

# OPEN DATA IMPACT CASE STUDIES

## OPEN EDUCATION INFORMATION IN TANZANIA

A Tale of Two Dashboards



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**Summary:** Low national examination pass rates in 2012 caused a public outcry in Tanzania, but the public's understanding of the broader context (and thus ability to demand accountability) was limited by a lack of information about the country's education sector. Two recently established portals are trying to remedy that situation, providing the public with more data on examination pass rates and other information related to schools. The first, the Education Open Data Dashboard ([educationdashboard.org](http://educationdashboard.org)), is a project established by the Tanzania Open Data Initiative, a government program supported by the World Bank and the United Kingdom Department for International Development (DFID) to support open data publication, accessibility and use. The second, Shule ([shule.info](http://shule.info)), was spearheaded by Arnold Minde, a programmer, entrepreneur and open data enthusiast who has developed a number of technologies and businesses focused on catalyzing social change in Tanzania. Despite the challenges posed by Tanzania's low Internet penetration rates, these sites are slowly changing the way citizens access information and make decisions. More generally, these projects are encouraging citizens to demand greater accountability from their school system and public officials.

**Dimension of Impact:** Empowering Citizens – Social Mobilization

**Key Takeaways:**

- Dashboards like Shule and the Education Open Data Dashboard are cheaply repurposable tools that can be quickly and readily implemented by local programmers. Both dashboards were built and launched in two to three weeks, although the data set used to build Shule had been scraped in increments over several years.
- In countries with low Internet penetration, raising awareness among infomediaries, particularly in the media, about the availability and use of open data can be critical in bridging the access gap and successfully engaging the public. Civil society organizations, both local and international, can play a vital role in spurring the use of open data by raising awareness among infomediaries.
- Shule and the Education Open Data Dashboard illustrate the benefits of coordination and collaboration between government open data initiatives and those developed by civil society and private organizations. Shule was developed by a single dedicated programmer with little outside help; the Education Open Data Dashboard was developed by a local developer in coordination with government data practitioners, NGOs and programmers (including the man behind Shule). Taken together, the information these sites provide about Tanzanian education is richer and more interesting than either site alone.
- The collaboration between open data champions like Arnold Minde and civil society organizations such as Twaweza can radically increase the value and impact of open data initiatives.

# I. Context and Background

Since 2012, education in Tanzania has become the subject of significant public discontent and controversy. That year, six out of every 10 Tanzanian students failed the standardized national secondary-level examination, resulting in significant public discontent and demand for reforms.<sup>1</sup> The poor results were in many ways the outcome of recent changes to the Tanzanian education system. In 2002, tuition fees for government primary schools were eliminated in an effort to raise school enrolment and literacy rates. The move triggered rapid growth in net primary enrollment, from 66 percent in 2001 to 90 percent in 2004,<sup>2</sup> but this growth was not matched by a proportional increase in school funding, hence the education sector's problems a few years later.

As the Tanzanian school system strained under the burden of the additional enrollments, examination pass rates among the 30 percent of secondary-aged children enrolled in school<sup>3</sup> began to decline. After the particularly bad set of results in 2012, the government introduced changes to the grading system<sup>4</sup> that appeared to raise the pass rate in 2013 and 2014.<sup>5</sup> However, the root causes of the nation's education problems – inadequately funded and supplied schools, a shortage of trained teachers,<sup>6</sup> limited teacher training and professional development, delays in the payment of teachers' salaries,<sup>7</sup> and stubborn regional, economic and social inequalities – remained unaddressed.

At the same time, information about the state of public education was not easy to come by, making it hard for citizens to understand the true state of the education sector and demand accountability from government officials. The Tanzanian media is considered only partly free by Freedom House,<sup>8</sup> and the country was ranked 75th out of 180 countries in the 2015 World Press Freedom Index.<sup>9</sup> Although several Access to Information bills have gone before the Tanzanian Parliament, none has yet been enacted, while other legislation, including the country's defamation law, constrains the media's capacity to function critically and independently.

