

Protocol for Systematic Review

Title

Does access to business relevant information through networked devices enhance the internal efficiency and business growth of the urban MSMEs in low and middle income countries?

Team

P. Vigneswara Ilavarasan, PhD*

Garima Sahay

Albert Otieno

Charlie Cabotaje

Ying Huang

* For communication: evignesh@gmail.com; +91 9910230407, Skype: vignesh.iitd

The Background

The objective of this systematic review is to examine the evidence as to whether access of business relevant information through networked devices enhances the internal efficiency and business growth of urban micro, small and medium enterprises (MSMEs) in low and middle income countries. To our knowledge, no systematic review in this area has been performed to date¹. MSMEs play a crucial role in the economic growth and job creation of both developing and advanced economies (Stein, Goland, and Schiff, 2010). MSMEs offer a broad range of employment opportunities and play an important role in reducing urban poverty. The studies of information and communication technologies (ICTs) in this space are moving from capturing adoption to understanding impact (for instance, Chew, Levy, and Ilavarasan, 2011). The adoption studies are conclusive about the level of adoption of information and communication technologies (ICTs)² by MSMEs, mobile phones lead the pack of ICTs and voice based activities in the personal domain dominate the usage patterns. The studies on the impact of ICTs, especially in the growth of MSMEs seem to be unclear (Chew, Levy, and Ilavarasan, 2011). With rise of networking capabilities, through Internet, of low cost technologies like mobile phones, questions are being asked whether these networked technologies are resulting in overall economic growth, at least for the MSMEs. With confusion persisting over the impact of information and knowledge mediated through networked devices on MSMEs, this review is first of its kind to attempt to find a conclusion.

The review aims to identify the contexts under which information and knowledge through networked devices may or may not contribute to the growth or even to increasing internal efficiency of the MSMEs. Some of the most commonly used types of indicators in the assessment of MSMEs growth and internal efficiency include those related to: time saving; Increase in sales, turnover, number of employees, branches, customers, suppliers, work locations, partnerships, products, services, business networks, and incoming referrals, diversification into new areas of business, products & services, and inventory management among others.

The review focuses on the urban MSMEs, since half of the world's six-and-a-half billion people now live in cities and over the next 30 years almost all global population increase is projected to occur in the urban areas of the developing world (United Nations Department of Economic and Social Affairs Population Division, 2006). As the world moving towards urbanization, understanding of ICTs in urban MSMEs will provide evidence based support for policy making. Also, direct and positive correlation have been demonstrated between the urban percentage of population in low-income nations and higher scores on the U.N.'s human development index (United Nations Department of Economic and Social Affairs Population Division, 2006). As the MSMEs are populated by the microenterprises which are again owned by either poor or low income population groups, the findings from this review is directly applicable to the poor (Stein, Goland, and Schiff, 2010)..

¹ An attempt is being made at systematic review of impact of mobile phones on rural enterprises and households (see here for further details <http://www.3ieimpact.org/en/evidence/systematic-reviews/details/249/>). The proposed review differs in terms of focus on networked devices, internal efficiency and business growth of micro enterprises located in urban localities.

² According to the World Bank, "ICTs consists of the hardware, software, networks, and media for the collection, storage, processing, transmission and presentation of information (voice, data, text, images), as well as related services." (ICT Glossary Guide).

We hope that the outcome of review will directly benefit the policy agents in the low and middle income countries to support or rethink their approaches in supporting or encouraging MSMEs and penetration of ICTs in their respective countries.

The Problem / Issue

We propose to examine whether access of business relevant information through networked devices enhances the internal efficiency and business growth of urban micro, small and medium enterprises (MSMEs) in low and middle income countries.

The extant literature is abundant and is consensual about adoption and diffusion of information and communication technologies (ICTs) among MSMEs in low and middle income countries and cost barriers to ICTs are lowering, especially Internet, and mobile phones (Qiu, 2009). However, agreement emerging out of quantification of impact of ICTs on MSMEs seems to be unclear. The proposed systematic review attempts to address the gap in the literature.

The Intervention

We choose 'access to business relevant information through use and access of networked devices' as intervention in this proposed systematic review. Any tool through which user can receive and send information to other users is treated as networked device. These devices are electronic tools. Examples of networked devices include: mobile phones, computers, laptops, tablets, and phablets³ etc. We focus on networked nature of the devices as the interconnectedness of technologies generates ever increasing value to the MSMEs (Piscitello and Sgobbi, 2004).

The focus here is the networked nature of the intervention, which refers to the use of such devices as the medium of information exchange or an interactive communication process, in spite of its ownership, electronic nature or one-way communicational impacts. In other words, only when the intervention fosters the "exchange" of information can it be counted as "networked". The users, i.e. the MSMEs, need not own these networked devices. The device can be of public access as well. For instance, a MSME accessing a computer in an Internet cafe will be treated as networked device. For example, the use of mobile phone to send business related SMS should be included while the use of this same device only as a calculator should be excluded. Similarly, use of laptop or computer will be included only when they are connected to Internet or intranet. A television will not be included in this review, as a MSME receives the information from it and will not be using it to send information.

