extent similar to the approach used in a previous study (Bernhard et al., 2018) and is a cross-sectional study based on official Swedish statistics regarding Swedish municipalities. The following data sources have been used:


The data from the four official statistics sources given above were pooled into one database. To ensure that the pooling associated the correct data for each municipality, both the official number for each municipality
and the name of the municipality were used when merging all the data. Thus, the final database includes data from all sources above for each municipality.

Our aim was to study the relationship between municipalities’ social media performance and citizens’ satisfaction with the municipalities’ service performance. Since we are using available data sources, our definition of citizen perception of service performance is limited to the measures of satisfaction and the dimensions of the citizen satisfaction survey (data source i), which is described in the next section.

We regard citizen satisfaction as the dependent variable and social media use as one independent variable. Furthermore, a number of variables are considered as potential confounders, e.g. employment rate, income and health, and are taken into account in the analyses.

3.1 Research Setting – Swedish Municipalities
The Swedish multi-level government system is based on national, regional, and local/municipal levels. Local government is the level of government closest to citizens in terms of public services, and together with regions and counties accounts for about 70% of all citizen contacts (SALAR, 2011). There are 290 municipalities in Sweden with strong constitutional autonomy (Montin and Granberg, 2013). This aims to relate democracy and public administration to local distinctiveness and the interests and ideas of citizens. Trust in local government is promoted by being inclusive, open, accessible and anchored in the local culture (Erlingsson and Ödalen, 2013; Montin and Granberg, 2013). In recent years, access to the Internet among Swedish inhabitants has been stable and high, almost 100% for citizens age 16-25 and 98% for citizens age 56–65 in 2018. However, even if the digital divide has been reduced, about 500,000 Swedes do not use the Internet at all (Davidsson, Palm and Melin Mandre, 2018). Most of these are elderly, although other reasons not to use the Internet are lack of interest and complicated technology. The use of social media among citizens continues to grow from already high levels, the largest being Facebook, but varies among the generations and is 84% for those born in the 1970s (Davidsson, Palm and Melin Mandre, 2018). Among the 290 municipalities, 217 (75%) used Facebook in 2015, based on one of the sources described below (iv), making it the most commonly used social media platform by local governments. In Europe, 66% of South European local governments have a Facebook page, 85% of Nordic local governments have a Facebook page, and 90% of Anglo-Saxon (Bonsón, Royo and Ratkai, 2015). Facebook is also the social media platform that the majority of the world population is familiar with (Pew Research Center, 2017).

3.2 Measuring Citizen Satisfaction
A national survey of citizen satisfaction with the municipality is performed twice annually by Statistics Sweden. The number of randomly selected individuals per municipality is usually 600 in smaller municipalities and 1200 in larger municipalities. The survey normally includes around 130 municipalities out of the 290 municipalities in Sweden. Some municipalities participate nearly every year, while other municipalities never participate. We gathered data from all the surveys conducted in 2015, and if a municipality did not participate that year, we included the survey from 2016 as the second choice and 2014 as a third, final choice. Altogether we included 184 municipalities from this survey, 111 from 2015 (60%), 60 from 2016 (33%) and 13 (7%) from 2014. The survey is comprehensive and includes a large number of questions. The complete survey and the underlying model is based on research developed by the marketing authority Claes Fornell, who developed the Swedish Customer Satisfaction Index (Fornell, 1992) and the widely used American Customer Satisfaction Index (Fornell et al., 1996). This model is inspired to a large extent by general theory for quality measurement and includes measures of citizens' perception of fulfilled expectations as described in 3.1.1.

The well-established model adopted by Statistics Sweden (SCB, 2017) for measuring perceived satisfaction with local government service performance consists of three different dimensions which matches the hypotheses presented above and is presented in detail below. This model has been used in previous research studying satisfaction with local government (Bernhard et al., 2018).

3.2.1 Satisfaction with Living in the Municipality
For studying this dimension the respondents were first asked to respond to a number of rather specific questions regarding access to a workplace at a reasonable distance, access to education, access to housing, communications, variety of restaurants, cafes and shops, possibilities of leisure activities and public safety. After responding to these detailed questions, the respondent is asked to give an overall opinion of satisfaction with
living in this municipality by raising the following three more general questions (each response on a scale from 1–10):

1. Overall how satisfied are you with living in this municipality?
2. How well have your expectations about living in this municipality been fulfilled?
3. Imagine the ideal municipality. How close to such an ideal do you think your municipality is?

Thereafter the average score of these three questions is calculated. Finally, this average is transformed into an index on a scale from 0–100, according to the following:

<table>
<thead>
<tr>
<th>Score</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Index</td>
<td>0</td>
<td>11.1</td>
<td>22.2</td>
<td>33.3</td>
<td>44.4</td>
<td>55.6</td>
<td>66.7</td>
<td>77.8</td>
<td>88.9</td>
<td>100</td>
</tr>
</tbody>
</table>

For instance, scores of 4, 5 and 6 would give an average of 5 and thus an index equal to 44.4. This index will henceforth be referred to as the Satisfaction with Living Index (SL).

3.2.2 Satisfaction with Performance of Government Services
This dimension starts with a number of detailed questions concerning the quality of delivered services (“judge how well this service functions on a scale from 1 to 10”), e.g. preschool, elementary school, upper secondary school, elderly care, social service for persons with extra needs, emergency service, maintenance of roads and walking/cycling paths, sport establishments (arenas, etc.), cultural establishments (library, theater, etc.), efforts for supporting environmentally sound behavior, refuse collection, water and sewage. After responding to these rather detailed questions, the following three more general questions are addressed:

1. Overall, how satisfied are you with the performance of government services?
2. How well have your expectations about performance been fulfilled?
3. Imagine the ideal municipality. How close to such an ideal do you think your municipality performs?

These three general questions are then used for constructing an index. This index will hereafter be referred to as: Satisfaction with Performance Index (SP) and is calculated in exactly the same manner as SL.

3.2.3 Satisfaction with Transparency and Influence
This dimension starts with a number of detailed question concerning, e.g., how easy it is to contact civil servants, managers or politicians, and their personal treatment, access to and clarity of information, possibility to make your voice heard and trust. These detailed questions are followed by the following more general questions (each response on a scale from 1–10):

1. Overall, how satisfied are you with the transparency and influence you have as a citizen in this municipality?
2. How well are your expectations about transparency and influence fulfilled?
3. Imagine the ideal municipality. How close to such an ideal do you think your municipality is regarding these attributes?

These three general questions are then used to construct an index which will be referred to below as Satisfaction with Transparency and Influence Index (STI). It is calculated in exactly the same manner as SL and SP.

3.3 Measuring Social Media Performance
Our primary variable for measuring Facebook performance is a Facebook Performance Index (FBP) developed by Smampion (smampion.se), a company hired by SALAR to study Facebook performance in Swedish municipalities (data source ii). The index was developed through an algorithm that considered the size of the page and was based on the basic Facebook page key performance indicators “followers,” “page growth,” “number of posts per day,” “posts by others to the page per day” and “response rate and response time,” as well as the following sub-indices: “engagement level,” “dialogues” and “spread,” described below.

Engagement level measures the average engagement relative to other Facebook pages, in percentage in relation to the size of the page, i.e., number of followers. This metric was based on the former Facebook value “People talking about this.” It shows the number of interactions a page has had with unique Facebook users per week. An interaction with a page was when the user: liked a page; wrote a post on the page wall; liked a post; commented on a post; shared a post (including all further likes, shares and comments on the shared post); replied to a question; replied to a page event; mentioned the page in a post; tagged the page in a photo;
checked in on the page; wrote a recommendation; or took part in a page like or offering. This measures the average engagement relative to other Facebook pages, in percentage in relation to the size of the page. "Dialogues" measures the percentage of possible dialogues the page took part in. A possible dialogue starts when a post is commented on by a user. If the page replies to the comment the page is considered as taking part in the possible dialogue. Spread or “virality” is a value between 0–100 based on the average spread of posts during one year. It measures number of interactions such as likes, comments and shares. Since a page with many followers gets a higher level of spread than a page with few followers, the size of the page is considered in the final score.

3.4 Measuring the Degree of Digitalization
In a previous research project, we studied the potential relationship between degree of digitalization (DoD) and citizen satisfaction. In that study we developed an index for measuring DoD (details in Bernhard et al., 2018). This index was based on the data sources iii-iv presented above. The information in data source iii was dominant, but some data was also used from data source iv. By using these sources four different sub-indices were created. The first one ("E-strategy") included questions like: “Does the municipality have a formal strategy for digitalization?"; “A responsible manager?"; “Is it highly prioritized?” The second index ("E-services") was mainly based on the number of e-services on the web and mobile apps. The third index ("E-information/transparency") focuses on one-way communication of important information, meeting notes and broadcasting meetings. The last index ("E-interaction") included questions regarding two-way communication, e.g. “Is there a discussion forum on the web?" All these four sub-indices were transformed to statistical standard points (mean 0 and standard deviation 1) and the overall index DoD was calculated by taking the mean of these four sub-indices, giving equal weight to the four different perspectives (strategy, services, one-way communication and two-way communication). In this study, we recalculated the DoD index but excluded the sub-index “E-interaction.” Since FB is the dominant social media tool for two-way interaction we believe that the e-interaction index used previously measures the same phenomena but with lower precision than the more specific and comprehensive FBP index. Using both indices would give a risk of multicollinearity and we argue that FB performance has higher validity for measuring interaction via social media. Thus, our revised index DoD measures the general degree of digitalization (strategy, e-services and one-way information), while FBP measures the performance in social media.

3.5 Statistical Methods - Analytical Considerations
As an exploration of whether the sample of municipalities could be considered representative or not, we analyzed response rate (achieved by the organizations making the surveys) in municipalities with different regional characteristics. To do this we used a classification of municipalities suggested by the Swedish Agency for Economic and Regional Growth Analysis (2014). The classification into different groups of municipalities is based on a typology used by Eurostat and the OECD and can therefore enable international comparisons. The basic classification contains three types of municipalities: rural, intermediate and urban. This division into three municipal categories correlates to a large extent with regional characteristics such as income, unemployment and education level, income distribution, median income and tax rate. The main variables (satisfaction indices and FBP) are summarized with mean and median as measures of location, by type of municipality.

Naturally, citizen satisfaction with a municipality is potentially affected by a number of other variables, such as population density, proportion of immigrants, proportion in employment, educational level, median income, Gini coefficient (distribution of income, values between 0 and 100, where 0 = totally equal distribution and 100 = totally unequal distribution), and sickness rate (the total amount of days with sick pay divided by the population aged 16–64). As a measure of education level we use the proportion of people with at least post-secondary education (three years or more). We also added tax rate for each municipality, since we believe that satisfaction may be related to the perceived value for the taxes being paid. All these variables were found in national data repositories for 2015 and were included in our database. As pointed out above, these variables are also closely related to the three categories of municipalities. Several of these variables may also be related to FBP. For instance, a wealthy municipality may have more money for e-investments and at the same time wealthy municipalities are likely to have more satisfied citizens than less wealthy municipalities.

Consequently, due to the confounding factor situation described above, we calculated partial correlation coefficients as a measure for the relationship between FBP and satisfaction, holding the other variables constant (Freund, Wilson and Mohr, 2010). We present standard Pearson correlation coefficient (r) and partial correlation coefficient (partial) in adjacent columns, allowing comparison of correlation both with and without ad-
justment, treating the partial correlations as the primary outcome. Correlations around 0.1 are considered as small, 0.3 as medium and 0.5 as large (Cohen, 2013). Due to the fact that the distribution of the type of municipality differed somewhat from the national distribution, i.e., intermediate municipalities were overrepresented and rural municipalities were under-represented, we also explored potential interaction effects between type of municipality and FBP and the relation to satisfaction. However, none of these interactions was significant, supporting that the estimated correlations would be the same even with a perfectly representative sample. Generally, 5% was used as significance level.

4. Results

4.1 Primary Variables – Descriptive Statistics

As seen in Table 1, the distribution of participating municipalities for each individual study does not differ significantly from the overall distribution in Sweden. There was however a significant difference in distribution considering the municipalities that are included in all studies (p=0.001). Rural municipalities are underrepresented (representing 44.8% of all municipalities in Sweden but 33.3% of all municipalities included in this study), while intermediate and urban municipalities are overrepresented.

**Table 1: Distribution of municipalities in the different studies**

<table>
<thead>
<tr>
<th>Respondents</th>
<th>Rural (n=130)</th>
<th>Intermediate (n=131)</th>
<th>Urban (n=29)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facebook study (n=217)</td>
<td>40.1%</td>
<td>47.9%</td>
<td>12.0%</td>
<td>&gt;0.20</td>
</tr>
<tr>
<td>Satisfaction (n=228)</td>
<td>38.6%</td>
<td>50.0%</td>
<td>11.4%</td>
<td>0.168</td>
</tr>
<tr>
<td>Digitalization (n=271)</td>
<td>43.2%</td>
<td>46.5%</td>
<td>10.3%</td>
<td>&gt;0.20</td>
</tr>
<tr>
<td>All studies (n=177)</td>
<td>33.3%</td>
<td>53.7%</td>
<td>13.0%</td>
<td>0.001</td>
</tr>
</tbody>
</table>

**Table 2: Basic descriptive statistics for the primary variables by municipality category**

<table>
<thead>
<tr>
<th>Primary variables</th>
<th>Rural (n=58)</th>
<th>Interm. (n=93)</th>
<th>Urban (n=23)</th>
<th>Total (n=174)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satisfaction Living (SL)</td>
<td>Mean/Median</td>
<td>57.2/57.5</td>
<td>60.5/60.0</td>
<td>63.7/64.0</td>
<td>59.8/60.0</td>
</tr>
<tr>
<td>Satisfaction Performance (SP)</td>
<td>Mean/Median</td>
<td>51.5/53.0</td>
<td>55.5/56.0</td>
<td>58.0/58.0</td>
<td>54.5/55.0</td>
</tr>
<tr>
<td>Satisfaction Transparency/Influence (STI)</td>
<td>Mean/Median</td>
<td>39.1/39.5</td>
<td>40.2/40.0</td>
<td>42.3/40.0</td>
<td>40.1/40.0</td>
</tr>
<tr>
<td>Degree of digitalization (DoD)</td>
<td>Mean/Median</td>
<td>-0.28/-0.18</td>
<td>0.30/0.32</td>
<td>0.60/0.49</td>
<td>0.15/0.14</td>
</tr>
<tr>
<td>Facebook performance (FBP)</td>
<td>Mean/Median</td>
<td>65.3/68.2</td>
<td>73.3/75.7</td>
<td>72.4/75.3</td>
<td>70.5/74.0</td>
</tr>
</tbody>
</table>

As seen in Table 2, there was a significant difference in mean values between the different municipality types. The overall tendency is that mean values are higher in intermediate and urban municipalities compared to rural ones. Satisfaction was highest for Living, second highest for Performance and lowest for Transparency/Influence.

4.2 Main Analyses: Correlations between Facebook Performance and Satisfaction

In this section the results for each hypothesis will be presented consecutively. The correlations regarding the first hypothesis: “Social media performance is related to how satisfied citizens are with the municipality as a place to live in” are presented in Table 3 below.

---

1 P-values based on ANOVA
Table 3: Correlations for Satisfaction with Living (SL).

<table>
<thead>
<tr>
<th>Variable</th>
<th>r</th>
<th>Partial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhabitants/km²</td>
<td>0.29**</td>
<td>0.04</td>
</tr>
<tr>
<td>Proportion immigrants</td>
<td>-0.22***</td>
<td>-0.45***</td>
</tr>
<tr>
<td>Education level</td>
<td>0.65***</td>
<td>0.27***</td>
</tr>
<tr>
<td>Proportion employed</td>
<td>0.39**</td>
<td>-0.07</td>
</tr>
<tr>
<td>Median income</td>
<td>0.57**</td>
<td>0.07</td>
</tr>
<tr>
<td>Gini coefficient</td>
<td>0.37*</td>
<td>0.03</td>
</tr>
<tr>
<td>Sickness rate</td>
<td>-0.58*</td>
<td>-0.10</td>
</tr>
<tr>
<td>Tax rate</td>
<td>-0.48**</td>
<td>-0.19*</td>
</tr>
<tr>
<td>Degree of digitalization (DoD)</td>
<td>0.36*</td>
<td>0.18*</td>
</tr>
<tr>
<td>Facebook performance (FBP)</td>
<td>0.32**</td>
<td>0.21**</td>
</tr>
</tbody>
</table>

*** Significant at the 0.001 level, ** Significant at the 0.01 level, * Significant at the 0.05 level

The partial correlations between FB performance and satisfaction (dimension: living), as well as between DoD and satisfaction (living), were of the same magnitude. These correlations were moderate in size, but approximately of the same magnitude (small to medium correlation) as other important factors like tax rate and educational level.