In addition, there exists a noticeable lack of independent voices in the Tanzanian media. While media ownership is transparent, it remains concentrated among a few proprietors. All four radio stations with national reach are regarded as favoring the ruling party.<sup>10</sup> Media outlets favorable to the opposition reportedly have

1 Kimboy, Frank. "High pass rate greeted as good as well as bad news." The Citizen. July 23, 2014  
<http://www.thecitizen.co.tz/magazine/political-reforms/High-pass-rate-greeted-as-good/-/1843776/2394162/-/umh9xl/-/index.html>

2 "World Data on Education (Revised Version)." UNESCO. August 2010.  
[http://www.ibe.unesco.org/fileadmin/user\\_upload/Publications/WDE/2010/pdf-versions/United\\_Republic\\_of\\_Tanzania.pdf](http://www.ibe.unesco.org/fileadmin/user_upload/Publications/WDE/2010/pdf-versions/United_Republic_of_Tanzania.pdf)

3 "Tanzania: World Bank Development Indicators." Accessed August 28, 2015  
<http://databank.worldbank.org/data/reports.aspx?source=2&country=TZA&series=&period=>

4 Magolanga, Elisha. "No more Div. Zero as govt guts national grading system." The Citizen. November 1, 2013.  
<http://www.thecitizen.co.tz/News/Govt-in-major-change-of-national-exam-grading/-/1840392/2055404/-/3kae76z/-/index.html>

5 Kimboy, Frank. "High pass rate greeted as good as well as bad news." The Citizen. July 23, 2014.  
<http://www.thecitizen.co.tz/magazine/political-reforms/High-pass-rate-greeted-as-good/-/1843776/2394162/-/umh9xl/-/index.html>

6 The Citizen Reporter. "Teachers shortage hurting Tanzania." The Citizen. October 14, 2014  
<http://www.thecitizen.co.tz/News/Teachers-shortage-hurting-Tanzania/-/1840340/2485582/-/tpeqyi/-/index.html>

7 Qorro, Edward. "Education Policy: What lies ahead for teachers." The Citizen. February 24, 2015.  
<http://www.thecitizen.co.tz/magazine/success/-/1843788/2633842/-/item/3/-/7gkOyk/-/index.html>

8 <https://freedomhouse.org/country/tanzania#.VaQZFvIViko>

9 <http://index.rsf.org/#!/index-details/TZA>

10 In 2010, the African Media Barometer did report, however, that the state-run Radio Tanzania has demonstrated more balanced views within recent years

government advertising contracts withheld.<sup>11</sup> Consequently, when stories about the state of education do make it to press, they tend to favor the official version of events, and often lack balance or context.

Citizens were for the most part unable to turn to the Internet or open data as substitutes for the information they needed. Open data use in Tanzania is still in its infancy, although recent initiatives such as the Africa Open Data Conference, convened by the president of Tanzania, are encouraging development.<sup>12</sup> The Open Data Barometer places Tanzania in the “capacity constrained” cluster of countries whose open data initiatives are challenged by limits in government, civil society or private sector capacity, Internet penetration, and data collection and management.<sup>13</sup> Tanzania joined the Open Government Partnership (OGP) Initiative in September 2011. The second phase of its OGP action plan, currently being implemented, commits the government to establishing an open data portal ([opendata.go.tz](http://opendata.go.tz)) that would release key data sets in the education, health and water sectors in machine-readable form.<sup>14</sup> Publicly launched in September 2015, the portal at that date had 81 data sets available for download.<sup>15</sup>

*“Data is frightening for many people, so raw data is going to appeal to a vanishing few. Open data needs to be open plus curated plus chewed plus digested to appeal to most people, including policymakers.” – Aidan Eyakuze, Twaweza*

## II. Product Description and Inception

In 2013, the National Examinations Council of Tanzania (NECTA) rolled out a dashboard<sup>16</sup> offering data downloads, searches, and visualizations of primary and secondary examination results by district, with statistics on annual and average pass rates, national ranking and changes in pass rates since 2011.