The networking nature of the devices will be completely open. However, the networking nature can be either restricted to a particular location or sets of devices. The networking can be enabled by themselves or an external agency - government, private or a non-governmental organization. It can also be either paid, shared or non paid.

³ a smartphone having a screen which is intermediate in size between that of a typical smart phone and a tablet computer. (Source: <http://www.oxforddictionaries.com/definition/english/phablet>)

The review will not emphasize the duration of ownership or access of the networked devices. Importance will be given whether the networked devices enabling information processing among the users.

The business relevant information is treated as any information that are used by the MSMEs for business related activities. The information types are multiple and are often interrelated. The examples include, communication from employees to owners and themselves that are related to the enterprise (simple examples include availability or non-availability of workers for work and location of owners etc), communication with customers, suppliers and partners (example being conveying status of orders to the customers or placing order with the suppliers), informal communication with business friends or networks to gauge the market, on-going market prices of inputs (raw materials, labor, transport, etc.), and products, and special services catering for MSMEs (e.g., government policies regarding business registration, tax incentives or other programs). The studies under review should explicitly mention that information is being used for or relevant to the business.

How the Intervention Might work?

We assume that MSMEs that receive business relevant information through networked devices will use them to achieve better internal efficiency and business growth of the enterprises (for instance, Donner and Escobari, 2010). For example, intimation on arrival time of pick-up truck from the transporter will enable the microenterprises to inform the customers about the time of delivery, thus resulting in better customer relationship management or repeat sales. This is schematically present in Figure 1.

We will follow a two layered analysis approach. First, MSMEs will be treated as a single group in the first round of analysis due to lack of standardized definition of MSMEs across the countries. Further analysis will differentiate the different types of them (size, nature of business domain - agriculture or not; manufacturing or not, and ownership gender etc) and the nature of causal relation exists between their use of networked devices and subsequent impacts. Efforts will be made to cluster the findings on the basis of number of workers and turnover, the two important components of definition worldwide.

However the outer boundary for the MSME as defined by the European Union, especially number of workers, will be followed. It defines a medium enterprise as one with less than 250 employees and annual turnover of less than 50 million Euros⁴.

We understand that the definition of the European Union may not be appropriate for low and middle income countries. The definition for a MSME is multiple across different countries. A scan of literature indicates that universally accepted standard definition is not available (Ilavarasan, 2004). Some of the factors used in definitions are: number of employees; nature of work contract of employees; annual turnover; investment; shareholders fund; gross income; and value of fixed assets. If the review considers country specific definition, there is a risk of non-generalization of the findings. As a nominal definition, the review will keep 250 employees as the outer boundary to

⁴ http://ec.europa.eu/enterprise/policies/sme/files/sme_definition/sme_user_guide_en.pdf

define a MSME. In the subsequent analysis, attempts will be made to differentiate the conclusions on the basis of number of workers. The other factor in the definition, 50 million Euros, will also be kept. But we are assuming that none of the MSMEs in the target countries will touch or exceed the boundary. However, one cannot rule out possibilities of small high technology start-ups with lesser employees achieving this.

The review include MSMEs that are operating out of urban locations. We do not differentiate the nature of industrial or business domain the MSME is operating - manufacturing, services and trade. Even MSMEs operating on a business related to agriculture, like selling fertilizers or seeds, will be included, provided they are stationed in the urban localities. The literature points out that ICTs are used differently by different domains (for instance, Ilavarasan and Levy, 2010). However, the findings of the review will offer the comparison of different types of MSMEs.

The internal efficiency of the MSMEs with respect to the focus of the review, information and networked devices, are inferred by multiple factors: the amount of time take by the enterprises while engaging in business - less travel due to networked devices, ability to manage home and work, especially for women entrepreneurs, availability of market requirements optimizes the production or service delivery process and inventory management, coordination with the employees and between different functional units within the enterprise improves productivity, enhanced channels for customer feedback improves the customer relationship management practices, improvement in managing business networks with respect to customers and suppliers, and increased access to finances due to inflow of information from various sources etc. Heeks & Duncombe (2005) delineated four possible roles for ICTs in the internal processes of MSMEs which can be extrapolated for the review as well. The four major areas are: value chain core (internal core operations of the business), value chain boundaries (to contact current and new customers, suppliers, etc.), value chain support (accessing information about supply and demand, and policy guidelines), and networking support (Connecting with social networks and building social capital with other business people).

Business growth will not be measured just by increase in turnover or revenue. As the focus is on MSMEs, multiple facets of business growth will be considered - increase in sales, turnover, number of employees, number of customers, number of suppliers, expansion of work premises, moving to a larger premises, shifting from rented location to owned, number of branches, number of service offerings, number of products, business networks, new partnerships, and inflow of referrals for business.