The correlations regarding the second hypothesis: “Social media performance is related to how satisfied citizens are with the municipality’s service performance regarding delivered services” are given in Table 4 below.

Table 4: Correlations for Satisfaction with Service Performance (SP)

<table>
<thead>
<tr>
<th>Independent variable</th>
<th>r</th>
<th>Partial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhabitants/km²</td>
<td>0.23**</td>
<td>-0.07</td>
</tr>
<tr>
<td>Proportion immigrants</td>
<td>0.01</td>
<td>-0.12</td>
</tr>
<tr>
<td>Education level</td>
<td>0.51**</td>
<td>0.19*</td>
</tr>
<tr>
<td>Proportion employed</td>
<td>0.20**</td>
<td>-0.15</td>
</tr>
<tr>
<td>Median income</td>
<td>0.43**</td>
<td>0.14</td>
</tr>
<tr>
<td>Gini coefficient</td>
<td>0.28**</td>
<td>-0.04</td>
</tr>
<tr>
<td>Sickness rate</td>
<td>-0.44**</td>
<td>0.02</td>
</tr>
<tr>
<td>Tax rate</td>
<td>-0.437**</td>
<td>-0.198*</td>
</tr>
<tr>
<td>DoD</td>
<td>0.36*</td>
<td>0.17*</td>
</tr>
<tr>
<td>FB performance</td>
<td>0.32*</td>
<td>0.17*</td>
</tr>
</tbody>
</table>

*** Significant at the 0.001 level, ** Significant at the 0.01 level, * Significant at the 0.05 level

The partial correlations between FB performance and satisfaction (dimension: service performance), as well as between DoD and satisfaction (service performance), were of the same size. These correlations were small to medium, and of the same magnitude as the correlations for other important factors like tax rate and educational level.

The correlations regarding the third hypothesis: “Social media performance is related to how satisfied citizens are with the transparency and the influence they have on their local government” are given in Table 5 below.

Table 5: Correlations for Satisfaction with Transparency and Influence (STI)

<table>
<thead>
<tr>
<th>Independent variable</th>
<th>r</th>
<th>Partial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhabitants/km²</td>
<td>0.17*</td>
<td>-0.00</td>
</tr>
<tr>
<td>Proportion immigrants</td>
<td>-0.06</td>
<td>-0.18*</td>
</tr>
<tr>
<td>Education level</td>
<td>0.35*</td>
<td>0.04</td>
</tr>
<tr>
<td>Proportion employed</td>
<td>0.09</td>
<td>-0.22**</td>
</tr>
<tr>
<td>Median income</td>
<td>0.35**</td>
<td>0.18**</td>
</tr>
<tr>
<td>Gini coefficient</td>
<td>0.27**</td>
<td>0.03</td>
</tr>
<tr>
<td>Sickness rate</td>
<td>-0.34**</td>
<td>-0.03</td>
</tr>
<tr>
<td>Tax rate</td>
<td>-0.34**</td>
<td>-0.14</td>
</tr>
<tr>
<td>DoD</td>
<td>0.17*</td>
<td>0.06</td>
</tr>
<tr>
<td>FB performance</td>
<td>0.13</td>
<td>0.04</td>
</tr>
</tbody>
</table>

*** Significant at the 0.001 level, ** Significant at the 0.01 level, * Significant at the 0.05 level

The correlation between FB performance and satisfaction (transparency and influence) was not significant (p>0.20).
5. Discussion and Suggestions for Further Research

Two of the hypotheses were confirmed. There were significant relationships between municipalities’ Facebook performance and citizen satisfaction with the municipality as a place to live in and satisfaction with delivered services. These findings are in line with previous research and our expectations in this study. The public servants frequently use Facebook for promoting good values with living in the municipality and creating awareness. It is important to bear in mind that the survey used measures the perceived satisfaction and not explicitly if the quality of living is changed in practice. Using FB as a marketing channel may increase the awareness of the good things about living in the municipality without changing how the citizens live their lives. But increased awareness could also have a direct effect on e.g. usage of sport facilities, leisure activities and cultural events, and in that sense change citizens’ lives. From a public health perspective it would be interesting to perform classical marketing research where the effect of using FB for promotion is related to increase in usage of facilities, ticket sales for events in comparison to other advertising channels, regarding efficiency and target population. Another important issue to be addressed in forthcoming research is whether there might be negative effects from a constantly positive and polished image of the municipality, i.e., if this may influence trust or other factors.

Regarding the second hypothesis, concerning services, citizens often comment on services that are not functioning well. In such cases, the municipality has the opportunity to be responsive and create goodwill by acting quickly and solving problems, while on the other hand non-response could generate bad will (Bonsón, Royo and Ratkai, 2015). Problems commented on Facebook are possible top read for all Facebook members which makes problem solving and fast action much more vital than a problem communicated via e-mail or phone. The magnitude of the relationships between Facebook performance and satisfaction with the municipality as a place to live in and its services are modest, i.e., correlations around 0.2, but interestingly, these relationships are of the same magnitude as tax rate and educational level, which are considered important factors.

When it comes to transparency and influence, the third hypothesis, there was no correlation with municipality Facebook performance. This observation is also in line with recent research where we see that discussions on public government platforms are often polarized and deliberation traits are lacking among the participants in the interaction (Medaglia and Zhu, 2017). Since we do not see the same lack of interaction in private domain platforms, it is worth speculating that the government context may be shaping and limiting the interaction. Previous research shows difficulties in professionals’ work practice related to tensions between what is possible to do with social media and what is proper professional behavior for a public servant (Bergquist et al., 2017). The uncertainty about what is proper action may hinder the professionals from fully following the logic of the platforms (Norström, 2019). Furthermore, several municipalities offer other forums, e.g. online forums for citizen dialogue, especially aiming at deeper political and development discussions. This may perhaps be another explanation for why there was no significant relationship between Facebook performance and transparency and influence. As Linders claims, there is a transformation going on towards a government where citizens and government co-create resources (Linders, 2012) and where responsibility to engage and provide input for the development of municipal services is partly distributed from the municipality to citizens and other stakeholders (Konsti-Laakso, 2017). This transformation demands new competences both by municipal civic servants and by citizens (Norström et al., 2019; Norström, 2019). The changing role of civil servants and citizens when social media is used in the municipality may be an important issue to address in forthcoming research. The lack of significance may also be explained by the fact that transparency and influence are more abstract variables and more difficult to model.

Since the study only includes municipalities in Sweden, the internal validity is restricted to this population, which is a limitation of this study. Furthermore, we decided to aggregate data from three years in order to increase sample size. An alternative would be to study the progression over three years, i.e. a longitudinal analysis, but the number of municipalities with data from all time points was judged to be too low for this approach. One could speculate that several of the studied elements (access to workplaces, education and housing) are universally important elements for quality of life. Furthermore, social media could be used for marketing and co-production in other countries. However, since there is a lack of similar quantitative studies in other countries, it is simply not possible to give a valid generalization of the results from this study to other countries.
It is worth pointing out that this study uses data on an aggregated level, i.e., with municipalities as objects. This means that the data represents the average situation in each municipality. Naturally, there could be variations within a municipality due to variation in socio-demographic variables. An important aspect is how digitalization could be used to increase equality and reach its full potential in vulnerable socio-demographic areas within a municipality. One important strength of the study is that digitalization is related to citizens’ satisfaction with municipalities, a variable known to be related to quality of life, which is perhaps the most important endpoint, even though frequently neglected, when evaluating effects of digitalization (Fischer, 2018). Another strength is the amount of data, including the vast majority of Swedish municipalities, pooling several important and reliable official data sources.

6. Conclusions - Implications

In conclusion, one important implication of the study is that citizen perceptions regarding whether a municipality is a good place to live in or not is related to the use of social media for promoting the municipality. Furthermore, a relation between satisfaction and citizen perception of government service performance implies that social media could be valuable for interaction and co-creation. Finally, an implication is that usage of social media and the potential relationship to trust, influence and transparency must be further elaborated and studied. Overall, our recommendation is that municipalities and their citizens may benefit from well thought-out strategies of how to use social media for marketing, interaction and co-creating.

References


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Abstract: Electronic government (EG) is a multidisciplinary research field that has been developing rapidly since its initial conceptualization in the 1990s. It is currently experiencing high levels of growth in terms of scholars in the field, publications, research funding opportunities, and dedicated conferences. Though the field is growing in terms of research output, it does appear that the field is stagnated when it comes to theoretical development. This paper aims to address this stagnation by proposing a new approach for scholars within the field of EG to understand and study the complex issues that exist within the field. In this paper, it is argued that the field of electronic government is, in actuality, studying the co-evolutionary relationship between ICT and government within a changing environment. Thus, by adopting an approach based around complex adaptive systems (CAS) and complexity theory, new insight and potential research directions should become possible.

Keywords: Complex adaptive systems, e-government, complexity

Highlights:
- Provides a meta-analysis of the current state of the electronic government field
- Presents an overview of complexity theory and complex adaptive systems.
- Discusses the current state of the electronic government field and argues that a complex adaptive systems approach to the study of complex electronic government phenomena would be beneficial for the field.
- Provides some initial propositions about what the inclusion of complexity into the field of electronic government means.

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1. Introduction

The academic discipline of electronic government (EG) has been growing and developing as its own research discipline since its initial conceptualization in the 1990s (Grönlund, 2004). This growth has largely been in terms of the number of publications, research in the field, conferences, and academics who self-declare themselves as belonging to the field of EG. Though there has been growth in the number of publications, published research within the field of EG often lacks quality, rigor, does not aim to advance or generate new concepts for the discipline, and lacks any sense of research philosophy, goals, or direction (Heeks and Bailur, 2007). This criticism has been repeated on numerous occasions since this 2007 paper by other scholars as well e.g. (Castelino and Sorrentino, 2018; Joseph, 2013; Meijer and Bekkers, 2015; Norris, 2010; Yildiz, 2007).

Though this criticism exists, there are those who argue an alternative. In Scholl (2006), it is argued that as EG is an applied multi-disciplinary field with impact, the presence or absence of theory does not necessarily dictate the importance or relevance of EG as a research domain. Bannister and Connolly (2015) explore whether the criticism about the lack of theory is true and warranted. They note that there is a wide use of ‘imported theory’ in EG and resist the claim that EG is ‘under-theorized’. Furthermore, they question whether or not there even can be native theory in EG and state that “deep theorization of a multi-disciplinary field may not be possible” (Bannister and Connolly, 2015, p.10). This debate is still ongoing. Many top EG conferences have now devoted specific tracks to the development and application of theory in EG which both directly and indirectly explore the nature and validity of EG as a research field.

It does appear to be the case that there is a clear need and interest for research papers that attempt either to argue for or against the relevance and necessity of theory for the field of EG; this paper supports an argument...
in the affirmative. Whilst EG is impactful and more of an applied research area than other fields, the importance of understanding the phenomena being studied by scholars of EG cannot be underestimated. These phenomena studied within the field of EG are complex, unpredictable, and non-linear and do not fit within any other discipline (Lips, 2012). Given this situation, it is plausible that the existence of the field of EG is, in fact, necessary, as it provides a way to study EG phenomena within their own unique environment. This is a view that has been also offered by others who note that traditional ways of studying the complex issues within the field of EG often fall short in dealing with the actual complexity at hand (Pardo and Gil-Garcia, 2005).

This paper argues that many of the issues studied by scholars of EG are complex adaptive systems (CAS), and that theories related to this, such as complexity theory, provide new insights and ways of thinking for scholars and practitioners within the field of EG. In line with this, this paper argues for the importance of systemic, holistic, and context-aware approaches in EG studies due to their usefulness in studying complex and open systems. In order to better understand and demonstrate the relevance of this approach to the study of EG, the paper asks the question “How can a CAS perspective contribute to the theoretical development of the field of EG?”. By answering this research question, this paper aims to make two core contributions. Firstly, to demonstrate the relevance and usefulness of CAS for the field of EG. Secondly, the paper offers some initial propositions about the nature of EG studies.

2. History and Background of EG Studies

What the field of EG studies is still up for debate. Contributors to the field come from a wide variety of backgrounds (Gil-Garcia, Dawes, and Pardo; 2018; Scholl, 2016, 2009) and this leads to a situation where there is no shared understanding or an agreed upon vocabulary in the field. Unless we have strong philosophically and epistemologically grounded shared definitions, scholars in the field are not actually talking about the same thing. Thus, it is of the utmost importance to begin to develop this shared and agreed upon understanding. In order to explore this conceptual ambiguity, some core papers that discuss and analyze the field of EG are presented in the following paragraphs.

In 2005, Grönlund and Horan published their paper “Introducing e-Gov: History, Definitions, and Issues”; this paper aimed to provide a description of the history of EG and the current research content within the field. The authors note that there are multiple definitions in use for EG research, and that these definitions widely vary based on the background of the researcher, though they note that there is a large information systems and IT research dominance in the field (Grönlund and Horan, 2005). The paper does not state directly any criticisms with the EG field, but it does bring to light the issues which are touched upon in future papers: multiple backgrounds, lack of agreement on definitions and terminology, and a heavy focus on information systems while ignoring important issues such as governance. The authors additionally highlight the importance of continuing to develop a body of theory if EG hopes to develop as a discipline.

In Heeks and Bailur (2007), the authors reviewed eighty-four papers published in Information Polity, Government Information Quarterly, and conference proceedings from the European Conference on e-Government and find that only a single paper used any theory and a majority were based around models or frameworks. Furthermore, none of the 84 papers had any reference to a research philosophy. This controversial paper finds that EG needs to develop its own theory, apply theory from other fields, encourage the use of research philosophy and a movement away from positivist works, and try to develop rigor among EG work (Heeks and Bailur, 2007).

Three years later, in 2010, Grönlund published another review of the EG field, titled “Ten Years of eGovernment: The ’End of History’ and New Beginning” where the author states that “there is no explicit EG theory, but there are several definitions” (p. 14). The author notes that there is almost no theory within the EG field and the reason for this is largely due to a strong information systems focus in the field, and due to this information systems focus the importance of organizations, governance, and government is overlooked (Grönlund, 2010). Though the field is likely to continue producing research as new ICTs continue to be invented and applied to government, in order to improve the field must better “understand the relation between technology, organization, and government values” (Grönlund, 2010, p.23).

As many argue that it seems to be true that there is a lack of rigor within the EG field and that when it comes to native EG theory there is little to none, it raises the question of whether EG needs native theory. Opponents of
EG as a research discipline, and the need for theory in EG, may point out that one would be hard pressed to argue that the field has had no impact; if the field is having positive impact on society and government transformation, is theory necessary? Meanwhile, proponents of the EG discipline and the need for theoretical development are likely to argue that in its current shape the EG field needs the development of theory and an increase of methodological and academic rigor.

One of the main reasons for the lack of theory in the EG field is due to the multidisciplinary nature of the scholarly community, which has thus far prevented mutual agreement among scholars about definitions and theoretical constructs. This multidisciplinarity, then, acts as a hindrance rather than a strength and thus encourages to fragmentation within the field. A potential first step to fix this fragmentation would be to adopt a shared set of definitions among EG scholars (this has been discussed in great detail by Waller and Weerakkody 2016). Another potential way to bridge the gap between disciplines would be for EG to adopt theory where definitions are clearly outlined and described so that it could then be applied by EG scholars. EG deals with both IT and government, though this duality is often ignored or forgotten; thus, what occurs, is a large amount of published work taking on a heavy techno-centric and information systems focus that appears to be self-promotional, ignoring the importance of the non-technical aspects of the field such as context, institutional beliefs, or government systems (see, for example, Bekkers and Homburg, 2007; Castelnuovo and Sorrentino, 2018; Norris and Reddick, 2013; Pollitt and Bouckaert, 2011; Yildiz, 2007)

Reflecting back on the history and development of EG as a discipline, a research gap does appear to exist. Scholars argue that there is a lack of theory in EG, that more rigorous work is needed, and that the study of EG is complex. Complexity, here means that relationships are important, systems are important, relationships between parts of the system are important, and that it is not simply about IT and government, but, rather, it is about the relationship between IT and government. If the phenomena being studied by EG scholars are complex, then a theory or lens that can help to make sense of this complexity would be rather beneficial for developing EG as an academic discipline.

3. Overview of Systems and Initial Propositions

This idea that government is a system and that it is complex is not new. For example, in Aristotle’s Metaphysics1 it is already argued that a system is more than the sum of its parts (Cohen, 2016). It is not possible to understand a system by looking at its individual parts, but only by looking and studying the behavior of the whole is it possible to understand the system. This theme is also constant throughout Aristotle’s Politics2 where the city-state is viewed as a system that exhibits different behavior at different scales (politis, koinônia, and polis) (Clayton, 2019).