The launch of its Big Results Now (BRN) program in 2012 committed the Government of Tanzania to publishing key data sets, powered by its parallel open data and OGP agendas, for public consumption. To support this, Tanzania Open Data Initiative launched the prototype Education Open Data Dashboard in 2015 (available at [educationdashboard.org](http://educationdashboard.org)).<sup>17</sup>

The Education Open Data Dashboard offers indicators such as pupil-teacher ratios, regional and district rankings, and improvement rankings over time, all of which are navigated via a clickable map and drop-down menu of schools. Although the site represents a significant advance by bringing together data from several sources, the dashboard’s remit limits its scope to BRN data, which does not include pass

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11 Tanzania Country Report – Freedom of the Press 2011. Freedom House. Accessed August 28, 2015. [https://freedomhouse.org/report/freedom-press/2011/tanzania#.VaARQ\\_IVikp](https://freedomhouse.org/report/freedom-press/2011/tanzania#.VaARQ_IVikp)

12 <http://www.africaopendata.net>

13 <http://www.opendatabarometer.org/report/analysis/index.html>

14 <http://www.opengovpartnership.org/country/tanzania/action-plan>

15 <http://opendata.go.tz/dataset>

16 Available at <http://www.necta.go.tz/opendata/>, and subsequently updated at <http://www.necta.go.tz/opendata/brn/>

17 <http://the Education Open Data Dashboard.org/#/>

rates before 2012, average pass rates over time, or pass rates by gender or region. The Education Open Data Dashboard also offers no analysis of its data visualizations.