The impact of business relevant information on the internal efficiency and business growth of MSMEs is possible through use of networked devices. However, there are other intervening factors that influence this relationship. Some of the possible factors are characteristics of MSMEs (age, size, industry domain, nature of employees, nature of customers and suppliers- walk-in, domestic, export, and ownership pattern etc), characteristics of owners (age, education, education, ICT literacy, and English language capabilities, etc), policy environment (protective of MSMEs, financial incentives for internationalization, and skill development facilities etc), gender, and national culture specific factors like paid employment preferences, and poor women labor participation rate etc). These important external factors are context specific and shall not be ignored in the review. However,

these factors will not be used for filtering in or out the literature, but in the synthesis of the findings. The review will attempt to sift the findings in the light of these external factors. While conducting analysis, the review will consider the assumption that the business relevant information through networked devices might result in internal efficiency which in turn will result in business growth.

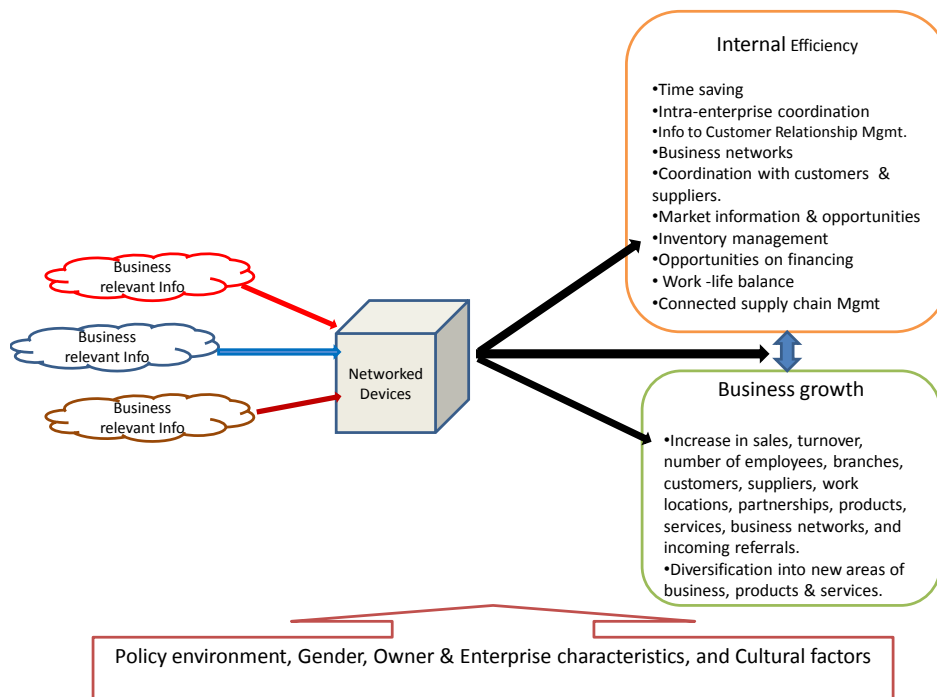


Figure 1: Role of networked devices in causal relationship between business relevant information and its impact on MSMEs.

Why it is important to do the Review?

This systematic review is important on many counts. Micro, small and medium enterprises (MSMEs) are significant sources of employment and channels of livelihood for the poor in low and middle income countries across the world (Ghanem, 2013). Rapid advancements in technology, particularly Information and Communication Technology (ICTs), have made it possible for the MSMEs to gain access to some of the goods and services including labour that may have been previously beyond their reach. Increased access to information and knowledge as well as the opportunity to participate in knowledge networks through the use of ICTs and globalization have led to increased opportunities for the MSMEs to integrate with the global markets. However, are the MSMEs able to utilize the opportunities now available? If so, what types of knowledge and information do they seek and from what sources?

Proposed systematic review makes an attempt to validate the existing broad notion that networked devices like mobile phones, computers with Internet and Internet cafes etc result in positive outcomes for the MSMEs in the low and middle income countries. This notion is widely seen in the

policy documents of the national governments, international agencies⁵ or even in the academic literature (Heeks, 2008). Though we are not belittling the serious attempts made by these players in creating the evidences, a closer look at the field is not showing repeated evidences. The most cited studies by Jensen (2007) and Aker (2008) on impact of mobile phones are either not being replicated or other studies not widely visible to the researchers. The impact of ICTs on enterprises is debated between no impact (for instance, Carr, 2004) and both negative and positive impact (for instance, Chowdhury and Wolf, 2003), due to nature of MSMEs (Esselaar et al., 2007) or minimal impact (Han Ei, Ilavarasan and Levy, 2011). With respect to MSMEs, Duncombe and Heeks (2005) offer a valuable framework to examine the use of ICTs by MSMEs to alleviate poverty, but empirical evidence is sparse.