Moving forward to the 19th century, Hegel’s Philosophy of Right (Hegel, 1820) also discusses this notion, where he describes the State as an evolving organism. To Hegel, the State contains different organs, which all play a role in how a State functions and governs (Duquette, 2018). What Hegel is describing is the emergent behavior of the State as it slowly changes, adapts, and improves how it is governed over time learning from the failures of previous administrations, laws, and experiences.

Other authors have also made a name for themselves when it comes to studying and analyzing the systemic nature of the State, governance, and society. Scholars such as David Easton have proposed a model for analyzing political systems. Easton (1953), proposed that a political system takes inputs (demands and support) and outputs decisions or policies; this system takes place within an environment and the outputs provide feedback to the inputs (Easton, 1953). Niklas Luhmann advances the idea of society as a social system and claims that social systems are autopoietic and exist in their current form due to evolution (Luhmann, 1992; Brans and Rossbach, 1997). There are additional systemic approaches to the study of governance and organization as well, such as: living systems theory (Miller and Miller, 1995), system dynamics (Forrester, 1958, 1968; Meadows, 2008), or cybernetics (Wiener, 1948; Beer, 1972, 1979). Thus, there is a large strand of literature from many different disciplines that all are based around the same idea, which is conceptualized below as the first proposition for this paper:

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1 http://classics.mit.edu/Aristotle/metaphysics.html
2 http://classics.mit.edu/Aristotle/politics.html
P1: Government should be thought of as a systemic process, it is made up of many interacting parts, and it is in a state of constant co-evolution with its environment.

In the past, there was an attempt to approach EG development in a linear manner as suggested by the much cited paper by (Layne and Lee, 2001). In practice, this development is not linear and takes place in a variety of different ways. For example, in Estonia, electronic government developed in a fairly bottoms-up manner owing its success to co-creation, informal networks, and active participation from a wide variety of sectors (Kattel and Mergel, 2018). However, this approach differs from those adopted by other countries such as Denmark or the UK where the development has been much more top-down. This is a key point, context matters. Empirical studies within the field of EG should pay careful attention to the unique context and environment that play a role in the co-evolution of the object being studied. This would suggest a more interpretivist or pragmatic epistemology may be useful for EG scholars.

By taking a most contextually aware approach to EG studies, it is possible to notice two things. Firstly, the systemic nature of government implies the existence of feedback loops, which, in turn, leads to non-linear, dynamic behavior. This dynamic behavior makes the creation of models, reductivism, prediction, and deductive research unlikely to be successful across a wide variety of contexts. Secondly, as these feedback loops and these systems are highly influenced by context, in order to explain some phenomena within the field of EG, one must first create understanding. Though understanding government and theorizing on the topic is hard due to its nature as a complex system, by understanding the system, the simple rules at play, the connections and relations between the agents, the environment that it operates in, and the different influential contextual factors, it is possible to begin to develop a new way of interpreting systemic developments. As electronic government, the object of study rather than the field, is part of government, and as P1 claims that government is a system, we arrive at P2:

P2: Electronic government initiatives will exhibit feedback mechanisms, dynamic non-linear behavior, and are highly influenced by co-evolutionary dynamics.

3.1 Complex Adaptive Systems

Complexity studies and complexity theory provide a different way of looking at and understanding the world (Cairney, 2012; Cairney and Geyer, 2017). Complexity theory sees the world as being made up of many complex systems and provides a toolkit for understanding and looking at said CAS (Bar-Yam, 1999). The study of systems is generally believed to have originated following the work of Ludwig Von Bertalanffy and his proposal for a general systems theory. Von Bertalanffy posited that “the fundamental character of the living thing is its organization, the customary investigation of the single parts and processes cannot provide a complete explanation of the vital phenomena” (Von Bertalanffy, 1972, p. 410), this is the original proposal for the study of systems as we know it today. Systems are more than the sum of their parts; they are made up of elements and interactions, and the interactions lead to the system’s function or emergent behavior (Meadows, 2008). Though the proposal for a general systems theory has largely been viewed as a failure (Checkland, 2000), the idea of systems thinking and systems science has led to many new fields, such as cybernetics and complexity. Complex adaptive systems are systems that consist of numerous interacting agents that behave independently, engage in co-evolution, and complex behavior emerges as a result of their interactions (Anderson, 1999; Cairney, 2012). It should also be noted that, in this paper, the authors adopt a more interpretive and pragmatic perspective on CAS, rather than a positivistic (Heylighen, Cilliers, and Gershenson, 2006; Ison and Schindwein, 2006; Knight and Halkett, 2010).

Though there are many properties associated and ascribed to complex adaptive systems, there tends to be wide agreement at least on the following: Emergence, Edge of Chaos, Co-Evolution, Connectivity, Self-Organization, and Feedback loops (Fryer, n.d.; Janssen and Kuk, 2006). While these properties are now assigned to complex adaptive systems, many of these concepts can trace their origins to other fields. For example, the existence of self-organization and feedback have all been heavily theorized by cyberneticians (Ison and Schindwein, 2006) and, in the case of feedback, system dynamics has also invested heavily in developing an understanding of this concept (Sterman, 2002).

Though CAS and complexity studies are based on old ideas, they take these ideas and apply them in a new way, offering practitioners in the field a new and diverse way for approaching, understanding, and studying complex problems. In order to begin to use this new approach, it is paramount to understand better the properties that

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are often associated with CAS and believed to be necessary parts of any CAS. A brief description of each of these properties follows:

- **Emergence** - Emergence is arguable the most important part of a CAS, this is what happens when a system operates, it is the behavior of the system (Crawley, Cameron, and Selva, 2015), it refers to “the existence or formation of collective behaviors - what the parts of a system do together that they would not do alone” (Bar Yam, 2011). In order to understand and study emergence, the collective behavior of the CAS must be studied in vivo, or within the system and environment itself (Bar-Yam, 1999).

- **Edge of Chaos** - The term “edge of chaos” was first offered up by a biologist named Stuart Kauffman who found that systems, contrary to popular belief, behave better when they are not structured and ordered (Kauffman, 1991). Adaptive and self-optimizing behavior naturally occurs at the “edge of chaos” as systems here have enough room to respond to shocks in creative ways that is otherwise limited by strict rules and structures.

- **Co-Evolution** - CAS are in a constant state of co-evolution with their environment; if the environment changes it effects the behavior of the system, and this change in system behavior also alters the environment (Anderson, 1999; Kauffman, 1991). These evolutionary changes do not happen in a linear fashion and thus CAS and the relationships within the system may be understood as non-linear (Fryer, n.d.).

- **Connectivity** - All agents within a CAS are connected yet acting independently. These relationships and interactions take place in a non-linear fashion and are governed by simple rules. Looking at the connectivity and relationships is key to understanding CAS (Bar-Yam, 1999).

- **Self-Organization** - CAS are self-organized in a bottom-up process which leads to the idea that CAS are the results of non-linear interactions rather than planning and design (Kaisler and Madey, 2009).

- **Feedback loops** - A CAS is dynamic, receiving both positive and negative feedback on its behavior. Traditionally, the field of system dynamics has made it an effort to understand and study these loops (Forrester, 1994). Feedback loops may be either balancing or reinforcing. Balancing loops focus on moving a CAS towards some objective, for example towards a more favorable evolution, whereas reinforcing loops aim to reinforce changes within the system.

Understanding the different parts of CAS allows for scholars to approach the study of EG in a unique and more informed way.

### 4. EG as a Complex Adaptive System

It is widely agreed that the ideas of government and governance are complex and a new approach is needed that allows for a better understanding of the new paradigm that is taking shape. Social science fields such as political science and public administration have toolsets, frameworks, and theories for dealing with these environmental and systemic factors, thus it follows that EG could learn from these fields by studying their approaches towards studying and understanding complex governmental phenomena. This is exactly what has been argued in a recent paper by Gil-Garcia, Dawes, and Pardo, 2018, where the authors conclude that there is still much work needed in terms of cooperation between scholars who write about EG phenomena. Interestingly the authors also note that one potential way forth for driving this cooperation is through adopting a systems based sociotechnical approach, as advocated by (Dawes, 2009).

There is a clear call for more cooperation, synergy, and information exchange between scholars of public administration, information systems, and EG, and, at the same time, there are also calls for a more systemic approach to EG. Thus, it is interesting, and yet not surprising, that one area where the application of complexity theory and CAS has been rising over the past years is within the field of public administration. One of the first concrete efforts by a public administration journal to bring complexity and CAS into the field was when a 2008 special edition in Public Administration Review on complexity theory and public management was released. This edition was edited by Geert R. Teisman and Erik-Hans Klijn and contained seven articles that each explore the benefits of complexity theory and CAS for public management research (Teisman and Klijn, 2008).

More recently, in 2017, another special issue has been released by another public administration journal, Public Management Review. This journal was edited by Elizabeth Anne Eppel and Mary Lee Rhodes, the issue notes that there is rising interest in how complexity theory and CAS may be applied to the public administration field and subsequently asks authors to explore how these ideas may contribute to public administration theory and
practice (Eppel and Rhodes, 2017). On the political and policy science side, there is also much work focusing on the application of complexity theory and CAS to the field and how these ideas may generate new understanding of political and policy processes (Geyer and Cairney, 2015). It has been stated that the public policy-making systems are, in fact, complex systems and that one reason policy implementation often fails is due to policy makers’ tendency to ignore the policy making environment and the different dynamics that are at play (Cairney, 2012).

One of the most prominent papers discussing the movement from traditional government and governance to the new “E” or “digital” paradigm, is the paper “New Public Management is Dead - Long Live Digital-Era Governance” by (Dunleavy et al., 2006). Here the authors note that public management is a complex system and that, due to the introduction of ICT and digital age technologies, we are currently experiencing an evolution or shift in said system. Specifically, the authors note that ICTs have been introduced into public administration and, as such, have influenced and effected the system in a variety of ways, varying from organizational to cultural changes (Dunleavy et al., 2006). The authors claim that the introduction of new ICTs and digital era technology to the public administration system has led to a phase transition, a change in the state of the system that has changed the system’s operation and behavior. In other words, the introduction of ICT and other digital technologies to the environment changed it in such a way that the “governance” system had to respond and “co-evolve” with this change.

Due to the relative newness of the field, a common definition and understanding of what is being studied by EG scholars is still being sought. Table 1 provides three different approaches that have been suggested by scholars as the core focus of EG studies.

**Table 1: Different Understandings of the Purpose of EG Research. Source. Author.**

<table>
<thead>
<tr>
<th>Understanding of EG Research</th>
<th>Source</th>
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<tbody>
<tr>
<td>“The purpose and role of government</td>
<td>(Dawes, 2009)</td>
</tr>
<tr>
<td>Societal trends</td>
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<tr>
<td>Changing technologies</td>
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<td>Information management</td>
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<td>Human elements</td>
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<tr>
<td>Interaction and complexity</td>
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<tr>
<td>“Information use</td>
<td>(Scholl, 2007)</td>
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<tr>
<td>Technology use</td>
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<tr>
<td>Public Policy</td>
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<td>Government Operations</td>
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<td>Government Services</td>
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<tr>
<td>Citizen Engagement</td>
<td></td>
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<tr>
<td>“Wide social domain including stakeholders in politics, administration and society</td>
<td>(Grönlund, 2010)</td>
</tr>
<tr>
<td>A wide technical domain not limited to any particular technology</td>
<td></td>
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<tr>
<td>A focus on several issues specifically to do with government values, such as accountability,</td>
<td></td>
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<td>legitimacy, and responsibility</td>
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All three approaches note that the field is quite broad and needs to account for a multitude of different elements, the importance of relationships and interactions between different elements is also highlighted. While discussing his idea of the central research question of EG, Hans Jochen Scholl notes that “transformation is central to the understanding of EG” and that the core questions of EG:

- “have to account for the six high-level variables [information use, technology use, citizen engagement, government services, government operations, public policy];
- have to address their complex interrelationships and the processes between them;
- which typically involve more than one discipline; and
- further important aspects in the relationships between those variables may even fall outside the scope of any one discipline” (Scholl 2007, p. 74-75).

Similarly, Grönlund writes that EG research needs to become “deeper” and devote more attention to the understanding of the relationships between different variables, such as technology, organizations, and government values and that, as a result of this direction of study, EG may be able to better contribute to better
governance (Grönlund, 2010). In Dawes’ work, she notes that the EG scholars should take a big picture approach and look at eGovernment as a “dynamic open socio-technical system” (Dawes, 2009). What begins to become clear is that though there is no widely agreed upon research direction and focus inside the EG field, there are certain aspects that appear in multiple understandings. For example, most scholars are likely to agree that the relationships between actors is important in EG research, that a big picture or holistic approach is needed, and that traditional approaches to the study seem to be falling short.

This also mirrors what has been written in both policy studies and public administration. Scholars from those fields have begun to state that governance and public administration may indeed be viewed as a CAS and that by adopting a complexity and CAS based framework new insights could be gained for the study of governance. One potential area where CAS and complexity is likely to provide a large benefit to scholars is when it is applied to the study of wicked problems (Klijn and Klijn, 2008). Scholars also note that the application and introduction of complexity theory may allow a bridge to be built between disciplines allowing for new discussions to take place (Cairney and Geyer, 2017). Though benefits have been touted, many barriers have also been pointed out. One of the most common weaknesses that is pointed out is that there is a need to understand how to operationalize the application of CAS and complexity theory to real-world phenomena (Cairney and Geyer, 2017; Klijn and Klijn, 2008). Secondly, some scholars also wonder if the benefits from CAS are actually realizable, or if, rather, they simply represent hype and represent new terminology for issues that have been understood for some time (Cairney and Geyer, 2017). While taking into account the potential barriers and weaknesses, the potential benefits from CAS and complexity theory for the field of EG should not be ignored and effort should be directed at understanding how they can aid EG scholars.

5. Discussion

Integrating theories from complexity studies and drawing on core concepts from CAS into the field of EG leads to several interesting propositions. Firstly, one of the inherent properties of CAS is change. To this end, the field of EG should position itself in such a way that it is able to develop as a field and maintain its relevance as, in the future, perhaps the “E” from EG is removed. This is, already, beginning to occur with some scholars saying that EG should be, rather, known as digital government as the “E” in electronic government is often associated with older, outdated, technologies not in line with the current technological environment. One way that the field of EG could do this is by adopting a common definition for the field that is able to retain relevance as technology and governmental systems continue to develop. Such a definition should acknowledge that the field of EG studies complex issues and that a phase shift in the future is inevitable. To offer an initial suggestion, the following definition is proposed:

• “The field of EG studies the co-evolutionary relationship between ICT and government under the premise that this relationship takes place within a dynamic and changing environment”.

This definition moves away from the traditionally techno-centric definitions that have dominated the field of EG, and shifts the focus towards relationships, context, environmental factors, and interactions. That is to say, whether we are studying big data or social media or blockchain, it is not necessarily the technology itself that is important, but, rather, how the introduction of such technologies changes the relationships and interactions between agents in the system, and how the environment and emergent behavior of said system adapt and change in response. This idea is supported by the CAS framework where it is noted that individual actors or parts are not likely to tell you anything about the system, but, rather, what must be studied is the interactions between the different parts. Taking these factors into account, it is possible to raise some initial propositions that naturally emerge from adopting a CAS approach in the field of EG. These propositions are:

• Any theory within the field of EG should be compatible with the properties of CAS
• The study of individual parts is not likely to provide new or promising insights to the field of EG, research should rather focus on the whole system, relationships, and emergent behavior
• As CAS operate at the edge of chaos, it is likely that we will see a movement towards less ordered government strategies, such as networked, adaptive, or agile government configurations
• It is unlikely for there to be predictive theory within the field of EG due to the non-linear relationships and evolutionary characteristics of CAS

These propositions may serve as an initial starting point for future research within the EG field that aims to use a CAS framework. One potential area of interest where a CAS framework is likely to already provide a high level of value, is in the study of wicked problems.
Wicked problems are those problems that have no correct answer, description, and their solutions remain aloof (Head and Alford, 2015) (In the context of EG, wicked problems may be related to internet voting, technological literacy, personal data ownership, electronic health records, etc...). There have been arguments by some that new ICTs and digital technologies (such as artificial intelligence and big data) have the potential to create new ways to understand and attack wicked problems (Zhang et al., 2016). At the same time, others have also noted that there appear to be similarities between CAS and wicked problems (Klijn and Klijn, 2008), and have proposed that taking a complexity approach towards wicked problems allows for them to begin to be unraveled (Zellner and Campbell, 2015). When talking about wicked problems, arguably, the seminal work comes from Rittel and Webber where they identify and state that there are 10 main attributes or characteristics of wicked problems:

1. “There is no definitive formulation of a wicked problem.
2. Wicked problems have no “stopping rule” (i.e., no definitive solution).
3. Solutions to wicked problems are not true or false, but good or bad.
4. There is no immediate and no ultimate test of a solution to a wicked problem.
5. Every (attempted) solution to a wicked problem is a “one-shot operation”; the results cannot be readily undone, and there is no opportunity to learn by trial and error.
6. Wicked problems do not have an enumerable (or an exhaustively describable) set of potential solutions, nor is there a well-described set of permissible operations that may be incorporated into the plan.
7. Every wicked problem is essentially unique.
8. Every wicked problem can be considered to be a symptom of another problem.
9. The existence of discrepancy representing a wicked problem can be explained in numerous ways.
10. The planner has no “right to be wrong” (i.e., there is no public tolerance of experiments that fail)” (Rittel and Webber, 1973, p. 136-144).