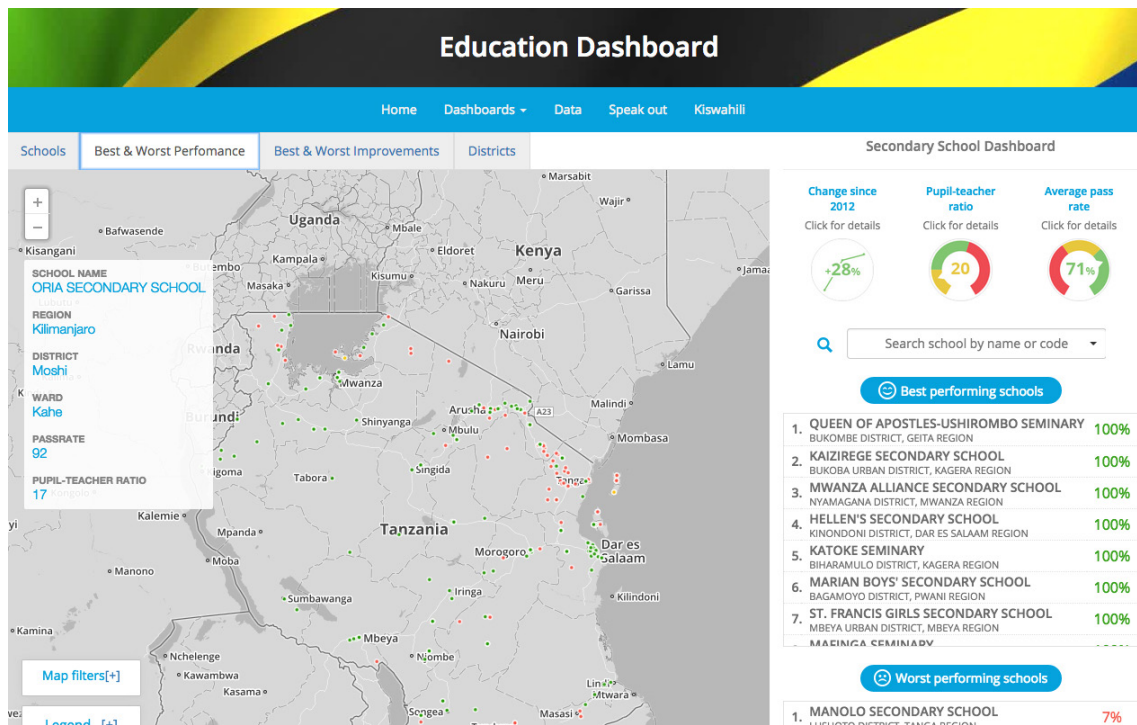


Figure 1: Mapping of school performance on the [educationdashboard.org](http://educationdashboard.org)

Many of these gaps have been filled in recent years by a pioneering project named Shule ([shule.info](http://shule.info)). Shule is the brainchild of the Tanzanian programmer Arnold Minde. It was released shortly after NECTA's own original dashboard, and was conceived when Minde, an entrepreneur and open data enthusiast, became aware that NECTA had been publishing individual exam results online since 2004. Although this data was available in isolated reports and websites, usually intended for individual students, it had never been made fully open in searchable and machine-readable format for citizens at large.<sup>18</sup>

Intrigued by the possibilities, Minde began scraping, cleaning and consolidating this data from the examination results as they were released each year. It wasn't until 2012, however, when poor examination pass rates prompted nationwide soul-searching, that Minde began working on the project in earnest. At that point, he realized the potential value of a single, readily usable source of national examination data.<sup>19</sup> Such data needed to be online, he concluded, so that citizens could see that the low pass rate of 2012 was not a new phenomenon, but part of a trend of worsening results over the past six to seven years. Minde had previously been involved in data visualization through his work for the Tanzanian development policy think tank REPOA (formerly Research on Poverty Alleviation); that work convinced him of the power of data visualization to communicate data trends and linkages, and helped shape the development of Shule.<sup>20</sup>

<sup>18</sup> <http://www.shule.info/about>

<sup>19</sup> <http://www.shule.info/about>

<sup>20</sup> GovLab Interview with Arnold Minde, Founder, Shule, July 9, 2015.

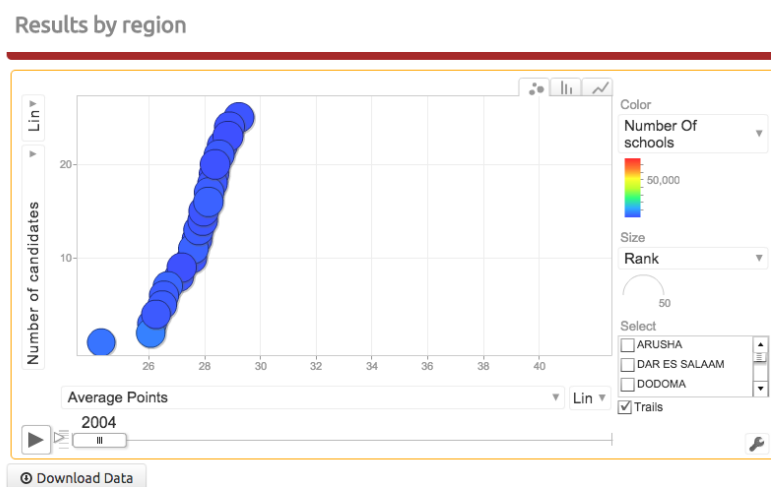
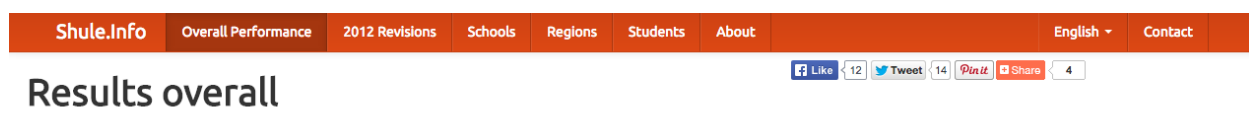