Deducing inferences from macro studies (national level data) (Katz, 2012) that links mobile penetration or broadband subscriptions to GDP for micro level (individual level) impact is a case of ecological fallacy. For instance, increase in broadband penetration may result in increase in GDP, but not necessarily increases revenue for microentrepreneurs. The review will include both macro and micro empirical studies. Macro studies will be included, if the focus is touching on the causal relationship delineated by the logic model of the review.

Needless to elaborate, presentation of importance of MSMEs in national development in terms of employment provision and related livelihood opportunities is abundant. MSMEs in low and middle income countries experience higher mortality rates and suffer from many challenges which include lack of access to market information, onslaught of global competition, infrastructure woes, poor manpower availability, lack of connectedness and technological obsolescence (Liedholm and Mead, 2009). Emergence of ICTs appear to circumvent many of these challenges. With gradual decrease in cost of hardware and blurring of computers and handheld devices, along with increasing access of broadband, availability of erstwhile privileged information to reach markets seems to be achieved. Out of these much discussed ICTs, mobile phones are leading the pack (Ilavarasan and Levy, 2011). Penetration of other networked devices like computers and laptops with Internet among the MSMEs is minimal (Ilavarasan and Levy, 2010, 2012; Esselaar et al., 2007). It will be prudent to see whether these devices, especially mobile phones, have enabled the MSMEs to overcome the challenges and achieve better economic growth status.

Among all the networked devices, the literature highlights the ubiquitousness of mobile phones, especially among the lower class population categories or bottom of pyramid and its positive impact on many domains⁶ (for instance , which include empowerment, economic growth opportunities, and transparent governance. Whether these phones have served the purpose of enabling the access to information that are relevant to the users like MSMEs to achieve positive results?

Ownership of device alone is inadequate to achieve the desired outcome, as the relevant usage determines outcome of the device. For instance, studies on use of mobile phones by microenterprises indicate dominance of personal domain rather than the business domain (Donner, 2009) . Also, an understanding of causality of the relationship between the device and outcome is

⁵ For instance, http://www.infodev.org/infodev-files/resource/InfodevDocuments_19.pdf

⁶ see here for detailed multi-country studies <http://lrneasia.net/projects/2008-2010/bop-teleuse-3/>.

important to decide the primacy of the actor.

The field has seen some reviews of ICTs in MSMEs, but suffers from inadequate rigour in the reviewing process. For instance, Barabara-Sanchez, Martinez-Ruiz, and Jimenez-Zarco (2007) and Ongori and Migiro, (2009) claim that they have done either 'critical review' or 'literature review' but failed to elaborate on how studies were chosen for review, examined and findings were synthesized. The approaches of these studies were more of ad-hoc rather than systematic. One study clearly follows systematic review methodology, Donner and Escobari (2010), but restricts itself to mobile phones and omits other networked ICTs. One more study (Donner, 2008) reviews an impressive 200 studies, but again focuses on mobile phones, and fails to provide a numerical analysis of the literature. Given this inadequacy in the field and vigorous pursuance by the policy makers in pushing ICTs, especially networked ones, there is a dire need for a systematic review to support their claims and policy initiatives.

Rather than restricting to only mobile phones, this review broadens the scope by including networked devices as there are possibilities of other handheld devices made available by the market or the government in the low and middle income world⁷.

Objectives

The proposed review aims to assess and synthesize research evidence on impact of access to business relevant information through networked devices on internal efficiency and business growth of the urban MSMEs in low and middle income countries. In this process of reviewing, we hope that the available literature will throw light on the following:

- What is the role played by the networked devices in the relation between information access and business growth for MSMEs in the low and middle income countries?
- How does the causal relationship between business relevant information and positive outcomes is mediated by information and communication technologies (ICTs), especially the networked devices?
- Whether the differential impact of networked devices in the causal relationship, if any, are due to extraneous factors like policy environment, characteristics of MSMEs and owners, gender and national specific cultural factors.
- What are the outcomes emerging from a sub-groups comparison between personal vs non-personal networked devices, male vs female owned MSMEs, micro vs small and medium enterprises, and Asian vs African countries etc.

The outcomes of this systematic review will provide insights for policy making in the countries where ICTs are pursued for national development through MSMEs. For instance, Africa's MSMEs suffer due to lack of access to finance (Kauffmann, 2005), as in all low income countries and efforts are being made to address the same. The networked devices might enable the MSMEs to access the required crucial information from the policy makers. Additionally, the review might be able to say provision of

⁷ for instance, Govt, of India is giving \$ 2 billion worth free mobiles, tablets to student community. <http://www.financialexpress.com/news/rs-10000-cr-plan-in-the-works-to-give-free-mobiles-tablet-pcs/1165642>

information comes first before the ICTs for MSMEs or the absorptive capacity of MSMEs is crucial from processing available information through the networked devices.