There are obvious overlaps between CAS and the characteristics in wicked problems. For example, “Wicked problems have no stopping rule” and “solutions to wicked problems are not true or false, but good or bad” relate closely to the notion that CAS are in a constant state of co-evolution at the edge of chaos and that they learn and adapt based on positive or negative feedback. What the CAS framework allows for is a way to take the traditional understanding of wicked problems, and translate it into a complex system or problem, keeping the problem intact, while, at the same time, providing a potentially clearer conceptualization of the problem and providing researchers with a new mindset and thought patterns that may allow for new and potential solutions to emerge.

Naturally, there is a follow-up question, which is, how to operationalize the insights provided by CAS and complexity studies. In the case of the field of EG, one of the most likely methodologies to be adopted is case study research; case studies may potentially be beneficial, however, they must make sure to take into account context, time, and look at systems in their own environment (Koliba et al., 2014). Generally speaking, the purpose of studying CAS is to understand the behavior of the system and look at how the relationships and interactions between agents effect the complex behavior of a system (Bar-Yam, 1999). Therefore, other methodological approach must also be able to take into account non-linear behavior, self-organization, interactions, context, relationships, the simple rules of the system, and acknowledge the time dimension.

6. Conclusion

This article embraces the idea that the field of EG studies issues that are complex, and, as such, puts forth the idea that an approach drawing on insights from CAS and complexity studies will be beneficial for the field. The article initially starts by exploring and providing an overview of numerous meta-analyses that have examined the state of the EG field and the use, or lack thereof, of theory within EG articles. It was noted that one reason or the lack of theory and agreement within the field is due to its multidisciplinary nature. Since the field is multidisciplinary, it would make sense that an approach that is capable of building a bridge between disciplines would aid the EG field, and this paper proposes that CAS and complexity theory can build this bridge. The paper explores the properties of CAS and derives some initial propositions that are applicable to issues being studied by scholars in the EG field. It does indeed seem that CAS and complexity theory are useful for the research of EG scholars and, additionally, for developing the discipline. The proposition that is likely to be the most valuable is as follows: “The field of EG studies the co-evolutionary relationship between ICT and government under the premise that this relationship takes place within a dynamic and changing environment”. This frames the study of EG in a way where relationships, trends, evolution, and interactions are more important and valuable for the
discipline rather than individual parts. Ultimately, this paper aims to provide the initial foundation for the application of CAS in EG research. Future work is needed, and potentially beneficial directions may include empirical research using CAS as the theoretical lens, native theoretical development that builds off of CAS building blocks, and work that tries to understand and conceptualize the EG system in a concrete form. Once the system is conceptualized, it is possible to better explore and delve deeper into relationships and begin to move towards a point where the EG field may make even more scientific and practical contributions than it currently does.

References


A Framework for Categorising and Evaluating Tools for e-Democracy

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Abstract: The design of tools and interfaces for e-democracy systems takes place in a highly multidisciplinary context. However, the inter-contextual understanding of democracy is still immature. This article presents a framework suitable for evaluating tools for e-democracy. The framework has been developed based on earlier theories and frameworks and then further evaluated against two test cases: Twitter and BottenAda. The evaluation model builds on the inclusion of different views of e-democracy, not seeing them as conflicting per se but rather making it possible for e-democracy tool users and developers to understand the varying degree of support a tool can display for several aspects of democracy. The model also provides a visualization of complex theories and can thus contribute to a more informed discussion on what types of democratic values are being supported in a particular e-democracy tool.

Keywords: e-democracy, democracy index, e-participation, e-service, open government, evaluation model

1. Introduction

The concept of e-democracy is complicated and connotes a variety of subjects, such as e-participation and open government. E-participation in itself represents a fragmented field of definitions, theories, and methods. Open government assumes many concepts that are inherently problematic in some respects, not least concerning the issues of representativeness where the relationships between the citizens and the state are far from uncomplicated. All this affects the variety of tools designed for e-democratic and e-governance purposes, and to navigate in this plethora it would be meaningful to have some kind of evaluation model to better understand the usability and properties of the available tools and underlying models. In this article, we propose how such a model can be designed. While doing this, we will nevertheless try to avoid the more fundamental discussion about the inner nature and the various general aspects of democracy, but rather try to elaborate on a kind of unifying and fairly open framework that we believe can be suitable for evaluating tools for e-democracy. Our underlying idea is to take an inclusive perspective aiming at being able to take very different views of e-democracy into account while not seeing them as conflicting per se. The idea is to make it possible for tool users and developers to understand the varying characteristics and degrees of support that are possible.

We exemplify how this can be carried out using a selected subset of properties being important for e-democracy in a very general sense. We also try to provide a visualization of different (even complex) theories and thus contribute to a more informed discussion of what types of democratic values are being supported in different e-democracy tools. However, the latter fact is not a limitation since our evaluation model can be applied to various subsets of democracy aspects in different contexts. This could, for example, contain only a few dimensions such as information quality and efficient distribution, or contain a significantly larger superset of attributes, such as flexibility in participation, reasonable voting possibilities, explanation and enlightenment, representativeness, agenda control, equality, inclusion, Internet access, anonymity, protection of privacy, transaction security, fraud detection mechanisms, depending on the circumstances and of the purposes of the tools investigated. There are thus no particular limitations to the model, neither regarding contexts nor component domains. The model can furthermore be used for handling hierarchies of attributes and can therefore be quite useful also in complex contexts.

The main contribution is a comparatively simple model used as the basis for a method for conceptualizing components supporting e-democracy as well as for the evaluation of how these dimensions can visually position different components of e-democracy. We also suggest how to use the model for evaluating tools to support participation and how tools for supporting e-democracy can then be measured in terms of the degree of support for the various components. This enables users to evaluate and hence select tools to support participation.

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2. Research Overview

It is somewhat unclear what a fully shared understanding of democratic participation in the information and communication technology (ICT) landscape would mean since it involves so many different research perspectives and practices. We refrain from scrutinizing the manifold of ideas that have been flourishing for many hundreds of years in the various sub-fields on structural, formal, and pragmatic aspects vs. ideological aspects, but a few comments are pertinent to understanding our aims with this article. Much of the e-democracy literature emphasize democratic rights and understanding through transparency. This is extensively discussed in, e.g., (Enenberg et al., 2017). Also, the earlier stages of policy design and design theory are of critical value in the processes, and some, such as Bellamy (2000), label this emphasis as the consumer model since it focuses on citizens as consumers of public services and their legal rights against the state. Others, such as Dahlberg (2011), argue that this is where most of the development of e-democracy takes place, i.e. in projects providing citizens with better services, increased accessibility, and information transparency. Or simply to improve government accountability and “customer service” through flexible information systems and more informed decision making. Especially in the areas of e-government and open government, transparency is emphasized and concepts such as interoperability and open data have to a large extent been dominating the scene (Hansson, 2015).

Another strongly interlinked part of e-democracy deals with e-participatory models. Many studies have discussed the effects of open government and e-participation, such as (Al-Jamal and Abu-Shanab, 2016) and some interesting spin-offs thereof, notably (Komendarova et al., 2018). There are several overviews of such models with a somewhat fragmented plethora of definitions, theories, and methods, see, e.g., (Susha and Grönlund, 2012). A more recent survey is provided in (Naranjo-Zolotov, Olivera, and Casteleyén, 2018). Further, (Porwol, Oja, and Breslin, 2018) provides state-of-the-art coverage of e-participation and discusses a set of requirements for Social Software Infrastructure (SSI) as well as an integrated model for e-participation. There are, of course, several issues involved here as well. For instance, (Hansson, Belkacem, and Enenberg, 2014) point out some shortcomings in the underlying concepts of democracy, in particular with issues concerning representativeness.

When it comes to tool support, most commonly used tools for e-participation, such as social platforms, music, photo, video sharing tools, and microblogs, are developed by the private sector. But there are also some examples of public sector projects aiming at making the sector more transparent, such as OpenCongress (Lee, 2014). There are, further, some more innovative projects, exemplified by Diplopedia (Cozzani, 2015), the US State Department’s wiki for Foreign Affairs information, Intellipedia, a joint information source for US Intelligence Agencies and Departments (Ben Eli and Hutchins, 2010), GCPedia, the Government of Canada’s wiki (Fyfe and Crookall, 2010), and MyUniversity (Mobini and Hansson, 2014) for educational settings. Other common categories include various wikis and community portals for collaboratively sharing information about local places. Here, the issue of validation is crucial and there is a range of possible improvements, not least when it comes to actual e-voting processes and tools such as data security, privacy, and counting auditability. There are also some platforms, notably Votem1 and Votewatcher2, that are using blockchain-based encryption.

How should these models and tools be categorised and analysed with respect to their intended use in a more general democracy setting and as participation-enabling instruments? The idea in this paper is to introduce a more elaborated index for this categorisation purpose. An index that can be used for visualising the various features included in the models and tools. Commonly used democracy indices, where Coppedge et al. (2017) provide an overview of different indices and their properties, are very similar from a mathematical perspective and many of them use variants of weighted averages based on questions or criteria sets, such as, e.g., the Economist’s Democracy Index (2019) or Freedom House3. Skaaning (2018) provides another overview of the current state of democracy indices with similar conclusions. The current indices seem to be unnecessarily simplified and can be improved considerably from an elicitation perspective to increase their granulation and adequacy. This is similar to the situation in the area of multi-criteria decision analysis, where (Ribacke, Danielson, and Ekenberg, 2012) provides a thorough overview of various issues involved, including some trade-off discussions. One crucial issue in practice is how to realistically elicit criteria weights (and also values) from

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users in such a way that they can provide information they understand the meaning of, since the elicitation of exact numbers demands an exactness which does rarely exist. We have therefore argued that ordinal or other imprecise importance (and preference) information could successfully be used for determining criteria weights (and values of entities). Surrogate weights (and values), which are derived from ordinal and cardinal importance (and value) information, could be very useful in the elicitation process (cf., e.g., Danielson and Ekenberg, 2016ab). In surrogate-number methods, the decision-maker provides information on the rank order of the criteria, i.e. supplies ordinal information on relative importance. Thereafter, the information is converted into numerical weights consistent with the extracted ordinal information. We will use the latter technique when constructing an index underlying the visualisation model discussed below. To better understand the feature of this index, we will first briefly discuss four aspects of democracy that will be used as underlying components in the index to illustrate the model. There are many more components that might and possibly should be included, but the inclusion of other aspects of relevance in a particular context can be analogously handled.

3. Aspects of Democracy

There are several important aspects of democracy and many of them concern societal decision-making processes. Central to those processes are transparency and individual autonomy, i.e. that there is a clear understanding of the pros and cons involved in the various issues on the agendas as well as the opportunity to freely discuss them and influence the results. Another important aspect is public participation in the sub-processes, such as the agenda-formation, consensus-building, discussions, and analyses as well as the actual voting procedures and the regulations around them. A broad pluralism and a diversity of conflicting perspectives on different levels seem furthermore to be of importance in the different phases during the process. In the following, we will use these democracy aspects to illustrate our model. More precisely, we will use four aspects of democracy to serve as positioning criteria in order to demonstrate the tool index that makes up the core of the paper. We could have selected a larger or a different set of criteria, but this would not have added anything to the explanatory strength of the presentation. A user of this indexing framework should select his or her own set of criteria to mirror the purpose and perspective applied. Since the main focus of this article is how to utilise the index and not to scrutinize the concept of democracy itself, four criteria seem to suffice to demonstrate the utility of the index approach without obfuscating the results with too much calculation details.

3.1 A Sample of Relevant Aspects

Transparency is an important aspect of democracy in general. Provided that there is governmental transparency, gathering information through autonomous actors makes information more easily available in the context of e-democracy. Another component, that can be facilitated by e-democracy tools, is citizen-to-citizen and citizen-to-government dialogues, enabling a bottom-up approach to information production and sharing where the public may participate.

Autonomy for the individual and the right to associate as well as to disassociate with communities is often considered as a basic democratic right (Bader, 2012). Micro-democratic processes in autonomous networks, what Dahlberg (2011) calls an autonomous-Marxist discourse, is also seen as a production principle where reciprocal relationships between equals replace a hierarchical workflow. This “cyber-democratic” model has sometimes been seen as one of the most radical changes to traditional democratic institutions (Päivärinta and Sæbø, 2006). Citizen dialogue is considered central, such as in SeeClickFix and FixMyStreet (Cantijoch, Galandini and Gibson, 2015; Szkuta, Pizzicannella, and Osimo, 2014) for identifying neighbourhood issues and in Ushahidi (Marsden, 2013) regarding how to collect eyewitness reports of violence.

The focus here is usually on improving the quality of citizens’ participation and involvement by using tools for collective decisions and/or information production to create and refine information and shared understanding: agenda-setting, arguing, deliberation, education, opinion-formation, and negotiating. Support tools for deliberative processes therefore also aim at structuring the decision situation and provide information regarding the alternatives and criteria involved (Danielson, Ekenberg, and Larsson, 2019). Deliberation can also be seen as a culture, a behaviour that needs to be established. This is, for example, the ambition of Regulationroom.org, an online experimental e-participation platform that aims to open up rulemaking processes in legislation by inviting the public to review new regulations (Farina et al., 2013).

An important feature of democracy is the tolerance and the existence of a plurality of values and identities. In an e-democracy context, this means the formation of a diversity of public spheres that develop their discourses.
in enclosed counter-publics (Dahlberg, 2011). This position focuses on how different interest groups are more actively involved in the formation of consensus. Components supporting pluralism should acknowledge diversity, inequality, and conflicts, and also support the establishment of counter-cultures, collective actions, community building, campaigning, contesting, organizing, and protesting.

### 3.2 A Map of Different Aspects of Democracy

We will now use the abovementioned sample positions and Päivärinta and Sæbø’s model for e-democracy (2006) to design a map illustrating how the different positions above are related to each other. The map uses the four positions shown in Figure 1.

**Transparency**: Components that support the sharing of data between agencies, government to citizens, and citizens to citizens, where the aim is better services, efficiency, and innovation: aggregating, competing, informing, petitioning, transacting, transmitting, voting, and controlling.

**Autonomy**: Components that support open-source cultures where participants typically collaborate motivated by peer recognition or other micro-rewards: networking, collaborating, distributing, and sharing.

**Consensus**: Components that support forms for collective decisions and information production to develop information and shared understanding: agenda-setting, arguing, deliberating, informing and educating, meeting, opinion-forming, reflecting, trade-off analysis, and negotiating.

**Pluralism**: Components that acknowledge and enable diversity, inequality, and conflicts. Support for establishing counter-cultures and collective actions: associating, campaigning, contesting, forming groups, community building, organizing, mediating, and protesting.

Organizing, community building, and group formation are placed close to pluralism since they are about organizing interest communities and thus creating the conditions for organizing around a diversity of perspectives and interests. Tools for networking and collaborating are placed in the autonomy corner as these tools focus on creating conditions for the individual to act autonomously and to have direct contact with other autonomous actors in different networks.

These positions are relative and oppose each other in the map for the purpose of making the model possible to visualize. If we place our four different aspects of democracy on a map of different foci of democracy, we obtain a map that can be helpful in discussing and identifying which kinds of democratic aspects that different types of e-democracy projects and components can support. Note that these particular four criteria and their roles within the paper are to demonstrate a general indexing method that should be adopted by the method users by incorporating appropriate criteria for the intended purpose. Below, we demonstrate how such a mapping can also lead to a categorisation of the tools by an index as a complement to and operationalization of the map itself.
4. Methodological Considerations

In general, elicitation efforts can be grouped into a) methods handling the outcome of an elicitation by precise numbers as representatives of the information elicited and b) methods instead handling the outcome by using less precise (interval-valued) information. But there are also other approaches, less reliant on high information precision on the part of the decision-maker while still aiming at non-interval representations.