Figure 2: Education results by region on Shule.info

Minde states that his aim in developing Shule was to make information available to everyone with a potential interest in it: parents choosing schools for their children; students looking up examination results; policymakers seeking to track educational trends and progress; and journalists wanting to improve their educational coverage. The original pilot of the site was ready in three weeks, but was revised and improved after Twaweza, a Tanzanian civil society organization promoting effective and transparent governance, became interested in Minde's project. Twaweza's advice prompted Minde to modify the design of his site for increased appeal and usability, and to double the number of indicators.<sup>21</sup>

The site currently presents data for Form 4 examination results from 2004 to 2013 at candidate, school, regional and national levels, and offers data visualizations of results by regions and gender, average performance over time, the number of candidates in each grading division over time, and the impact of the government's controversial revision of the 2012 results. All data used to build the site is available for download. In addition, and in contrast to NECTA's dashboards, Shule offers commentary on its data visualizations, making it easier for users to understand the significance of the data they are accessing.

21 GovLab Interview with Arnold Minde, Founder, Shule, July 9, 2015.

### III. Impact

Tanzania is a country with low Internet penetration rates (4.9 percent in 2014, according to ITU, the United Nations specialized agency for information and communication technologies<sup>22</sup>), and a general lack of familiarity with the concept and potential of open data. As such, the impact of Shule and the Education Open Data Dashboard has been more modest and difficult to assess than it might have been in another country. Nonetheless, early signs of impact by these two education data dashboards are discernible. Impact can be gauged in three ways: engagement and use by both citizens and infomediaries; data quality and diversity; and spillover effects on other open data projects.

#### *Intended Beneficiaries*

<b>PARENTS</b>	<p>Able to visualize and compare school performance before choosing a school for their children</p> <p>Able to hold schools to account for performance</p>
<b>STUDENTS</b>	<p>Can access examination results using candidate number and examination center</p>
<b>POLICYMAKERS AND PLANNERS</b>	<p>Data archives and visualizations allow the tracking of trends in education over time and by region</p> <p>Data visualization encourages better allocation of resources according to need</p>
<b>JOURNALISTS</b>	<p>Data visualizations and analysis offer context and prompt questions to improve depth of coverage of education stories</p> <p>Able to translate and digest data for general public, improving penetration</p>

### ENGAGEMENT AND USE

Since Shule went live in June 2013, the site has averaged around 1,500 visits per month, according to Arnold Minde.<sup>23</sup> Feedback directly on the site and through Twaweza suggests that visitors fall into two categories. The first consists of data sophisticates, typically programmers or employees of civil society organizations, who are already aware of the potential of open data to inform decision-making, and visit

22 ICT Statistics. ITU. Accessed August 28, 2015. <http://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx>

23 GovLab Interview with Arnold Minde, Founder, Shule. July 9, 2015.



the site to research education in Tanzania and better understand the overall educational context. These visitors may have become aware of the site through Twaweza, REPOA's network of civil society partners, or the emerging open data community in Dar es Salaam.

The second category of site visitors consists of former students making use of the site's archive of examination results to look up their scores.<sup>24</sup> These students may not initially be interested in or even aware of open data, but they are nonetheless exposed to Shule's visualizations and other tools when they access the site.

Engaging the ordinary Tanzanian families Minde had originally hoped to reach has been more challenging. Low rates of Internet penetration and a lack of experience using the Internet have suppressed the amount of casual traffic received through search engines. Minde says he fears that average Tanzanians don't have much interest yet in looking at data visualizations, preferring to get their information predigested by the media. "I don't see people asking the real questions," says Minde. "I don't see discussions around the issues, even among people I know."<sup>25</sup> Aidan Eyakuze, Executive Director of Twaweza, believes both the public and policymakers are looking for the insight contained in the data, not the data itself. "Data is frightening for many people, so raw data is going to appeal to a vanishing few. Open data needs to be open plus curated plus chewed plus digested to appeal to most people, including policymakers."<sup>26</sup> Few in the media, however, have the knowledge and skills to digest Shule's data offerings, despite initiatives like the Data Bootcamp, which was designed to introduce members of the Tanzanian media to open data.<sup>27</sup>