Methodology

Criteria of inclusion

Population:

Studies should have been done in the low and middle income countries. We will follow the list provided by the definition of World Bank.⁸ The MSMEs in question should be located in urban areas, defined by the respective national statistics frameworks. Studies on rural locality based MSMEs will be excluded from the review.

The studies should have clearly mentioned the definition for MSMEs they have adopted. Those who have included enterprises with more than 250 employees and annual turnover of less than 50 million Euros will be included.

Interventions:

The proposal undertakes 'access to business relevant information through use and access of networked devices' as the intervention for analysis.

The business relevant information is treated as any information that are used by the MSMEs for business related activities. The examples include, communication from employees to owners and themselves that are related to the enterprise (simple examples include availability or non-availability of workers for work and location of owners etc), communication with customers, suppliers and partners (example being conveying status of orders to the customers or placing order with the suppliers), informal communication with business friends or networks to gauge the market, on-going market prices of inputs (raw materials, labor, transport, etc.), and products, and special services catering for MSMEs (e.g., government policies regarding business registration, tax incentives or other programs). The studies under review should explicitly mention that information is being used for or relevant to the business.

Any tool through which user can receive and send information to other users is treated as networked device. These devices are electronic tools. Examples of networked devices include: mobile phones, computers, laptops, tablets, and phablets etc

Outcomes:

We will include studies that assess the impact of access of business relevant information through use and access of networked devices on the internal efficiency and business growth of MSMEs.

The examples for the internal efficiency of the MSMEs include the following: the reduced amount of time taken by the enterprises while engaging in business, availability of market information,

⁸ http://data.worldbank.org/about/country-classifications/country-and-lending-groups#Low_income

coordination with the employees, and receiving customer feedback, etc.

The business growth will be measured by increase in turnover or revenue, increase in sales, turnover, number of employees, number of customers, number of suppliers, expansion of work premises, moving to a larger premises, shifting from rented location to owned, number of branches, number of service offerings, number of products, business networks, new partnerships, and inflow of referrals for business etc.

Study types:

All the studies that follow experimental and non-experimental designs will be included. Among the non-experimental designs, exclusive qualitative studies will be omitted. Exclusive qualitative studies will be excluded, as they do not present the causal relationships in numerical forms.

While presenting the findings, the studies should have used at least elementary inferential statistics, for instance, Chi Square. Descriptive statistics based studies will be omitted as the focus of the review is causal relationships. While explaining the causal relationships, if ICTs or networked devices are treated as inputs or independent variable, the studies should clearly mention the results of reverse relationships. For instance, ICTs should enable the information access to MSMEs and not vice versa.

The studies do not include networked devices or business relevant information as part of investigation shall not be included. The review will include only studies that are published in English.

Time period:

The review will include studies, both published and grey literature, that are available from 2000, a year of Millennium Development Goals of United Nations where Goal 8 has Target 8F '... to make available benefits of new technologies, especially information and communications'⁹

The criteria of inclusion is summarized in Table 1.

Search strategy

The search of studies required for the review will involve multiple stages. In the first stage, all material relevant, even marginally, to the review will be collected from multiple sources. Keywords that were derived from the concepts discussed earlier and summarized in Table 1 will be used for search of material. Keywords are given in the Table 2.

⁹ <http://www.un.org/millenniumgoals/global.shtml>

Table 1: Criteria of inclusion

| Components | Description |
|-------------------|---|
| Participants | <p><i>Countries:</i> Low and lower middle income countries as defined by World Bank.</p> <p><i>Target group:</i> Micro, Small and Medium Enterprises - maximum with 250 employees and annual turnover of less than 50 million Euros. All MSMEs irrespective of size, domain of business (agriculture or not; manufacturing or not) and ownership gender etc) will be included. The studies should have provided segregated analysis for the MSMEs.</p> <p><i>Location:</i> Urban.</p> |
| Interventions | <p>Business relevant information enabled by networked (ICT) devices. Business relevant information include communication from employees to owners and themselves that are related to the enterprise, communication with customers, suppliers and partners, informal communication with business friends or networks to gauge the market, on-going market prices of inputs and products, and special MSME policy related information. Networked devices include any electronic tool used by MSMEs that are connected to other similar devices either through Internet or intranet.</p> |
| Comparisons | <p>Among the selected studies, comparison groups will be delineated for analysis. Some of them include, personal vs non-personal networked devices; male vs female owned MSMEs micro vs small and medium enterprises; and Asian vs African countries.</p> |
| Outcomes | <p>Internal efficiency of MSMEs; Business growth of MSMEs.</p> |
| Study types | <p>All the studies that experimental and quasi experimental design are included in the analysis. Exclusive qualitative studies will be omitted.</p> <p>The analysis of the studies should have undertaken at least inferential statistics.</p> <p>The studies do not include networked devices or business relevant information as part of investigation shall not be included.</p> |
| Time Frame | <p>Published in 2000 and after.</p> |