Today’s commonly used democracy indices are very similar from a mathematical perspective. To gain an overview, we surveyed the usage of the terms democracy/dictatorship index, index of democracy, list of freedom index, and democracy ranking. In the indices we found, most use a weighted average based on questions or criteria sets, such as, e.g., in the Economist’s Democracy Index (2019) on electoral process and pluralism, civil liberties, the functioning of government, political participation and political culture, or thinner ones such as Freedom House. For instance, (Pirannejad, Janssen, and Rezaei, 2019) provides an overview of indices and suggest a weighted average model for e-participation. Most of the indices assess criteria weights using exact numbers. These methods range from relatively simple ones, such as direct rating and point allocation methods, to somewhat more advanced procedures. Generally, in these approaches, precise numerical values are assigned to criteria and performance values to represent the information extracted. There exist various weighting methods that utilise questioning procedures for elicitation, but the requirement for numeric precision in the input information is in any case problematic. This is because people’s beliefs are not naturally represented as numerically precise terms, cf., e.g., (Danielson, Ekenberg, and Riabacke, 2009; Ekenberg et al., 2009).

Therefore, our suggestion tries to accommodate these considerations and suggests a ranking method that goes beyond the commonly used scales also for rankings and where we have quite conservatively extended a purely ordinal scale approach with the possibility to supply cardinal information as well. The discrimination formula that we used is validated by simulation studies similar to (Barton and Barrett, 1996; Ahn and Park, 2008; Butler, Jia, and Dyer, 1996) that have become de facto standards for comparing weight methods relevant for cardinal ordering methods. The details of the validations can be found in (Danielson and Ekenberg, 2016ab).

To obtain an adequate sample set of tools to investigate, we have scanned the literature for groupings and established categories where tools are used in the context of e-democracy services. For each of these categories, we aimed at identifying instances currently used in e-democracy. In this categorization, we were inspired by the early work performed during the eParticipation Network of Excellence project Demo-net4 organized by the University of Koblenz. Wimmer (2007) identified three groups of tool categories that support democratic participation: i) core e-democracy tools, ii) ICT tools extensively used in e-democracy, and iii) basic ICT tools

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4 https://participedia.net/organization/316
needed in e-democracy. This is a categorisation that still makes sense. Using these categories, the group of core e-democracy tools consists of artefacts especially designed and used for e-democracy services while the other groups, ICT tools extensively used in e-democracy and ICT tools needed in e-democracy, consist of generic interfaces that are designed as multi-purpose e-tools but are being used primarily as e-democracy services.

We have also elicited categories of tools from papers that discuss types of tools concerning particular projects or experiments and from the analyses of specialized fields within e-democracy research. Examples include (Sabø, Rose, and Nyang, 2009), who discuss the role of Social Networking Services (SNS) in e-participation, and (Danielson et al., 2010) who discuss decision analysis in e-participation as a social process and sketches a basic architecture for an ICT system to support such processes.

5. Core E-democracy Tools and Their Indexation

We will now turn to the index and apply it to a set of e-democracy tools emanating from our survey. The index is constructed from cardinal orderings of properties and the relevant criteria under consideration. The orderings are then transformed to surrogate numbers that are aggregated to form the index for the respective tool. Table 1 shows some categories of tools of interest that were used as well as brief descriptions of them.

Table 1: Characterisations of some e-democracy tools

<table>
<thead>
<tr>
<th>Chat Rooms</th>
<th>Tools that support citizens in participating in real-time sessions. Can also be configured to support peer-to-peer communication.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Networks and Virtual Communities</td>
<td>Tools that facilitate communication, sharing resources, and other interaction activities such as gaming, between people who share a common interest.</td>
</tr>
<tr>
<td>Online Survey Tools</td>
<td>Tools that are web-based questionnaires where the public can submit responses online.</td>
</tr>
<tr>
<td>Deliberative Survey Tools and Deliberative Polls</td>
<td>Tools and polls that can be seen as a combination of traditional online survey tools but applied to focus groups where deliberation can take place.</td>
</tr>
<tr>
<td>E-consultation Tools</td>
<td>Tools that can be used by stakeholders to communicate and share information on specific issues, or get advice online, instead of meeting locally.</td>
</tr>
<tr>
<td>E-voting Tools</td>
<td>Systems that offer a secure environment for online voting.</td>
</tr>
<tr>
<td>E-petitions</td>
<td>Electronic lists where participants can sign up to support or protest against an issue.</td>
</tr>
<tr>
<td>Decision-Making Games</td>
<td>Games directed towards policy decision-making.</td>
</tr>
<tr>
<td>Internet-Based Decision Support</td>
<td>Computer-based systems used to retrieve data from the Internet and other sources and then to analyse this data.</td>
</tr>
<tr>
<td>Collaborative Environments</td>
<td>Systems that are used to support social interactions and collaboration.</td>
</tr>
<tr>
<td>Argument Visualization Tools</td>
<td>Software tools that use argument diagramming to analyse arguments.</td>
</tr>
<tr>
<td>Semantic Web Technologies</td>
<td>Technologies that support automatic extraction of semantic content.</td>
</tr>
</tbody>
</table>

5.1 Positioning Criteria

The following steps were undertaken to evaluate the degree of support of a tool relative to the four positioning criteria from Section 3:

Description and classification of a tool in terms of the categories in the survey.
- Measuring the tool in terms of an index defined in the next section and based on the four dimensions of e-democracy (transparency, autonomy, consensus, and pluralism) on a scale from where the tool displays no characteristics of any of the dimensions, to where the tool displays a maximum degree of the characteristics of all of the dimensions. In between, we could assert statements such as *The tool displays some characteristics of at least one of the dimensions or The tool displays characteristics of several of the dimensions.*

Note that tools can be measured under two interpretations, where the second one seems to be of more relevance in forming the index:
- The tool (or its managers/owners/manufacturers) itself claims that it supports a characteristic and no evidence contradicts this.
5.2 Modelling and Evaluation

We will now show how an index, a weighted average over the (in our example) four dimensions, can be constructed. The method takes into account that there are usually large uncertainties and vagueness involved when characterizing tools concerning these kinds of criteria. A general way to create an index is to stipulate a set of criteria and evaluate a set of entities for them. A value function could preferably be the additive model

\[ V(e) = \sum_{i=1}^{m} w_i v_i(e), \]

where \( V(e) \) is the overall value of an e-tool \( e \) that can be described by a set of values under multiple criteria. \( v_i(e) \) is then the value of the e-tool under criterion \( i \) and \( w_i \) is the weight of this criterion. In a few cases, the weights are (quite artificially) considered to be equal. Except for these cases, the criteria weights are critical components describing the significance of each criterion in the context under consideration.

One key characteristic is that there is more than one perspective under which we view the set of entities to be evaluated, and for each perspective the evaluator must assign values to each e-tool on some value scale. An even more general situation can be modelled like the tree in Figure 2 where the criteria are also allowed to have sub-criteria, a feature that is more seldom used but can nevertheless improve the granularity of the entities under consideration. (Danielson, Ekenberg, and Larsson, 2019) discusses this in detail.

![Figure 2: A multi-criteria tree with two criteria levels](image)

To express the relative importance of the criteria, weights are restricted by a normalisation constraint

\[ \sum_{i=1}^{m} w_i = 1, \]

where \( w_i \) denotes the weight of a criterion \( G_i \) and the weight of sub-criterion \( G_{jk} \) is denoted by \( w_{jk} \).

The value of e-tool \( E_i \) under sub-criterion \( G_{jk} \) is denoted by \( v_{ijk} \). Then the weighted overall value of an e-tool \( E_i \) (from the example in Figure 2) can be calculated by

\[ \sum_{j=1}^{2} w_j \sum_{k=1}^{2} w_{jk} v_{ijk}. \]

As we have discussed above, a practical issue is how to realistically elicit information from users. Ordinal or other imprecise importance (and preference) information could, for instance, be used for determining criteria weights (and values of entities). Many authors suggest using surrogate weights which are derived from ordinal importance information (cf., Danielson and Ekenberg, 2016ab). In such methods, the decision-maker provides information on the rank order of the criteria, i.e. supplies ordinal or cardinal information on importance, and thereafter this information is converted into numerical weights consistent with the extracted information.

5.3 CAR Weights and Values

A straightforward and robust method for cardinal ranking is CAR, which extends the idea of surrogate weights as one of the main components. The idea is to obtain information about how much more or less important the criteria are compared to each other.

In the following, we use \( > \) to denote the strength (cardinality) of the rankings between criteria and values respectively, where \( \geq 0 \) is the equal ranking operator ‘=’. Assume that we have a user induced ordering of criteria
weights \( w_1 \geq \ldots \geq w_n \). Then we construct a new ordering, containing only the symbols = and \( \geq \), by introducing auxiliary variables \( w_{ij} \) and substituting

\[
\begin{align*}
\text{w}_k & > 0 \ 	ext{w}_{k+1} \text{ with } \text{w}_k = \text{w}_{k+1} \\
\text{w}_k & > 1 \ 	ext{w}_{k+1} \text{ with } \text{w}_k > \text{w}_{k+1} \\
\text{w}_k & > 2 \ 	ext{w}_{k+1} \text{ with } \text{w}_k > x_{k_i} > \text{w}_{k+1} \\
\ldots \\
\text{w}_k & > i \ 	ext{w}_{k+1} \text{ with } \text{w}_k > x_{k_i} \ldots > x_{k_{i-1}} > \text{w}_{k+1}
\end{align*}
\]

(1)

and analogously for the values. In this way, we obtain a computationally meaningful way of representing preference weight and value strengths.

To see how this works, consider the cardinality expressions as distance steps on an importance scale. The number of steps corresponds straightforwardly to the strength of the cardinal relations above such that \( \geq \) means \( i \) steps. The statements are then converted into weights. This is explained in detail in (Danielsson and Ekenberg, 2016b), where also the performance of a set of cardinal weights are compared to ordinal weights. In this paper, we use the SR (Sum-Reciprocal) weights of the aforementioned article. Then the cardinal ranking weights \( w_i^{CAR} \) are found by the weight formula

\[
w_i^{CAR} = \frac{1}{\sum_{j=1}^{N} \left( \frac{Q+1-p(j)^{i}}{Q} \right)}.
\]

which are effortlessly calculated by, e.g., a spreadsheet program. The values (assessments) of the various e-democracy tools under each criterion are elicited in a way similar to the weights. For each criterion in turn, each tool is ranked relative to a base (zero) tool depending on how well it performs in the particular dimension under consideration. As an example, consider Transparency. In Figure 3, some tools (A-E) are compared to the zero tool (a base tool with almost no useful capabilities in the dimension considered).

![Figure 3: Tools assessed under the Transparency criterion](image)

The positions on the ranking ruler in Figure 3 are then converted into rankings on the \( > i \) format. Each tool is assigned a ranking symbol \( > i \) in which the integer \( i \) represents the number of steps the tool is away from the zero tool base. For example, Tool D is represented by \( > 2 \) under the criterion Transparency. This scoring is repeated for each of the criteria being measured, in this example four. Thus, we obtain four rankings, one along each of the criteria. For Tool D, this might have yielded Transparency: \( > 2 \); Autonomy: \( > 1 \); Consensus: \( > 2 \); and Plurality: \( > 2 \). Only Transparency: \( > 2 \) is shown in the figure but the others would have been measured on similar scales for the other three perspectives. Tables 2 and 3 contain two real-world examples scored along the four dimensions in question.

Thereafter, a weighted overall value is calculated by multiplying the centroid of the weight simplex (i.e. the numbers best representing the weight relations, given by the CAR weight formula above) with the centroid of the e-tool value simplex (again, the numbers that best represents the value relations on rules such as in Figure 3). This can be pictured as obtaining a kind of “mean value” best representing the assessment of the e-tool. Thus, given a set of criteria in a (one-level) criteria hierarchy, \( G_1, \ldots, G_n \) and a set of e-tools \( a_1, \ldots, a_m \). A general value function \( U \) using additive value functions is then

\[
U(a_i) = \prod_{i=1}^{n} w_i^{CAR} v_i^{CAR}
\]
where $w_i^{CAR}$ is the weight representing the relative importance of attribute $G_i$, and $v_{ij}^{CAR}$: $a_j \rightarrow [0,1]$ is the increasing individual value function of $a_j$ under criterion $G_i$ obtained by the following procedure. As seen in the figure, for each criterion (i.e. characteristic), the integers $k$ in the statements $>k$ are interpreted as the values being $k$ steps away from the zero tool. Each step is represented on the criterion’s local value scale as $\alpha \cdot k$, where $\alpha$ is the scaling constant for the index. The scaling constant is determined by $\alpha = d/s$, where $d$ is the desired target for the average of the indices and $s$ is the expected average number of steps in the $>k$ symbols used. Again, this is straightforwardly calculated in a spreadsheet.

Thus, the $U(a_j)$ expression is subject to the constraints in the polytopes of weights and values. This means that the feasible values are the ones in the extended polytopes defined by (1) above. Now, we define the weighted value

$$U(a_j) = \sum_{i=1}^{n} w_i \cdot v_{ij}$$

as a general result value, where $\bar{w}_i$ is the centroid component of criteria weight $w_i$ in the weight simplex and $\bar{v}_{ij}$ is the centroid component of the value of e-tool $a_j$ under criterion $G_i$ in the simplex of values. Since we only consider non-interval valued results, the centroid is the most representative single number of a polytope, thus reducing the operation to a sum of multiplied factors $w_i$ and $v_{ij}$.

The criteria (in our example, the four characteristics transparency, autonomy, consensus, and pluralism, but more generally any set of e-democracy aspects) are then measured and weighted into an index reflecting the degree of fulfilment of the characteristics. The result will be a ranking of all the tools under consideration under each of the four criteria in relation to the zero tool. Thereafter, the criteria are ranked according to the method described above. The values and weights are then aggregated into a weighted value $U(a_j)$ and where finally the resulting index $I(a_j)$ is $U(a_j)$ rounded to the nearest integer value. The scale and measurements involved can be made even more realistic by, e.g., utilizing sub-criteria as well as more complex assessments, in terms of mixtures and comparisons and interval statements as well as distributions, along the lines of, e.g., (Danielson and Ekenberg, 2019). How this works in practice will be demonstrated in the next section.

6. Some Examples of Components of the Positioning Criteria

We will now map some tools according to the index being used. As above, we will use the criteria transparency, autonomy, consensus, and pluralism. Tables 2 and 3 show, respectively, the analyses for municipality chat rooms and political discussion boards.

<table>
<thead>
<tr>
<th>Table 2: Analysis of Municipality Chat Rooms</th>
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</thead>
<tbody>
<tr>
<td><strong>Grading</strong></td>
</tr>
<tr>
<td>Transparency: $&gt; 0$</td>
</tr>
<tr>
<td>Autonomy: $&gt; 0$</td>
</tr>
<tr>
<td>Consensus: $&gt; 2$</td>
</tr>
<tr>
<td>Pluralism: $&gt; 1$</td>
</tr>
</tbody>
</table>
Table 3: Analysis of Political Discussion Boards

<table>
<thead>
<tr>
<th>Grading</th>
<th>Motivations for grading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transparency: $&gt;0$</td>
<td>The reviewed (and probably most) discussion boards are unaffiliated with decision-makers.</td>
</tr>
<tr>
<td></td>
<td>However, political agendas, suggestions, or rulings can be discussed on discussion boards and information on issues can be shared. Due to the lack of affiliation with decision-makers, discussion boards only show weak support for transparency.</td>
</tr>
<tr>
<td>Autonomy: $&gt;2$</td>
<td>Discussion boards let their participants form collaborations and posts and especially frequent posters get peer recognition.</td>
</tr>
<tr>
<td>Consensus: $&gt;1$</td>
<td>As the political discussion boards are not affiliated to any political parties they do not have much impact on decision making in communities, but they do support creating a shared understanding of political issues. Therefore, the reviewed political discussion boards do only provide weak support for consensus.</td>
</tr>
<tr>
<td>Pluralism: $&gt;2$</td>
<td>Political discussion boards let their users easily form counter-communities and create collective actions. The boards strongly support pluralism.</td>
</tr>
</tbody>
</table>

First, we need a scale for the analyses. Assume that we desire the indices to be around 20 on average and that we expect an average $k$ of about 1.2 for the $>k$ statements. Then we obtain a scaling constant $\alpha = 20/1.2 = 16.7$. (The particular scale does not matter and any linear transformation of this one would do.) Utilising the transformations described in the previous section, this results in the following assessments:

The components of Municipality Chat Rooms ($a_1$) are assigned the following surrogate numbers: Transparency: $v_{12} = 0.0$; Autonomy: $v_{14} = 0.0$; Consensus: $v_{11} = 33.3$; Pluralism: $v_{13} = 16.7$.

