Big data solutions for micro-, small- and medium-sized enterprises in developing countries

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Abstract:

In recent years, micro-, small-, and medium-sized enterprises (MSMEs) in developing countries are increasingly benefiting from big data solutions. Such solutions have helped developing world-based MSMEs to improve business processes and market intelligence. Big data solutions have also helped them to increase access to financial services, such as loans, credit, and insurance.

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Article:

The use of big data solutions to make better and faster business decisions is no longer limited to large organizations. In recent years, micro-, small-, and medium-sized enterprises (MSMEs) in developing countries are increasingly benefiting from big data solutions (see Table 1). Such solutions have helped developing world-based MSMEs to improve business processes and market intelligence. Big data solutions have also helped them to increase access to financial services, such as loans, credit, and insurance.[1]

Table 1. Some examples of big data solutions from MSMEs in developing countries.

Launched by	Big data solution	Key functions
Indonesia's Collective Intelligence Agriculture	Mobile App CI Agriculture	Give advice regarding the best time to plant, fertilize and use pest control based on the analysis of soil condition, weather, and other factors Predict prices and demand of crops Increase farmers' access to low-cost loans and insurance
China's Alibaba	Ling Shou Tong for small physical stores	Help store owners make decisions related to product procurement and sales
	Big data-based advertising and other services to online vendors	Provide deep insights into shoppers' preferences
Kenya's FarmDrive	DigiFarm	Help smallholder farmers get low-cost loans combining their records revenues and expenses with other categories of information to generate credit scores

MSMEs make a significant contribution to national economic development in developing countries. The developing world is estimated to have 365–445 million formal and informal MSMEs (https://tinyurl.com/y5vffr3p). Formally registered MSMEs are estimated to contribute up to 45% of total job creation and 33% of gross domestic product in developing economies. These proportions would dramatically increase when informal MSMEs are included. MSMEs are likely to play especially important roles in reducing rural poverty among women and other disadvantaged groups.[2] Big data diffusion among MSMEs is, thus, likely to bring tremendous economic and social benefits to developing countries.

BIG DATA SOLUTIONS TO IMPROVE BUSINESS PROCESSES AND MARKET INTELLIGENCE

An important use of big data solutions has been in improving MSMEs' business processes and market intelligence. To take an example, Collective Intelligence Agriculture (CI-Agriculture), a subsidiary of Indonesia's big data analytic firm Mediatrac, has developed precision farming techniques for the Indonesian context. Small holder farmers can use the technique. Its Crop Accurate system uses data from diverse sources such as satellite, drone, and sensors for smart farming. The system analyzes soil condition, weather, and growth progress to give farmers advice regarding the best time to plant, fertilize, and use pest control. Farmers can make more efficient use of fertilizer and pesticides.[3] CI-Agriculture also learned about local farming practices and supply chains to develop the system.[4] The technology is scalable, which means that it is possible to use sensors for a large area. Agricultural data are collected and analyzed on a regular basis to predict crop yields. At the end of each season, smart farming system analyzes the data and provides recommendation to improve farming in the next season.

CI-Agriculture's another solution, Agritrack system, links farmers with supply chain partners such as distributors, market, and end customers.[5] Each party of the supply chain provides data via an app. Real-time information on key indicators, such as commodity prices, is provided, which can help predict prices and demand of farmers' produces.

To take another example, China's Alibaba has attracted vendors to its e-commerce websites Taobao Marketplace and Tmall.com by promoting big data-based advertising and other services. These solutions provide deep insights into shoppers' preferences.[6] Taobao has 666 million monthly active users (https://fortune.com/longform/ping-an-big-data) and over nine million vendors (https://www.azoyagroup.com/blog/index/view/chinas-new-e-commerce-law-bad-for-daigou-good-for-cross-border-e-commerce/).

Alibaba has also developed a big data-based retail-management platform known as Ling Shou Tong for small physical stores in China. The solution aims to help store owners in making decisions related to product procurement and sales. In 2017, Alibaba started providing the platform to Chinese retail shops. The shops get the platform for "free" but they are required to use their storefronts as Alibaba's fulfillment-and-delivery centers. They also need to provide data on their customers' shopping habits and patterns (https://tinyurl.com/y5mpzgle).

BIG DATA SOLUTIONS TO IMPROVE ACCESS TO KEY RESOURCES

Big data solutions can also help to improve MSMEs' access to key resources. Especially access to credit is extremely difficult for smallholder farmers in the developing world. For instance, less than 1% of farmers in Kenya are reported to have access to formal credit.[7] To address this, the Kenya-based social enterprise FarmDrive's big data solution DigiFarm helps unbanked and underbanked smallholder farmers to receive credit. The process is simple. Smallholder farmers keep a record of their revenues and expenses. An app installed in the phone tracks these records. This information is combined with data generated from other sources such as satellite, agronomic data such as crop yields, pests and diseases, and local economic data.[8] In addition to agriculturally relevant data, DigiFarm also uses know your customer data to identify and verify the identity of the farmer as well as advanced behavioral analytics (https://tinyurl.com/y66awka5). The information is used to generate credit scores and assess their creditworthiness for loans (https://tinyurl.com/yyun3mes). Banks can use this information to provide loans to farmers and customize a farmer's payback timeline in order to match with harvests. As of 2018, over 200,000 farmers were using DigiFarm on a daily basis and 7,000 had successfully received loans to buy seeds, fertilizers, and pesticides (https://tinyurl.com/yyx4u8sz).