Table 2: Keywords to be used in literature search

| Components | Description | Keywords |
|---------------|---|--|
| Participants | <p>Countries: Low and lower middle income countries as defined by World Bank</p> <p>Target group: Micro, Small and Medium Enterprises - maximum with 250 employees and annual turnover of less than 50 million Euros</p> <p>Location: Urban</p> | <p>Developing countries, underdeveloped countries, less developed countries, low income countries, lower middle income countries, middle income countries.</p> <p>Afghanistan, Gambia, The Myanmar, Bangladesh, Guinea, Nepal, Benin, Guinea-Bissau, Niger, Burkina, Faso. Haiti, Rwanda, Burundi, Kenya, Sierra, Leone, Cambodia, Korea, Dem, Rep, Somalia, Central African Republic, Kyrgyz Republic, South Sudan, Chad, Liberia, Tajikistan, Comoros, Madagascar, Tanzania, Congo, Dem Rep, Malawi, Togo, Eritrea, Mali, Uganda, Ethiopia, Mozambique, Zimbabwe, Armenia, India, Samoa, Bhutan, Kiribati, São, Tomé, Príncipe, Bolivia, Kosovo, Senegal, Cameroon, Lao, PDR Solomon Islands, Cape Verde, Lesotho, Sri Lanka, Congo, Rep. Mauritania, Sudan, Côte d'Ivoire Micronesia, Fed. Sts. Swaziland, Djibouti Moldova, Syrian, Arab Republic, Egypt, Arab Rep. Mongolia, Timor-Leste, El Salvador Morocco, Ukraine, Georgia, Nicaragua, Uzbekistan, Ghana, Nigeria, Vanuatu, Guatemala, Pakistan, Vietnam, Guyana, Papua, New Guinea, West Bank and Gaza, Honduras, Paraguay, Yemen, Rep, Indonesia, Philippines, Zambia.</p> <p>SMEs, MSMEs, small, medium, informal, large enterprises, small businesses, small enterprises, microenterprises, micro businesses, medium enterprises, medium businesses, tiny businesses, entrepreneurs, microentrepreneurs, self-employed, owners, business men, business women, self-help groups, cooperatives, social enterprise, Start-ups, incubators, born globals,</p> <p>Urban, city, town, semi urban, metropolitan, metro, township, metropolis, central business district, city center, industrial area, non-agriculture area</p> |
| Interventions | <p>Business relevant information enabled by networked (ICT) devices</p> | <p>Business relevant information:</p> <p>Calling and receiving calls from employees, customers, suppliers, distributors, government officials, partners, order, supplies, delivery, despatch, market prices, selling price, buying price, raw materials, labor supply, power, electricity, tax, registration, transport, products, services, closure, timing, reminders, list, reminders, account balance, savings, and interest rate.</p> <p>Networked devices:</p> |

| | | |
|-------------|---|---|
| | | Laptop, computer, PC, Internet Cafe, Internet, landline, telephone, mobile phone, mobile, cell phone, cell, cellular phones, cellular, smart phones, CSCs, telecenters, Wfi, mobile Internet, WLAN, GPRS, instant messaging services, mobile applications, ipad, iphone, apple, android, windows, broadband, wireless, wireline, CDMA, SMS, text, short messaging services, shared phone, phone ladies, MMS, facebook, linkedin, network, Intranet, discussion list, contacts, online forum, discussion thread, online feedback section. |
| Comparisons | personal vs non-personal networked devices. male vs female owned MSMEs. micro vs small and medium enterprises. Asian vs African countries. | (Not applicable) |
| Outcomes | Internal efficiency of MSMEs. Business growth of MSMEs. | Time saving, less journey, travel, intra-enterprise coordination, information to customer relationship management, customer feedback, business friends, associations, business networks, social capital, coordination with customers and suppliers, customer interaction, market rates, goods, services, opportunities, inventory management, opportunities on financing, work -life balance, supply chain management, efficiency, staff productivity, communication, mobility, Production growth, productivity growth, output growth, storage/warehouses, finance, credit. Increase in sales, turnover, number of employees, branches, customers, suppliers, work locations, partnerships, products, services, business networks, and incoming referrals, Diversification into new areas of business, products & services, business scale / size, market value, reputation. |
| Study types | Experimental and quasi experimental design studies. | Experimental design, quasi experimental, experiments, RCTs, control groups, treatment groups, participation, non-participation, intervention, factor design, statistical designs, random, empirical data, survey, questionnaire, longitudinal data, sampling, assigning, sample size, regression, DID, Propensity Match Scoring, PMS. |
| Time Frame | Studies published in 2000 and after. | Year of publication is 2000 and after. |

Following sources of material or studies, all in English, will be searched:

Academic Databases:

- ABI / Inform
- Digital Library
- Annual Reviews
- EBSCO Databases
- Elsevier's Science Direct
- Emerald Management Xtra
- IEEE Electronic Library online
- JSTOR
- Nature
- Taylor & Francis
- SCOPUS
- Web of Science
- American Economic Association Journals
- Cambridge University Press
- Oxford Journals
- Sage
- Wiley
- Inderscience
- IGI Global
- Psychlit
- Sociological Abstracts
- Academic Search Complete

Grey Literature:

Institutional databases

- Infodev
- World Bank
- DIME
- World Bank
- JOLIS
- IMF
- World Bank
- DFID's Research for Development
- IDRC's Digital Library
- IDEAS
- J-PAL
- ELDIS
- British Library of Development studies
- Millennium challenge
- USAid
- FAO
- UK Theses Ethos
- US/Canada Dissertations
- SSRN.