And for Political Discussion Boards ($a_2$): Transparency: $v_{22} = 0.0$; Autonomy: $v_{24} = 33.3$; Consensus: $v_{21} = 16.7$; Pluralism: $v_{23} = 33.3$.

Further assume that we establish a ranking of the importance of the characteristics, for example Transparency $>1$ Pluralism $>0$ Autonomy $>2$ Consensus, resulting in the following weights: $w(\text{Transparency}) = 0.40$; $w(\text{Pluralism}) = w(\text{Autonomy}) = 0.25$; $w(\text{Consensus}) = 0.10$.

Note that these values are not simply assigned but a consequence of the asserted ranking and the derived characteristic weights. Consequently, the ranking then yields the indices $I(a)$ by

$$
\tilde{U}(a) = \sum_{j=1}^{n} w_j v_j
$$

as the sum of products $w_j v_j$ and then $I(a)$ as $U(a)$ rounded to the nearest integer.

The result is that Municipality Chat Rooms receive an index $I(a_1) = 17$ and that Political Discussion Boards receive $I(a_2) = 18$.

One issue concerning the use of e-democracy tools such as the above ones is that a tool is not always used as intended – if we by intended mean increasing e-democracy or the participation in e-democratic processes. Just using a tool that in our analysis displays high support for information dissemination may not in the end increase e-democracy per se – it might simply be used to disseminate information to a target population for good and for bad. A tool is not inherently democratic or non-democratic, but in our model we analyse the potential of using these tools to support components that are usually mentioned in the literature as useful and beneficial for e-democracy (as was discussed in the literature overview above).

The example continues with two more specific e-tools:

6.1 Analysis: BottenAda

BottenAda was a software that used Bayesian statistics to try to predict the election results in Sweden in 2014.

Transparency: BottenAda supports transparency in that it visualizes the strengths of parties and coalitions of parties based on polls of polls and Bayesian analysis. By showing the likelihood of, for example, a certain party’s ability to take seats in the government, it lets potential voters make more informed and/or tactical decisions on which party to support. Measure: $>2$
Autonomy: BottenAda does not support networking, collaborating, distributing, or sharing among users. Measure: \( \geq 0 \)

Consensus: BottenAda does not support Consensus per se since it only provides information on parties and coalitions rather than issues to reach consensus, without the possibility to have discussions or reach consensus on specific issues. Measure: \( \geq 0 \)

Pluralism: BottenAda does not support pluralism in more than it recognizes the probable percent of votes for different parties. It does not cover different ideas or issues in its scope, and it does not support collective actions Measure: \( \geq 0 \)

6.2 Analysis: Twitter

Twitter is a very well-known online social networking service where a user can post short messages, so-called “tweets”, iterate others’ messages, and interact.

Transparency: Twitter does not explicitly support forms sharing of data between agencies, government to citizens, and citizens to citizens, where the aim is better service, efficiency, and innovation: aggregating, competing, informing, petitioning, transacting, transmitting, voting, controlling. Implicitly it supports the aim of informing. Measure: \( \geq 0 \)

Autonomy: Twitter supports forms for open-source cultures where participants typically collaborate motivated by peer recognition or other micro-rewards: networking, collaborating, distributing, and sharing. Measure: \( > 2 \)

Consensus: Twitter does not explicitly support forms for collective decision-making or information production. Implicitly it supports some of the aspects of shared understanding, namely: opinion-forming, arguing, and agenda-setting. Measure: \( > 1 \)

Pluralism: Twitter supports or enables activities that acknowledge diversity, inequality, and conflicts. There is some support for establishing counter-cultures and collective actions: associating, campaigning, contesting, forming groups, community building, organizing, mediating, and protesting. Measure: \( > 1 \)

Adopting the same characteristic weights as in the example above, we obtain the indices \( l(BottenAda) = 8 \) and \( l(Twitter) = 14 \).

Similarly, various other tools can be evaluated and positioned with respect either to the strengths of the respective characteristics (such as those in Figure 1) or to the aggregated measure discussed above where also the relative importance of the characteristics can be taken into account.

For a practitioner to use an indexing method like this, a relevant set of criteria for the purpose intended has to be selected, defined, and described. Then for each participating e-democracy tool, it needs to be measured and evaluated on a scale as in Figure 3, comparing it to a base or zero tool with almost no capabilities in the dimension under consideration. The results of the comparisons can be illustrated on an index scale as shown in Figure 4. For the actual implementation, a spreadsheet should be sufficient. It could easily hold the computational formulas, thus hiding them in everyday use and eliminate the risk of making errors that could arise if performing the calculations manually.

Note that Figure 4 aims only at illustrating the methodology with a broad coverage of tools. To give a more precise picture, a much more detailed analysis would be required, which is beyond the scope of this article.

Some other dimensions (or criteria) could be valuable in such evaluations. For example, criteria for usability could be employed. It is important for the practical use of a tool that it is reasonably well-designed when it comes to the usability and accessibility of the user interface (UI). If usability is to be considered, one way of measuring the success of the UI in that respect would be to consider its affordance, i.e. how well its functionality could be inferred from the interface that it presents to the prospective intended users, some or many of which might not be extensive everyday computer users. Affordance theory, while introduced by (Gibson, 1977), has among computer scientists and computer tool designers become widely spread as a concept by (Norman, 2013).
A dimension of affordance could easily be added to the framework, as could many others depending on which goals are being set by the index makers.

Figure 4: Example of how various types of tools can be positioned on a mapping of e-democracy to an index

7. Concluding Remarks

Democracy is a multi-faceted concept and evaluating ICT tools for enhancing democracy along only one dimension can be misleading since all aspects, relevant for the context under consideration, should preferably be considered. We have, therefore, suggested an e-democracy indexing and mapping technique which is a functional approach to evaluating e-democracy tool support while taking various aspects of democracy and analysing the concept with respect to a set of dimensions. The point of departure for the exemplification in this paper has been four different aspects of democracy (transparency, autonomy, consensus, and pluralism) and for each aspect, several components needed for support of e-democracy have been identified.

The comparatively simple model has then been used as the basis for a method for conceptualizing components supporting e-democracy as well as for evaluation. The model makes use of the aspects and it is demonstrated how these dimensions can visually position different components of e-democracy. We have also suggested how to use the model for evaluating tools to support participation in these contexts and how tools for supporting e-democracy can then be measured in terms of the degree of support for the various components (aspects). If we would want to extend the geometric representation, more dimensions could be introduced and handled analogously. For instance, a three-dimensional picture showing a constrained local locus to a global one without clear boundaries could be introduced. With locus we mean whether it is a locally constrained situation (such as the citizens in a nation-state) or if the locus is more fluid and unlimited (as in the environmental movement where almost everyone that has an interest in environmental issues can take part). The index itself is insensitive to the number of dimensions but the geometrical representation becomes problematic, although it can still be made meaningful by using projections onto subspaces. In any case, the framework can support interdisciplinarity and communication with a diversity of stakeholders in a highly multidisciplinary development context. Depending on the goals, the e-democracy map can be used to assess and choose a tool to be used to meet those goals. The model can also be used as a way to reflect on if a tool can be enhanced in some way, or to see which democracy aspects a portfolio of tools is covering.

Several roads of improvement of the work are conceivable. Firstly, the scoring process in terms of how measurements are assigned to e-tools could be tuned in several ways. A first step could be to test the reliability of the assigned values by letting larger groups of researchers and practitioners redo the scoring of the samples analysed in this paper (i.e. Municipality Chat Rooms, Political Discussion Boards, BottenAda, and Twitter) and other similar tools. Another aspect concerns the normalisation of the obtained results, i.e. the scores could be weighted in order to indicate that some analysed aspects are considered to be more important than others. The framework is open by design and can easily be combined with various existing multi-criteria decision tools and tools for conflict detection and resolutions of different complexities to form a more powerful toolset. Another natural extension is to allow for a richer variety of statements, for which there exist methods within the area of multi-criteria decision making.
The evaluation model builds on the inclusion of different views of e-democracy, not seeing them as conflicting per se but rather making it possible for e-democracy tool users and developers to understand the varying degree of support a tool can display for several aspects of democracy. The model also provides a visualization of complex theories and can thus contribute to a more informed discussion on what types of democratic values are being supported in a particular e-democracy tool.

Acknowledgements

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Editorial for EJEG Volume 18 Issue 1, 2020

It is with great pleasure, but also with mixed feelings, that I write this editorial. The pleasure is due to having 6 full research papers from very different contexts (West-Indies, Saudi-Arabia, UK, Sweden and Estonia), both empirical and conceptual on very different issues, including Internet voting, social media and citizen satisfaction, sustainable e-government, methods for studying electronic government, public procurement, and e-democracy. The mixed feelings are due to the fact that EJEG will become dormant for an undecided period.

In the first paper, Lloyd G. Waller and his co-authors Nichola Satchell, Gavin Daley and Damion Gordon from University of West-Indies, explore the relationship between Internet voting and youth political participation in the Jamaican society through a survey of 600 youngsters. Their findings suggest that Internet voting may not substantially reduce apathy, as under-participation is often a symptom of deeper problems or conditions that cannot be resolved solely by the introduction of ICT. Still Internet voting holds the potential to improve voter turnout.

The second paper examines the relation between municipalities social media performance and citizen satisfaction. The authors, Irene Bernhard and her colleagues from University West in Sweden, use secondary data on citizen satisfaction from official Swedish statistics, and apply a Facebook performance index developed by a Swedish company. Through calculation partial correlation coefficient, they find correlation between municipalities’ Facebook performance and citizen’s satisfaction with living in the municipality and with the service provision.

Sulaiman Aljarallah and Russel Lock from Loughborough University, UK has authored the third paper which titles: “An investigation into Sustainable E-Government in Saudi Arabia”. They find that the term sustainable e-government is defined in an over-simplified and too generic way. Based on survey data from Saudi Arabia, they find that users pay significant attention to social sustainability, with trust, security and usability being top ranked, but less to economic and environmental sustainability. The study affirms the importance of cooperation between software development departments and government agencies during design and implementation of e-government, and shows the importance of sustainability for e-government success.

Keegan McBride and Dirk Draheim from Tallin University of Technology in Estonia have authored a conceptual paper on “Complex Adaptive Systems and Electronic Government”. They argue that the phenomena EG scholars study are complex, and hence propose adopting an approach based around complexity theory and complex adaptive systems (CAS). The paper aims to provide the initial foundation for application of CAS.

Deepak Saxena and Joe McDonagh, both from Trinity College in Ireland, have authored: “Exploring enterprise information systems procurement in public service organisations”. They find that the majority of Enterprise Information Systems (EIS) research is on implementation, with relatively little work on the pre-implementation, including the procurement. The authors did a retrospective study of three instances of EIS procurement in one public service organisation in UK. Through a processual analysis, they find that decision-making it is not a rational and linear process, but rather a multi-level process where factors from the work system and the larger macrosocial level play a crucial role in influencing decisions at the organisational level.

In the final paper Mats Danielson and Love Ekenberg from Stockholm University, and International Institute for Applied Systems Analysis in Austria, have developed a framework for evaluating tools for E-democracy. This is based on earlier theories and frameworks, and is evaluated against two test cases. The framework is generic and can be applied for evaluating what types of democratic values are being supported in particular e-democracy tools, and for actually selecting a tool.

The editor,
Dr Carl Erik Moe
Exploring Enterprise Information Systems Procurement in Public Service Organisations

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Abstract: Enterprise Information Systems (EIS) are often used by organisations to automate and integrate their business processes to create value and efficiency. However, the majority of EIS research is centred on the implementation phase with relatively little work on the pre-implementation phase. Another gap in the existing literature is that it usually ignores the wider institutional context when determining the generalisability of research findings. This study focuses on the procurement process and analyses three instances of EIS procurement in a public service organisation. The data collection is conducted using a socio-technical systems framework embedded within a case study methodology. Narrative analysis with a processual lens is used as an analytical tool in this study. In contrast to the existing conception of the procurement process as a completely rational and linear decision-making process, our findings explain it as a multi-level process where factors from the work-system and the macrosocial level play a crucial role in influencing the decisions at the organisational level. Technological imperative (work-system level) and business case (organisation level) are found to be critical factors in EIS procurement, in line with previous findings. However, the findings suggest a greater role of the macrosocial factors – EIS market, EIS vendor, and the institutional context. This study also notes the demonstrative nature of certain elements of the EIS procurement process in public service organisations. Thus, this study brings out the complexity and contextual nature of EIS procurement in public service organisations by demonstrating the interplay of factors operating at the work-system, organisational, and macrosocial levels.

Keywords: enterprise information system, EIS, procurement, acquisition, socio-technical systems

1. Introduction

Enterprise Information Systems (EIS) may be defined as complex and large information systems that “integrate and streamline business processes across various functional departments/areas” (Hsieh and Wang, 2007, p. 216) in an organisation. EIS, such as Enterprise Resource Planning systems, are increasingly being deployed by public service organisations to further the goal of digital transformation. However, a major research gap in existing literature is that the majority of EIS research belongs to the implementation phase (Esteves and Pastor, 2001; Esteves and Bohorquez, 2007; Eden, Sedera and Tan, 2012; Saxena and McDonagh, 2017) with relatively less attention given to other phases. Therefore, there have been calls for conducting research on the pre-implementation (Howcroft and Light, 2006; Pollock and Williams, 2007) and the post-implementation (Wagner, Newell and Piccoli, 2010) phases. Another gap in existing research is that it usually ignores the wider institutional context (Avergou, 2001; Currie, 2009) and generalises findings to all types of organisations, thereby lacking a context-aware perspective (Howcroft, Newell and Wagner, 2004). The crucial role of the institutional context is especially evident in the case of public service organisations which, due to their unique institutional setting, need to fulfil some context-specific requirements (Martinekki, Aaltosen and Walker, 2019; Moe, Newman and Sein, 2017) during EIS procurement and implementation. Considering the increasing focus of governments towards digital transformation of public services (Curtis, 2019), more research is required in this domain to increase our understanding of EIS procurement in a public service context.

The research question for this study is: how does the EIS procurement process unfold in a public service organisation and what are the influencing factors? To answer the question, this study presents a process-oriented socio-technical case study based on three instances of EIS procurement in a public service organisation. The case method is used since the study was conducted in a real-world context where the researcher has limited control over unfolding events (Yin, 2017). The process-oriented perspective allowed us to focus on the sequence of events unfolding over time (Pentland, 1999; Pettigrew, 1997) to search for patterns (Langley et al., 2013; Pettigrew, Woodman and Cameron, 2001) across multiples instances of EIS procurement. Finally, the inclusion of the sociotechnical systems (STS) framework not only supported the examination of the social and the technical (Robey, Anderson and Raymond, 2013), but also helped in presenting a contextual perspective due to inclusion of the macrosocial level (Avergou, 2001, 2019; Trist, 1981; Winter et al., 2014).

The remainder of the paper is structured as follows. Section 2 presents the literature review associated with EIS procurement. Section 3 provides the justification for and outlines the research methodology employed in this study, along with a short description of the case study organisation. The narrative analysis of the procurement process is presented in Section 4. Section 5 presents a socio-technical understanding of EIS procurement in public service organisations and discusses it in light of existing literature. Finally, section six concludes the paper and notes the implications and the limitations of the study.

2. Literature review

In this study, we refrain from subscribing to any specific model of the procurement process and rely on the empirical case study to develop a socio-technical understanding of the EIS procurement process in public service organisations. Based on the literature review, the EIS procurement process may be viewed as a result of two interrelated processes – technical-managerial and socio-political (Figure 1).

![Figure 1: EIS procurement as a technical-managerial and a socio-political process](image)

While EIS lifecycle models (e.g. Markus and Tanis, 2000) often present procurement/adoption/acquisition as one single phase, Verville and Haltingen (2003) divide EIS acquisition process into six distinctive and interrelated stages – planning, information search, selection, evaluation, choice, and negotiations. However, irrespective of the number of stages, such models essentially subscribe to a technical-managerial philosophy and present EIS procurement as a linear decision-making process within the organisational boundaries (Howcroft and Light, 2010), what Winter et al. (2014) call a ‘container’ approach.