Likewise, big data solutions of Indonesia's CI Agriculture discussed above are expected to reduce loan costs for small-holder farmers. Data from satellite, drone, and sensors are used to calculate a field's production potential with a higher level of accuracy. These data can also be utilized to make more efficient use of fertilizer and pesticides.[3] CI-Agriculture provides insurance to farmers, which is based on calculations and schemes on smart farming technology, sensor systems, and analysis of other categories of data (https://tinyurl.com/yxrtgn2o). Insurance models are based on an analysis of weather data for up to 10 years.[4]

KEY CHALLENGES AND OPPORTUNITIES

MSMEs in developing countries have a number of options available to utilize big data solutions. MSMEs can benefit from open-source software such as Hadoop and Spark. For instance, Hadoop-based applications help MSMEs take advantage of real-time analytics from diverse sources and types of data. These include data from external sources such as social media, machine generated data, as well as data from video, audio, email, and sensors. Many global technology companies such as Microsoft, IBM, EMC, Google, and Amazon Web Services provide Hadoop-as-a-Service (HaaS) to MSMEs in many developing countries. The HaaS providers help MSMEs in the management, analytics, and storage of data (https://tinyurl.com/y5vagmu7). MSMEs are increasingly adopting HaaS (https://tinyurl.com/y23hhj4r). These and other big data solutions targeted at MSMEs are getting more user-friendly. This is a rich community of users. Tutorials, tools, and other services are more easily accessible to MSMEs (https://tinyurl.com/yyun3mes).

MSMEs obviously experience a number of barriers in the adoption of big data solutions. Big data solutions provided by big companies are unaffordable and out-of-reach for many MSMEs in developing countries. For instance, it was reported that due primarily to Alibaba's high advertising rates, most vendors on Taobao were making losses.[9] According to an article published in the Chinese language newspaper Enterprise Observer in August 2013, over 80% of

sellers on Taobao did not make a profit. It was also reported that thousands of shops on Taobao close down every day.[10]

In many cases the benefits to MSMEs of so-called free big data solutions provided by technology giants are not clear. The providers of such solutions tend to use them as a useful instrument to promote their own interests rather than those of MSMEs'. For instance, while the use of Ling Shou Tong may make it easier to run stores, many small stores worry about unfair competition from Alibaba's online marketplace, which has a huge selection of products to choose from. This means that these small stores' customers may decide to take advantage of the convenience of online shopping on Alibaba's online marketplace and pick up the products from these stores (https://tinyurl.com/y5mpzgle). Furthermore, Alibaba is in a position to make a better utilization of data on these stores' customers that these stores are required to provide.

Effective utilization of big data requires organizational capability to handle cooperation across different units and departments. Organizations in many developing countries may lack capabilities to organize and manage such multidisciplinary teams. A further challenge is MSMEs' lack of human resources to utilize big data effectively. Indeed, even large enterprises face such challenges in developing countries. Especially there has been a severe lack of big data manpower with high-level strategic thinking capabilities in developing countries. For instance, compared to many other developing countries, China has a rich endowment of big data human resources, thanks to an abundant supply of engineers. The country, however, lacks experts at the executive level (https://tinyurl.com/y5ayxkwl). Likewise, the lack of strategic leadership and the lack of idea of where to start the implementation of solutions are noted as a main reason why Colombian companies have not taken advantage of big data.[11]

More broadly, the big data labor market in developing economies faces challenges on two fronts.[5] First, there is a severe lack of engineers and scientists in order to perform analytics. Second, many analytics consultants lack skills and capabilities to understand, interpret, and put the data to work. Some estimates suggest that India would experience a shortage of 1 million data consultants (http://www.techrepublic.com/article/indias-high-demand-for-big-data-workers-contrasts-with-scarcity-of-skilled-talent/).

SUMMARY

The reliance on big data to make better and faster decisions is, thus, no longer limited to large companies. While only a tiny fraction of MSMEs in the developing world are currently taking advantage of big data solution, such solutions are getting popular among these enterprises. They increasingly depend upon big data. Data-driven decisions are gradually becoming the norm among these enterprises.

There are growing and encouraging signs of big data's positive impacts on MSME in the developing world. Big data-based innovations such as low-cost crop insurance and low-cost loans have benefitted micro enterprises and small holder farmers in the developing world. In addition to access to these strategically valuable resources such as finance and insurance, big data-based solutions have also increased the quality of their entrepreneurial activities with improved business processes and market intelligence.

Since MSMEs are critical for job creation and economic growth, it is important to deploy policy measures to facilitate the adoption of big data by these enterprises. For instance, broad national policy measures directed toward increasing competition in the big data industry may lead to the availability of affordable solutions to MSMEs. This can be done by attracting foreign big data companies and facilitating the growth of local companies in this sector.

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