Academic search engines like Google Scholar, Mendeley, <http://www.academia.edu/>, and Microsoft Academic Search will be used to find additional material using selected, important key words. Open access journals not supported by any reputed publishers will also be searched. Following are the possibilities: Information Technologies and International Development, Electronic Journal of Information Systems in Developing Countries, Development Informatics Working Papers, Manchester University, and First Monday.

Published proceedings of the conferences, but are not part of the above said electronic databases will also be searched separately. The examples include Mobiles for Development (M4D), International Conference on E-Governance (ICEG), International Communication Association (ICA), and International Development Information Association Conferences (IDIA).

At least three experts will be asked to suggest other sources where additional studies or material can be considered for the review. If the electronic sources indicate presence of certain studies which are only available in hard copy, the review will include them as well.

After searching above sources using the keywords, in the second stage, the titles of the articles will be screened for possible inclusion in the review. If the titles are not clear enough, abstracts will be read. In the third stage, abstracts of the studies will be examined for possible inclusion in the review. If the abstracts are not there or unclear, methodology section will be scrutinized in the full text. In the fourth stage, methodologies of the studies will be examined to decide whether to include or not.

In each of the four stages, we will apply the following criteria:

- Whether the study is conducted in urban?
- Whether the study is conducted in the listed low and middle income countries?
- Whether study offers something on MSMEs (maximum of 250 employees and annual turnover of less than 50 million for an enterprise)?
- Whether the study has primary data?
- Whether the study follows relevant methodological design for data collection and analysis?
- Whether MSMEs use at least one networked device?
- Whether MSMEs process business relevant information?
- Whether the study attempts to establish causal relationship between business relevant information and its impact on MSMEs?

In first and second stages, any studies that meets at least one criteria listed above will be included. This way none of the potential studies for review will be excluded.

Data Extraction

The studies that stand the four stages of filtering, will be retained for data screening. For the data extraction, a template is being prepared and will be used. Please see Table 3. This data will be inserted in an excel template enabling easier comparison and deeper analysis. Two reviewers will extract the data onto the template independently and compare to form a single extracted database after agreement. The agreed database will be used for analysis and writing of the systematic review.

Table 3: Data extraction sheet for each of the selected studies

| SNO | Possible Data Extraction Variables |
|------------|--|
| 1 | Identification No |
| 2 | Authors |
| 3 | Year of publication |
| 4 | Title of the article / chapter |
| 5 | Other publication details (Journal name, Book, Editor details, Issue no, page numbers etc) |
| 6 | MSME Details (Location, nature of business, number of employees, turnover, business domain, age, ownership and export intensity) |
| 7 | MSME Owner Details (gender, age, literacy, mathematical skills, and first generation entrepreneurship or not) |
| 8 | Context (country - low or middle income, continent & location - rural, urban) |
| 9 | Sample Size |

| | |
|----|--|
| 10 | Sampling technique used |
| 11 | Year of study |
| 12 | Nature of statistics used in analysis |
| 13 | Information on policy environment |
| 14 | Information on cultural factors |
| 15 | Exclusivity of quantitative method in the study |
| 16 | Nature and types of ICTs used |
| 17 | Nature and types of networked devices used |
| 18 | Nature and types of business relevant information processed by MSMEs |
| 19 | Impact on Internal Efficiency |
| 20 | Impact on Business Growth |
| 21 | Role played by networked devices |
| 22 | Role played by non-networked devices |
| 23 | Intensity of causal relationship |

Criteria for determination of independent findings

Assessment of risk of biases

To assess the Risk of Bias in the selected studies, we will explore the feasibility of combining the framework suggested by Waddington and Hombrados (2012) and IDCG tool (Baird et al., 2013). In the former, following categories are used: selection bias, confounding, motivation bias, performance bias, analysis reporting bias, other biases, and Type I and Type II error. In the later, adapted tool by Baird et al. (2013) contains the following: selection bias and confounding; spill overs, cross-overs and contamination; outcome reporting; analysis reporting; and other risks of bias.

Two reviewers will independently record each quality assessment using the adapted tool for the selected studies. The outcome scores will be used to grade the methodological quality of each study assessed. Wherever needed, we will contact the authors to get adequate details to avoid misrepresentation or underrepresentation of the findings. Discussion of unresolved disagreements regarding quality assessment with a third person will further ensure methodological rigour.