During the early stages of procurement, the organisation becomes aware of the possibility of adopting an off-the-shelf EIS as against developing a bespoke information system. Perceived or expected benefits are usually listed by the organisations as motivations/justifications (Bwalya and Healy, 2010; Oliver and Romm, 2002; Poba-Nzaou et al., 2014) for the EIS adoption decision. System-related justifications relate to system aspects such as dissatisfaction with the existing system, maintainability of the existing system, systems modernisation, integration of IT systems, improvement in IT infrastructure, and improved information access across organisations. Process-related justifications relate to business process aspect of the organisations. These include standardisation and integration of administrative processes, improvement in administrative data accuracy, and improvement in effectiveness of administrative processes. Strategy-related justifications relate to long-term strategy associated with the EIS adoption. These include organisational vision of integration, business considerations, improvement in service quality, supporting organisation growth, and compliance with laws and regulations.

Once the business case is accepted, organisations engage in evaluating diverse EIS packages. In this stream of research (e.g. Gürbüz, Alptekin and Alptekin, 2012; Kilic, Zaim and Delen, 2015), scholars try to isolate selection criteria and to devise algorithms for selecting the ‘best’ EIS for the organisation. In most cases, these criteria are drawn from the justifications/motivations presented earlier. System-related criteria relate to features of the EIS software such as software functionality, system reliability, compatibility with existing systems, ability of cross-module integration, underlying technology standards and protocols, compliance to international standards, ease of use, ease of customisation, maintainability of the system, and security.
Business-related criteria usually flow from the business case put forward during the adoption phase and include business related aspects such as business vision, brand image, market position, better fit with organisational structure, fit with parent/allied EIS, prevalent EIS in the same industry, and fit with business processes. Vendor related criteria primarily relate to project cost. The cost considerations include hardware, software and network cost, license cost, consultancy cost, user training cost, and support and maintenance cost. Other vendor related criteria include vendor’s market position, vendor’s domain knowledge, vendor and product reputation, adequacy of consultants, and quality of after-sales service.

While the literature discussed so far exhibits a technical-managerial orientation, another interpretation of EIS procurement rejects the notion of completely rational procurement processes and offers a socio-political view. This view rests upon two main arguments. The first argument focuses on the fluid nature of the organisation’s requirements and the EIS package. The requirements of the organisation may be unclear or continually emerging (Cox, Roberts and Walton, 2012; Howcroft and Light, 2010), and different units may present differing and competing sets of requirements (Berente et al., 2019; Matinheikki, Aaltosen and Walker, 2019) for an EIS package. Similarly, although the EIS package is often portrayed by vendors as a comprehensive and complete solution, scholars (Gosain, 2004; Pollock and Cornford, 2004) argue that an EIS is usually a work-in-progress which is in constant development and should be viewed in more fluid terms. Due to the opaque nature of the EIS architecture, the precise characteristics of an EIS are difficult to ascertain (Entwistle and Light, 2008; Moe and Päivärinta, 2013; Pollock and Williams, 2007) without actually implementing it. Although adopters may visit reference sites, such sites may not be completely similar to the adopting organisation (Entwistle and Light, 2008; Pollock and Williams, 2007). The second argument in this strand speaks to the social and political nature of the acquisition process. Even if one may accept the notion of the EIS as a static system, the same technology may be evaluated differently by different social groups in the organisation (Berente et al., 2019; Cox, Roberts and Walton, 2012; Saxena and McDonagh, 2016). The formal evaluation process may not occur at all or it may be conducted only to support a pre-determined decision arrived at based on politics between senior management, IT managers, vendors, consultants, and end-users (Howcroft and Light, 2006, 2010). Further complicating the matter, there might be multiple institutional logics (Berente, Gal and Yoo, 2010; Berente et al., 2019; Matinheikki, Aaltosen and Walker, 2019) operating in public service organisations, making it difficult to form a universally accepted view of the procurement process.

Reconciling the technical-managerial and socio-political view of the EIS acquisition process, Pollock and Williams (2007) argue that although the packaged software procurement process is influenced by social factors, organisations do not completely do away with the rational evaluation process. As Moe, Newman and Sein (2017) demonstrate, the public procurement process can be understood more as a dialectic between the two. In other words, although the procurement process is not smooth and linear as suggested by the technical-managerial strand, organisations still try to rationalise and formalise the decision-making. To paraphrase Tingling & Parent (2004) – processes of rationality, organisational structures, and processes of legitimisation – all have an impact on the procurement decision. Hence, in this research we adopt a socio-technical perspective to examine all relevant factors influencing the procurement process.

3. Research methodology

To answer the research question (how does the EIS procurement process unfold in a public service organisation and what are the influencing factors?), we adopted a multi-level qualitative case study involving retrospective and real-time processual analysis (Leonard-Barton, 1990; Pettigrew, 1990). Since the research question is of the ‘how’ type, and we wanted to conduct research in the real-world context (Yin, 2017), we opted for a case study methodology. Since we were analysing multiple instances of EIS procurement, process tracing (George and Bennett, 2005) was a major goal of the case study and there was a search for patterns (Pettigrew, 1997; Pettigrew, Woodward and Cameron, 2001) across process instances. Finally, an STS framework was included as a theoretical lens in the case study since it allows for the incorporation of the macrosocial context (Aupperle, 2001, 2019; Trist, 1981), thereby moving beyond a ‘container’ approach (Winter et al., 2014).

The case organisation is a Blood Service Organisation (BSO, a pseudonym) engaged in the processing of blood and associated products. BSO belongs to the public sector of one of the parliamentary democracies from Western Europe. Although constituted as a self-financed public service body, BSO requires the approval of its parent government department for major capital investment, including strategic information systems procurements. Due to the key requirement of traceability, the blood bank industry is information intensive.
Therefore, BSO engaged in three instances of a Blood Bank System (BBS) procurement and implementation between 1999-2015. The case was considered ideal in terms of presenting an opportunity to look for patterns (Langley, 1999; Langley et al., 2013; Pentland, 1999; Pettigrew, 1997; Pettigrew, Woodman and Cameron, 2001) across three instances and to explore the influence of one instance on subsequent ones (Pollock and Williams, 2009; Williams and Pollock, 2012).

Figure 2: Research methodology used in the study

Figure 2 illustrates the research methodology used in this study. Data collection for the study commenced with secondary data collection (Table 1). Secondary data included documentation made publicly available by the case organisation as well as other public agencies. Some project documentation was also provided by the case organisation. We performed a preliminary analysis of the secondary data before conducting the interviews. Analysis of the documents served three purposes. First, it enabled us to arrive at a detailed chronology of events. Second, it guided us towards identification of key actors as interview participants. Finally, it also sensitised us towards certain aspects around which interview questions could be framed.

Table 1: Classification of secondary data collection

<table>
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<tr>
<th>Corresponding level (Trist, 1981)</th>
<th>Secondary data collected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macrosocial</td>
<td>Reports from the public auditor, debates of parliamentary committee, reports by other commissions</td>
</tr>
<tr>
<td>Organisational</td>
<td>Annual reports, board meeting minutes, strategic plans</td>
</tr>
<tr>
<td>Work-system</td>
<td>User requirement specifications, project audit</td>
</tr>
</tbody>
</table>

Primary data collection consisted of in-depth qualitative interviews with the participants identified based on the secondary documents. To ensure internal generalisation, we interviewed participants from top management, implementation team (with members drawn from IT and business), and user groups. Furthermore, we also asked participants if they would recommend additional key actors to be interviewed. We took special care in balancing the affiliation in terms of top management team, project team, and user groups in order to increase internal generalisation. In total, we conducted 24 interviews with 25 participants (one interview had two participants) which amounted to 1312 minutes averaging to 54.6 minutes per interview. All but three interviews were recorded and transcribed verbatim by the first author. Detailed notes were taken during the three interviews for which the recording was not permitted. Table 2 presents the interview participants’ profile. In the paper, interview participants are referred to as P1, P2, P3 and so on along with their affiliation as noted in the table.

Table 2: Profile of interview participants.

<table>
<thead>
<tr>
<th>Participant’s Primary Affiliation</th>
<th>No. of Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top Management Team (TMT)</td>
<td>6</td>
</tr>
<tr>
<td>Project Team (PT)</td>
<td>8</td>
</tr>
<tr>
<td>User Groups (UG)</td>
<td>11</td>
</tr>
</tbody>
</table>

To ensure consistency with the STS framework, the interview schedule included questions related to the project (work-system), organisational, and the external context (macrosocial level). However, instead of following a fixed structure, the responsive interviewing method (Rubin and Rubin, 2011) was followed in which subsequent questions are asked based on a participant’s initial responses. Once the data was collected, a descriptive case narrative was written describing the events, structure and context. The strategy of temporal bracketing (Langley, 1999) was used to write the case narrative. For this purpose, the key events at all three levels (macrosocial, organisation, and work-system) were identified across the timeline (1999-2015). Subsequently, the event-sequence and related interconnections were identified (as presented in Section 4).
In this study, the narrative was not merely used as a description tool but also served as an analytical device (Cloutier and Langley, 2020) for identifying underlying structures in processual analysis. Narrative analysis was chosen over other analytical methods since the processual analysis that draws on narrative data is considered “particularly close to the phenomena” (Pentland, 1999 p.712) it seeks to explain. This essentially reflects a ‘theory as narrative’ view (DiMaggio, 1995) in which an explanation is viewed as a story describing the sequence of events, connecting the cause with effects. Once the narrative was complete, further analysis involved examining and explaining the narrative based on the patterns (Langley et al., 2013; Pettigrew, Woodman and Cameron, 2001; Pentland, 1999) observed across EIS procurement instances and explaining the sequence of events. The focus was on developing an explanatory framework (Cloutier and Langley, 2020) that moves beyond the description and provides an explanation of unfolding events within a well-defined context (Avgerou, 2019). The resultant explanatory framework is presented in section 5 in the form of a socio-technical understanding of the procurement process in a public service organisation.

4. Narrating the sequence of events

Figure 3 illustrates the sequence of events in the case study. Following Langley’s (1999) strategy of temporal bracketing for processual analysis, the case narrative (Pentland, 1999) is divided into three procurement instances, with the pseudonyms given as BBS-I, BBS-II, and BBS-III with the separation between instances denoted by solid lines. It is understood that this separation includes the implementation (which is not investigated in this work). Here we discuss the predominant events at the three STS levels (Trist, 1981; Winter et al., 2014) as they relate to the EIS procurement process. Since events at one level have an impact on the events at other levels, the division between the levels is shown as dotted lines.

4.1 Existing system limitations

The motivation for adopting BBS-I stemmed from the work-system level due to the limitations of the existing system. The existing system, namely Blood Bank Control System (BBCS), had limited functionality and offered limited avenues for analysis due to a lack of integration across offices, as noted below.

When I came in 1999, there was a system called BBCS, which was bespoke system. It only managed the donor records. It didn’t manage anything happening at the clinic, and it didn’t manage the laboratories. (P2, TMT)

Before the BBS-I, we had the BBCS and we had the separate box in [Centre 1] and a separate box in [Centre 2]. So, the results, you know, there was no link between them. (P20, PT)

Another crucial issue was the prevailing Y2K issue which, if unresolved, could cripple the system. BSO was concerned that BBCS was not Y2K compliant and there was no assurance that it could be made so. It was identified that urgent action was required to ensure the continuity of operations after 31st December 1999.
Figure 3: Sequence of Events in the Case Study

1. Existing system limitations motivate adoption of a new system.
2. Business case for EIS adoption
3. Institutional approval, public tendering and market response
4. BBS-I acquisition
5a. The vendor offers BBS-II
5b. Proposed features of BBS-II
6. Business case and acquisition of BBS-II
7. Implementation failure
8. Parliamentary scrutiny
9a. Vendor’s push for adopting new system
9b. System obsolescence motivates adoption of a new system
10. Business case for BBS-III adoption
11. Institutional approval, public tendering and market response
12. BBS-III acquisition

4.2 Business case for EIS adoption

At the organisational level, the justification for BBS-I was expressed in terms of what it could offer upon implementation. For BSO, BBS-I offered the opportunity to integrate its donor information from procurement to transfusion following industry’s best practices and to build a national database of blood banking. While integration motivations are justified, the ‘best practices’ motivation looks more like rhetoric since BSO ended up implementing the same business processes on BBS-I, as noted by one participant:

We took BBS-I and we changed it to suit us rather than take BBS-I and say - well, okay, well that’s a different way of doing things; we’re going to move and do it that way. So, we did some of that, but it was slow. So, instead there was an awful lot of, and BBS-I does allow for a lot of user configuration, but we did probably too much user configuration and ended up doing more or less of what we’d always been doing... using BBS-I to, not to, not to drive that process but to record that process. (P19, UG)

A major focus of the adoption argument was also geared towards provision of increased donor and patient safety made possible by the new system. The safety could be ensured by donor recruitment and screening (aided by database integration) at the donation stage, tracking of blood from donation clinics to the hospitals (due to business process integration), and parameter checks (made possible by parameterisation of the system) at issue stage.
4.3 Institutional approval, public tendering and market response

For BBS-I, the BSO approached the parent government departments for its approval. Upon receiving approval, BSO went with a public tender for the acquisition of a new system. Going with a public tender is a key feature of public sector procurement processes (Matinheikki, Aaltonen and Walker, 2019; Moe, Newman and Sein, 2017) in the European Union. However, due to niche nature of the blood bank market, only two vendors were short-listed for consideration.

4.4 BBS-I acquisition

One of the vendors was a dominant supplier of blood bank control systems to transfusion services across the world at the time. As one participant recalls:

*When we went with BBS-I, it was in New Zealand, it was in Australia, it was in Scotland, it was in several places in the US, it was in France, it was in Netherlands, it was in Finland and one or two other places as well.* (P19, UG)

Another key factor for BBS-I acquisition was the level of integration offered by the product. The solution from the other vendor did not have an integrated system. It offered two different software packages to manage the blood collection process and the production process. In contrast, BBS-I offered an integrated system to manage the entire blood operations. After evaluation, BSO selected BBS-I for implementation.

4.5 A new system (BBS-II)

Within a year after BBS-I rollout in 2003, BSO decided to adopt BBS-II developed by the same vendor. Like BBS-I, adoption motivations for BBS-II also stemmed from the work-system level. Work-system related justification included hardware obsolescence, limitations of flat-file system underlying BBS-I, and data recovery ability of BBS-II. As one participant notes:

*Because of the length of time taken to implement BBS-I, the BSO was left in a situation where the hardware on which it was operating had reached the end of its life and needed to be replaced. It made good economic sense to upgrade the current blood bank control system at the same time... [BBS-I] technology has a flat-file structure which makes it very difficult to extract effective management information in a timely manner.* (P2, TMT)

The flat-file structure underlying BBS-I offered limited data recovery abilities and always had the risk of data inconsistency where the same data was updated in one file and not updated in the other. BBS-II, due to its underlying relational database system, offered to solve these two problems. A relational database design not only ensured data consistency across different tables; it also offered the facility to fully recover the data right up to the point of failure.

4.6 Business case and acquisition of BBS-II

At the organisational level, justifications for BBS-II included introducing operational efficiency, generation of management reports, and providing strategic advantage to BSO among its peers.

*Part of the reason we went early with BBS-II was we thought it gave us a good opportunity for improving the costs in our donor collections... We were very inefficient at the clinics. It’s laborious, it’s time-consuming; it’s the opposite of lean... We saw it as solving a whole lot of problems that we had mostly at the clinic level.* (P19, UG)

The justifications for BBS-II adoption reflects the assumption that merely connecting all the information systems will solve the organisational problems, despite some cautionary tales (Mangan and Kelly, 2009) that merely automating business processes using IT may not result in operational efficiency. Similarly, although it is known that relational databases allow generation of management reports due to connectivity among tables, BBS-II was a new software and was not implemented elsewhere. Consequently, BSO did not have any evidence for the reporting functionality offered by BBS-II. The justification was based more on the potential reporting capabilities rather than actual reporting capabilities.
For BBS-II acquisition though, BSO neither sought approval from its parent government department nor did it go with the full public tendering process. First, a project definition for the implementation of BBS-II, which included a business case, was drawn up in May 2004. The vendor sent an official proposal for the BBS-II project to the BSO in Oct 2004, which was then accepted by the project steering group.

4.7 Implementation failure

However, since BBS-II was the first time the vendor was offering a relational database version of its system, it was not fully developed when BSO decided to implement it. BSO was the first user of the software and the vendor was still developing the software. As participants recall:

(BBS-II) wasn’t a mature software application... We probably would have been one of the first sites to go with it... it would have been the first time they were really cutting their teeth in the open market. (P3, PT)

When we went with BBS-I, it was the state of the art and if there was a problem in getting it in, it was because of us, not because of the system. The system was working very well in very good blood transfusion services. BBS-II wasn’t like that. (P19, PT)

As it turned out, this was the single biggest challenge in the BBS-II implementation. Due to consistent bugs identified in the system, eventually BSO decided to abandon the project in 2007, writing off €729,000.