The Education Open Data Dashboard's use is similarly constrained by Tanzania's low rate of Internet use. Nonetheless, the site's developers point out that Tanzanians don't necessarily need Internet access to benefit from the information stored on the site. Members of civil society organizations, for example, including Tanzania's active parent-teacher organizations, can potentially act as infomediaries, printing out information about school performance to share on a community notice board or at meetings.<sup>28</sup> For its part, the government of Tanzania has recognized the potential impact of this tool. Using the open-source code of [educationdashboard.org](http://educationdashboard.org), a second iteration of the Education Open Data Dashboard – [elimu.takwimu.org](http://elimu.takwimu.org) – will soon be integrated directly into the Tanzanian open data portal to help build demand for additional data set availability and use.

## DATA QUALITY AND DIVERSITY

The combination of the Education Open Data Dashboard and Shule increases the diversity and thus the usefulness of available data on education in Tanzania. Taken together, the information they provide is richer and more interesting than either site would be on its own. The Education Open Data Dashboard offers indicators such as pupil-teacher ratios, regional and district rankings, and improvement rankings

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24 GovLab Interview with Arnold Minde, Founder, Shule. July 9, 2015.

25 GovLab Interview with Arnold Minde, Founder, Shule. July 9, 2015.

26 GovLab Interview with Aidan Eyakuze, Executive Director, Twaweza. July 14, 2015.

27 Bauer, Michael. "The Data Bootcamp in Tanzania." Open Knowledge Blog. October 25, 2012. <http://blog.okfn.org/2012/10/25/the-data-bootcamp-in-tanzania/>

28 Interview with Samhir Vasdev, ICT Sector Unit, World Bank Group and Verena Luise Knippel, Senior Governance Specialist, World Bank June 30, 2015.



over time, all of which are navigated via a clickable map and drop-down menu of schools. Shule captures a much longer span of data, with examination results going back to 2004. In addition to results by gender, Shule offers average performance over time, and looks at the breakdown of candidate numbers per grading division over time. It also models the effect of the 2012 grading revision to examine how it changed candidate pass rates.

Although based on government data, the data set used to build Shule is not completely identical to that used for the government dashboard because of differences in their methods of data collection. Perhaps as a result, Shule's figures can depart in significant ways from the government version. For example, NECTA has traditionally published an annual list of the 10 government and secondary schools with the highest examination results. In 2012, Minde reports that NECTA's official list contained a number of government schools, but Shule's analysis showed that all 10 of the top-performing schools were private.

For the developers of the Education Open Data Dashboard, one of the more surprising discoveries was the dashboard itself became a potent tool for teaching and understanding data management, publication, cleaning and licensing. Regional officials and head teachers were excited by finding their school or region in the dashboard, and by seeing what the data they submitted was creating, and this excitement encouraged increased understanding of data management. This suggests that the novelty of open data and data visualization, as manifested in a dashboard, can be a valuable entry point in building data management capacity.<sup>29</sup>

## IMPACT ON OTHER DATA PROJECTS

As the developers of the latest version of the Education Open Data Dashboard have indicated, Shule forms part of a nascent data ecosystem of which they were very much aware during the development and refinement of their own site. The existence of such independent projects validated both the demand for the kinds of open data portal they were building and provided evidence that the local technical and other capacity existed to build it.<sup>30</sup> Their own dashboard was, in turn, a powerful tool in demonstrating the potential and uses of open data to a nontechnical audience, particularly among policymakers. In addition, the data visualizations and linkages it made possible ignited interest in, and impetus for, the development of dashboards in other sectors, such as water and health, both priorities for the BRN initiative.<sup>31</sup>