4.8 Parliamentary scrutiny

This loss of public money invited bad press and an audit by the public auditor in 2008. The audit revolved around the procurement process and the implementation. In its review, the auditor asked questions on the absence of public tendering processes in BBS-II acquisition. BSO justified the procurement process before the parliamentary committee as noted below:

When [BSO] initially purchased BBS-I it followed a full tender process and there was only one other supplier shortlisted for consideration. Senior staff of the [BSO] regularly attend conferences and scientific meetings where suppliers of all major systems and equipment for use in blood transfusion services exhibit. In addition, the national blood services in Europe have formed an association that meets biannually where all areas of activity are discussed. There was no evidence at either of these fora that an appropriate alternative system to BBS-I had come to market. Therefore, it was a reasonable course of action not to go through a formal tender process when the decision was taken to upgrade to BBS-II. In fact, during this time one European blood service had carried out a benchmarking exercise to examine all possible systems available or that could be customized to provide a blood bank control system and decided to purchase BBS-II.

As one can see here, the justifications for this were primarily drawn from the external market context and included system usage in other blood banks coupled with the dominant market position of the vendor. It also made use of the benchmarking exercise conducted by other blood banks to justify BBS-II acquisition.

4.9 BBS-III adoption

Adoption motivations for BBS-III were primarily work-system and vendor driven. The case evidence suggests that the end of software lifecycle and vendor support were the two main reasons for BBS-III adoption.

We have to do it because it the end of life [for the software]. If we don’t, [the vendor] won’t support any longer. (P9, PT)

BBS-I software is towards the end of its operational life and... [the vendor] has indicated that they could support the existing version of BBS-I only around 2014 or so. (BSO Board Minutes, 2010)

Consequently, BSO either needed an upgrade of the existing system or a replacement of the existing system with a new one. It cannot be denied that since the vendor was offering a new system, BSO sought to adopt it. The vendor arguably played a major role in BBS-III adoption by indicating the end of support for BBS-I, thereby nudging BSO to look for a new solution.
4.10 Business case for BBS-III

Once the adoption decision was taken, BSO included organisational justifications in the business case. Users were involved in writing user requirement specification (URS) documents for their respective functional areas.

We set down with all the user departments, we gathered up all the requirements, we determined what was phase-1; we determined what was phase-2. (P5, PT)

However, it was also expressed by participants that writing URS was probably not given much attention and users had very little role in decision-making processes.

I think, again more time should be given to writing the URS... Probably not enough time was put in at that stage of the process. (P16, PT)

I was told I was being part of URS... We were given documents from the (another) blood service and more or less told to copy and paste them... To my mind, I wasn’t given any opportunity... to say - okay, what are the problems we have with BBS-I that really give us headaches, and let's try and avoid that for the next time... but it’s only kind of dawning on me now. I feel that we were pushed into the project. (P17, UG)

4.11 Institutional approval, public tendering and market response

Although earlier instances also note it, the acquisition process for BBS-III demonstrates the full impact of BSO’s institutional context. After taking an acquisition decision, when BSO approached the parent government department for its approval, the department vetoed not only the BBS-III project but also the other IT projects (BSO Board Minutes, Dec 2010). Interestingly, this was due to some other factors not directly related to the project, as noted below:

We were getting at this thing, what we were getting to the decision-making points of this thing, right to the point of the crash hitting the country. So, there was whole question of how much money we are going to spend. Which were, these were very legitimate questions to ask us - ‘why do you need to do this?’ (P1, TMT)

We did need to get department of health approval to proceed with the project. That was difficult to achieve because we are in dispute with them over [an administrative] issue... I think it didn’t impact on conduct of the project. It was more to get approval at the beginning of the project to commence, the project initiated. (P3, PT)

Here one can note the importance of macro-economic and institutional contexts in the acquisition phase. The recession at the macro-economic level forced governments to be prudent in their spending and questioning the requirement and justification for the investment. At the same time, it also underscores the importance of institutional context in terms of getting approval. The logjam with the department continued for some months where BSO kept trying to convince the department and the department kept vetoing the implementation. Ultimately, BSO used similar arguments to those used in the adoption phase – technical constraints, and the criticality of blood operations, as noted below:

[The CEO] eventually wrote to the department, saying - ‘That’s okay. If the existing hardware falls over, and if the existing software is no longer supported, I’m sure you’ll take responsibility for the impact of that on the national blood supply and the supply of that to the patient.’... They straightaway came back and said, okay go ahead. (P1, TMT)

Once the project got approval, BSO went ahead with the public tendering process, perhaps learning from its earlier experience.

4.12 BBS-III Acquisition

However, external market conditions did not change much in terms of the availability of solutions or the vendor’s dominance, as noted by one respondent:
We held a competitive tendering process. Okay, so, we went for Request for Information first and then we had the tendering process. The request for information process came back with four suppliers. A lot of the responses didn’t cover tissue system and didn’t cover a patient or a risk system or whatever else... we didn’t have a conglomerate that came together and say we’ll give you all these... [Existing vendor] came out to be clear winners because they could answer very much all the elements of it. (P3, PT)

At the time of acquisition, BSO also decided to go for the complete suite offered by the vendor to further its goal of further business process integration. Although it was theoretically possible for BSO to implement different modules for different functions, they opted for the complete suite offered by the same vendor. The justifications mainly relate to interfacing between modules, as noted below:

There may be a case – and some services have done it – to take individual modules like appointments systems or a customer relationship management and to buy those off the shelf from specific companies; but then they have always got the problem of bringing it back in-house and integrating the two together. So, my preference would always be to try to go for the full integrated package. (P1, TMT)

The vendor’s push was also evident in the acquisition of the complete suite since acquisition of only one module would have resulted in the loss of business integration. As one participant notes:

Our main system was still going to be provided by [existing vendor] and we were going to have to have multiple, I suppose, systems then trying to communicate with them. They already provide a solution in that space. (P5, PT)

5. A socio-technical understanding of the EIS procurement process

Based on narrative analysis and the patterns identified in the three instances (Langley, 1999; Pentland, 1999; Pettigrew, 1997), it becomes clear that EIS procurement is a complex process and is influenced by various socio-technical factors at different levels. Figure 4 represents a socio-technical understanding of the EIS acquisition process. It may be noted that Figure 4 essentially draws from Figure 3 in deriving the general (factors) from the specific (case events), thus developing an explanatory process theory (Cloutier and Langley, 2020; Pentland, 1999) providing contextual explanation (Avgerou, 2001, 2019).

![Figure 4: A socio-technical understanding of the EIS acquisition process](image)

5.1 Technological Imperatives

Technological imperatives operate at the work-system level and are primarily related to constraints/features of the technology. The constraints associated with the existing EIS usually provide the justifications for moving away from the old system. BBCS’s inability to integrate information and limited functionality paved the way for BBS-I adoption, whereas limited reporting capabilities of BBS-I provided justification for moving to BBS-II. At the same time, enabling features of new technology also act as justification for the introduction of the system. While BBS-I offered benefits of database integration across two centres of BSO, BBS-II seemed to offer the benefits associated with a relational database in terms of data consistency and data recovery. Therefore, the findings support the assertion that adoption motivations stem from the constraints of existing systems and the
affordance of the proposed system (Alves and Matos, 2011; Oliver and Romm, 2002; Laukkanen, Sarpola and Hallikainen, 2007; Raymond, Uwizeyemungu and Bergeron, 2006; Poba-Nzaou et al., 2014).

5.2 EIS Vendor

Factors related to the EIS vendors operate at the macrosocial level and reflect in the vendor’s push for EIS adoption. Since BBCS was developed in-house, there was no influence of any vendor in the adoption motivation for BBS-I. However, since BSO was already using BBS-I, it considered implementing BBS-II from the same vendor immediately after BBS-I was rolled out. The finding supports the observation (Markus and Tanis, 2000) that once the customers have signed the contract and have put substantial organisational and financial resources into the process of implementation, they become reluctant to shift allegiance and in turn may become locked into a vendor’s product development trajectory. Furthermore, as evident in the case of BBS-III procurement, customers often do not wish to replace the system (Furneaux and Wade, 2017) considering the learning and training costs associated with a new system. To paraphrase Howcroft and Light (2010, p.142), technological legacies and histories shape decisions for the future. In such a case of being tied to a vendor, the client becomes active in the user group and engages with the vendor in an attempt to influence their plans for product enhancement (Markus and Tanis, 2000; Howcroft and Light, 2010), as BSO tried to do by being the first implementer of BBS-II. As far as BBS-III adoption is concerned, it is clear from the case that the vendor played a major role by signalling the end of support for the existing system, thereby supporting the findings by Khoo and Robey (2007) and Khoo, Robey and Rao (2011) on the vendor’s role in the post-implementation phase.

5.3 Business case for EIS Adoption

Supporting the existing literature (Adam and O’Doherty, 2000; Alves and Matos, 2011; Laukkanen, Sarpola and Hallikainen, 2007), the business case for EIS adoption in BSO included operational and strategic justifications such as business process integration, operational efficiency, and business vision. BBS-I adoption was characterised by focus on integration of blood operations from blood donation to issue to hospitals. It was also justified by the business vision for donor and patient safety due to an integrated database. Empirical evidence from the case study also supports the applicability of factors such as perceived benefits (Bwalya and Healy, 2010; Oliver and Romm, 2002; Poba-Nzaou et al., 2014). For BBS-II, the business case put forward was that of ensuring organisational efficiency, enabling managerial decision-making, and organisation’s strategic advantage. It was argued that generation of management reports by BBS-II would result in better managerial decision-making. For BBS-III, organisational motivations involved pursuing further business process integration and portraying an image of a ‘twenty-first century’ organisation, showing compliance with the accepted norms (Currie, 2009; Oliver and Romm, 2002) to obtain legitimacy.

Analysis also points at the partly demonstrative nature (Berente, Gal and Yoo, 2010) of the business case. While the organisational motivation of business process integration was followed in all three cases, business vision mostly seemed to serve demonstrative purpose. Although the business vision of efficiency was put forward in all three cases, there was no serious effort on reengineering business processes for efficiency. Similarly, generation of management reports was put forward as a justification for BBS-II although there was no prior evidence for the claim. As the evidence from BBS-III suggests, the user community was a bit marginalised (Lyytinen and Newman, 2015) in the procurement decision and the business case was prepared mostly to support a pre-determined decision (Howcroft and Light, 2006, 2010) based on the two macrosocial factors, as discussed in the following sections.

5.4 Institutional context

Based on the patterns identified in the three instances, it becomes clear that the macrosocial context played a crucial role in the EIS procurement process at BSO. As noted earlier, business case largely served the demonstrative purpose and there was no serious pursuit of organisational justifications beside business process integration. This might be due to the public service context of the organisation, since Berente, Gal and Yoo (2010) report similar practice of the public display of compliance through demonstrative actions. Based on their study of four public universities, Oliver and Romm (2002) also note that public organisations often engage in justifying their EIS adoption by alluding to what they call ‘technical rationality’. They note that compliance with the accepted and emerging norms of technical rationality (e.g. following best practices, using the state-of-the-art system) becomes a way of obtaining legitimacy but never gets institutionalised in the organisation.
For both BBS-I and BBS-III, the institutional context mandated the public tendering process (Cox, Roberts and Walton, 2012; Matinheikki, Aaltonen and Walker, 2019; Moe, Newman and Sein, 2017) for procurement. In case of BBS-II where the public procurement process was not followed, BSO ended up providing a post-facto justification to the public auditor and the parliamentary committee of public accounts. In this sense, institutional context of BSO was influential in all three instances of procurement. Case findings also highlight the specific role played by top management in working with the institutional context (Liang et al., 2007) during the procurement process.

5.5 EIS market

Apart from institutional context, EIS market was also found to be influential at the macro level in all three instances. This was primarily due to vendor’s dominance in a niche market and widespread use of the system in the blood bank industry. Monopoly market structure of the niche market (Olsen and Sætre, 2007; Pollock and Cornford, 2004) constrained the choices available to BSO. Standard EIS vendors such as SAP prefer to compete in the crowded (oligopolistic) market since their commitments to the crowded market can mitigate concerns about compatibility between the components purchased from several suppliers (Chellappa, Sambamurthy and Saraf, 2010). In the context of health services, however, very few IT vendors possess the appropriate capabilities and skills to fully appreciate, understand, and mediate with institutional context of the health sector (Currie, 2008). Moreover, blood banks form a very small part of the larger healthcare IT market (Raghupathi and Tan, 2002, 2008). Furthermore, the widespread use (Raymond and Uwizemungu, 2007) of BBS-I in the blood bank market drove BSO towards the acquisition decision. Similar market conditions prevailed during BBS-II and BBS-III acquisitions, resulting in the EIS procurement from the same vendor. The niche nature of the blood service seems to be responsible for the influential role played by a dominant vendor.

5.6 EIS acquisition

Not much data was available on the tender evaluations for BBS-I and BBS-II. The tender evaluation for BBS-III reportedly involved technical evaluation, business fit evaluation, project methodology, and cost. System functionality was measured mostly in terms of availability of the functions specified in the URS, though it appears that evaluation was primarily based on information submitted in the bid by the vendor. This is why the arrow from the business case to EIS acquisition is shown as dotted lines in Figure 4, since the acquisition seems to be driven more by the institutional context and EIS market and less by the business case. The findings partly support the prescription of techno-managerial literature (Gürbüz, Alptekin and Alptekin, 2012; Kılıç, Zaim and Delen, 2015) that organisations evaluate the EIS based on the technical and business criteria. The study rather strongly supports the observation (Entwistle and Light, 2008; Moe and Päivärinta, 2013; Pollock and Williams, 2007) that it is usually difficult to evaluate the functionality of an EIS artefact without actually implementing it. This makes the gap analysis and evaluation process dependent on the features reported by the vendor and renders it less than rational. However, BSO still engaged in a formal gap analysis of the EIS during the tendering process. It supports the contention that despite its limitations, organisations do not completely discard the rational evaluation process (Pollock and Williams, 2007; Moe, Newman and Sein, 2017). BBS-III acquisition in particular supports the finding by Kauffman and Tsai (2009) that firms have moved toward a unified procurement strategy for EIS solutions, thereby trying to avoid any integration issues (Laukkonen, Sarpola and Hallikainen, 2007).

6. Conclusion, implications and limitations

Governments all over the world are increasingly focussing on the digital transformation of public services (Curtis, 2019). EIS may play a big role in this transformation by providing business process standardisation and integration. However, limited research is done on EIS procurement in the public service context. By conducting a case study of three instances of EIS procurement, this study responds to the call for research on pre-implementation phase (Howcroft and Light, 2006; Pollock and Williams, 2007). By explicitly focussing a public service organisation, this study helps in developing a contextual perspective (Avgerou, 2001, 2019; Howcroft, Newell and Wagner, 2004) on EIS research. The study demonstrates that EIS procurement is a socio-political process and the factors emerging at all three STS levels influence the procurement process in a public service organisation. However, the most notable finding of this study is influence of the macrosocial factors, namely the institutional context and the EIS market structure over the procurement process. While the work-system and organisational-level factors prompt the adoption decision, macrosocial factors tend to have more influence over the acquisition process. In summary, this study brings out the complexity of EIS procurement in
public service organisations that result from the interplay of factors operating at the work-system, organisational, and macrosocial levels.

A key implication of this study is that public service practitioners need to be aware of the institutional and sector-specific context in order to align the procurement process with the prevalent legitimacy expectations. They also need to engage more closely with the vendors if they are operating in a niche sector. In this regard, public policy makers may also need to think beyond their standard operating procedures and support alternate procurement strategies. For instance, Matinheikki, Aaltosen and Walker (2019) outline the formation of multiparty alliance for a lakeside tunnel project in response to the institutional complexity of the public sector. This kind of temporary structure may help managers in successfully coping with multiple institutional logics (Berente et al., 2019) in operation.

A couple of limitations of this study are to be noted. One limitation stems from the research methodology adopted. Following a case study approach, we cannot claim for the external/statistical generalisation, as findings are context specific to a public sector organisation in a western democracy. However, what we aim for is providing a contextual explanation (Averrou, 2001, 2019; Cloutier and Langley, 2020; Pentland, 1999) which could be used to drive theoretical propositions. Therefore, to achieve external generalisation, the future work may engage in investigating case organisations from other sectors/countries to explore the EIS procurement process in other contexts. A second limitation stems from the composition of the participants who belong to the organisation procuring the EIS, thereby excluding the viewpoints of the vendor and the parent department. Although the triangulation of data (Yin, 2017) partly remedies this situation, inclusion of a vendor perspective in future work would strengthen the findings of the study. Despite these limitations, however, we believe that we have presented a rich picture of the procurement process from a socio-technical perspective and have uncovered contextual aspects largely ignored in extant literature.

References