Outside Tanzania, Shule has been used as an example of the potential and use of open data in education. Both it and the Education Open Data Dashboard illustrate the power of a deceptively simple tool, one that can be cheaply and easily produced in a matter of a few weeks by local programmers, then refined through user feedback. As one of the developers of the Education Open Data Dashboard put it: "Get a minimum viable product out there ... and provoke a response."<sup>32</sup>

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29 Interview with Samhir Vasdev, ICT Sector Unit, World Bank Group and Verena Luise Knippel, Senior Governance Specialist, World Bank June 30, 2015.

30 Interview with Samhir Vasdev, ICT Sector Unit, World Bank Group and Verena Luise Knippel, Senior Governance Specialist, World Bank June 30, 2015.

31 "Social Justice." Open Data for Tanzania. Accessed August 28, 2015. <http://tanzania.opendataforafrica.org/igcpumb/social-justice>

32 Interview with Samhir Vasdev, ICT Sector Unit, World Bank Group and Verena Luise Knippel, Senior Governance Specialist, World Bank June 30, 2015.

## IV. Challenges

Shule and the Education Open Data Dashboard are both young projects, launched into a society and country that is only beginning to grasp the potential of open data. Their most influential years could well lie ahead. However, if they are to grow and disseminate further among the population, they will need to overcome some challenges. This section examines two of the most important challenges they are likely to face.

### LACK OF INTERNET PENETRATION AND USE

Perhaps the most important challenge stems from Tanzania's low Internet penetration and usage rates. The two dashboards take as a given that providing information to target audiences will lead to improved conditions on the ground. It will be difficult to prove this, particularly in rural areas, where Internet penetration rates are estimated to be about a quarter of those in urban areas.<sup>33</sup> This clearly limits the reach of education-related data, and open data more broadly. Furthermore, of the 4.9 percent of Tanzanians who used the Internet in 2014, the great majority do so only by mobile phone; only 0.2 percent of Tanzanians had a fixed broadband subscription.<sup>34</sup> In order to appeal more widely, any open data site clearly needs to consider launching a mobile application to appeal to "the retail user of data sitting in a bus shelter with a mobile phone."<sup>35</sup>

The barriers may be even higher, in fact, when it comes to using data and technology as instruments of change. Minde notes that, in general, the Tanzanian public is deeply unfamiliar with the potential of the Internet, and perhaps not yet inclined to trust it. He adds that Tanzanians have yet to embrace or commit to digital solutions for the problems of everyday life, whether complex or mundane. As an example, he cites the difficulty he experienced in convincing bus operators to adopt an earlier application he developed that allowed passengers to purchase tickets by phone. "It will only take one [company], and then people will see the benefit," he says. "But first you have to convince the one."<sup>36</sup>

Meanwhile, as Internet penetration slowly expands, civil society organizations like parent-teacher organizations or NGOs have an important role to play as infomediaries who can share information with parents directly or through low-tech solutions like community notice boards. A recent study notes, for instance, that ultra low-tech solutions like posting printouts of information drawn from open data dashboards on school or community noticeboards can be effective in getting information to the people who can use it.<sup>37</sup>

### FRAGMENTATION

Given low Internet penetration rates, the existence of two separate dashboards for education information

33 "Tanzania: Old Media, New Media." AfricaFocus. April 5, 2011. <http://www.africafocus.org/docs11/tan1104.php>

34 ICT Statistics. ITU. Accessed August 28, 2015. <http://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx>

35 GovLab Interview with Aidan Eyakuze, Executive Director, Twaweza. July 14, 2015.

36 GovLab Interview with Arnold Minde, Founder, Shule. July 9, 2015.

37 Interview with Samhir Vasdev, ICT Sector Unit, World Bank Group and Verena Luise Knippel, Senior Governance Specialist, World Bank June 30, 2015.

could also prove confusing to parents, and limit the effectiveness of both platforms. Indeed, the greatest impact on education in Tanzania could very well come from integrating the two platforms and cooperatively advancing a single project, rather than providing a limited user base with two separate entry points for accessing essentially the same information. Moves toward greater coordination have been made, however, including notably Minde's involvement in development strategy workshops for the Education Open Data Dashboard,<sup>38</sup> where government education specialists worked with Minde and with their own data to better understand opportunities and techniques to prepare and publish open data.

## V. Looking Forward

Both the platforms under study here have begun a process of transformation that is likely to be slow and gradual. Ultimately, if they are successful in overcoming their various challenges and scaling up usage, their impact is likely to be felt far beyond the education sector.

In the near term, the individuals and groups behind the platforms have two main strategies for extending their reach.

### IMPROVING USER ENGAGEMENT THROUGH EXPANDED FUNCTIONALITY

One of the key goals in coming years, according to Minde, is to engage more average families and schools as users. Ordinary citizens want to know how schools are performing, he argues; they have a stake in the education data. Schools, especially private ones, also have a stake – they want to understand how their competitors are doing, and the data provided on Shule can help benchmark their own performance.<sup>39</sup>

In order to expand his user base, Minde plans to include a wider variety of data and new services. For example, he hopes to expand the site in the future to include Form 4 examination results, as well as the Form 2 and 6 results already included.<sup>40</sup> In addition, he would also like to increase the range of information about schools, for example mapping their locations and showing contact details, performance over time and sample student profiles. He is also considering offering an online application system that would give schools a better and more efficient way of connecting with potential students.<sup>41</sup>

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38 Interview with Samhir Vasdev, ICT Sector Unit, World Bank Group and Verena Luise Knippel, Senior Governance Specialist, World Bank June 30, 2015.

39 GovLab Interview with Arnold Minde, Founder, Shule. July 9, 2015.

40 <http://www.shule.info/about>

41 GovLab Interview with Arnold Minde, Founder, Shule. July 9, 2015.

## EDUCATION OF INFOMEDIARIES

As noted, infomediaries and civil society groups have a key role to play in overcoming the challenge posed by low Internet usage. Such groups can help disseminate insights gleaned from open data among citizens who would otherwise not have access to the data.<sup>42</sup>

Some efforts have already taken place to involve civil society. For instance, in 2012, in an effort to encourage interest and build skills among coders and the media, the World Bank Institute and the Africa Media Initiative combined to offer the Data Bootcamp in Dar es Salaam.<sup>43</sup> A similar initiative was offered by Twaweza in 2013, and community groups such as the Open Knowledge Foundation Network TZ have attempted to promote open data meetups in Dar es Salaam. In 2015, the Africa Open Data Conference was organized by a group that included both civil society organizations such as Code for Africa and the Open Knowledge Foundation, and the World Bank. These collaborations, and smaller informal meetups, provide an opportunity to bring together atypical combinations of stakeholders to meet and work with data.<sup>44</sup>

Such efforts are likely to become more frequent in the coming years – and, as they do, the impact of open data on education and many other sectors will begin to be felt more widely. Greater impact will also increase awareness, thus creating a virtuous cycle of change and empowerment. For the moment, significant challenges remain. But the two projects studied here indicate the clear potential of open data to, application by application, sector by sector, chip away at those challenges.

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42 It is worth noting, however, that even among such groups, awareness of the potential of open data remains at best nascent. Like the public at large, civil society groups also need to be trained to analyze and visualize data.

43 Bauer, Michael. "The Data Bootcamp in Tanzania." Open Knowledge Blog. October 25, 2012. <http://blog.okfn.org/2012/10/25/the-data-bootcamp-in-tanzania/>

44 Interview with Samhir Vasdev, ICT Sector Unit, World Bank Group and Verena Luise Knippel, Senior Governance Specialist, World Bank June 30, 2015.