Dealing with missing data

If the final set of studies have missing data, we will be contacting the authors of the papers to provide the required information. In case of non availability of the missing data, a decision will be taken to further continuation with the review of the concerned studies. If the missing data is not crucial for the review and not available even after contacting authors, the review will share this inadequacy with clear information to the readers.

Assessment of publication bias

The review minimizes the publication bias by comprehensively searching all possible sources, including the grey literature. The researchers will make all the efforts to detect unpublished studies. Apart from the review team searching the electronic databases and physical sources within their reach, requests will be sent to all possible experts to share the bibliography records, if any. The final

set of studies shortlisted for synthesis will also be shown to three experts to cross check whether any potential studies are excluded.

The authors will explore the presence of publication bias through conducting funnel plots and egger's test. Furthermore, if relevant, the authors will conduct trim-and-fill analysis to estimate the relevant pooled effects of the intervention while accounting for the possibility of publication bias.

Statistical procedures and conventions

Synthesis

As a part of the review, we shall attempt meta-analyses with possible tools like Review Manager (RevMan) and the additional statistics with Stata (Version 12.0) to synthesize the quantitative evidence from the empirical studies by random effects meta-analysis. The estimates and 95% confidence intervals shall be presented for each impact measure of the study, together with forest plots. Meta-regression analysis shall also be done using Stata Software (version 12.0). We will be using both random effects model and also perform a weighted meta-analysis. The weighting of evidence will first be performed on a sample group of the data, prior to being applied to the entire dataset; this methodology will be reported in full in the final systematic review.

Where appropriate, sub-group analysis will be performed to examine heterogeneity among the study results based on the characteristics examined (e.g. gender effects, firm size differences and effects of low and middle income countries, or types of networked devices). Statistical tests for publication bias and heterogeneity will be carried out as appropriate and then presented in the final report (e.g. funnel plots for publication bias).

We will use Waddington and Hombrados (2012a) to further guide analysis, if needed.

Subgroup analysis and investigation of heterogeneity

The review expects a significant amount of heterogeneity in the extant literature and is hoping to explain using subgroup analysis at various levels. Following characteristics will be to categorize the findings into different subgroups: size of the enterprise, nature of business domain, continent location of the MSMEs, age of the enterprise, public policy and incentives, nature of networked devices, nature of business relevant information used by the MSMEs, gender of the owner, nature and type of internal efficiency, nature and types of business growth, and other characteristics of the owner like education and age etc.

Sensitivity Analysis

If feasible we will use sub-group analysis to explore the sensitivity of the results to the quality of the included studies, relevant differences in intervention (networked devices, business relevant information) and the impact (internal efficiency and business growth).

Sources of support

International Development Research Corporation, Canada.

Declarations of Interest

The team members do not have any conflict of interest in conducting this proposed systematic review.

References

- Abraham, R. (2007). Mobile phones and economic development: Evidence from the fishing industry in India. *Information Technologies and International Development*, 4(1): 5–17.
- Aker, J. (2008) Does Digital Divide or Provide? The Impact of Cell Phones on Grain Markets in Niger. Working Paper No. 154. Washington, DC: Center for Global Development. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1093374#.
- Baird, S., Ferreira, F. G. H., Ozler, B and Woolock, M. (2013). *Relative effectiveness of conditional and unconditional cash transfers for schooling outcomes in developing countries: A systematic review*. Campbell Systematic Reviews, 8. Retrieved on 25 April 2013 from http://www.campbellcollaboration.org/lib/download/2954/Baird_Cash_Transfers_Review.pdf
- Barabara-Sanchez, V., Martinez-Ruiz, M., and Jimenez-Zarco, A. I. (2007). Drivers, Benefits and Challenges of ICT Adoption by Small and Medium Sized Enterprises (SMEs): A Literature Review. Retrieved on 10 April 2013 from http://businessperspectives.org/journals_free/ppm/2007/PPM_EN_2007_01_Barbara-Sanchez.pdf
- Carr, N. (2004). Does IT matter. Information technology and the corrosion of competitive advantage. Harvard, Harvard Business School Press.
- Chew, H., Levy, M and Ilavarasan, P. V. (2011). The limited impact of ICTs on microenterprise growth: A study of businesses owned by women in urban India. *Information Technologies and International Development*, 7(4), 1-16.
- Devane, D. (2012). Systematic reviews: Statistical tests for heterogeneity. *Assessing statistical heterogeneity*. Retrieved from, http://www.iresearch4birth.eu/iResearch4Birth/resources/cms/documents/Statistical_tests_for_heterogeneity_Declan_Devane.pdf
- Chowdhury, S, K and Wolf, S. (2003) : *Use of ICTs and the economic performance of SMEs in East Africa*, WIDER Discussion Papers. World Institute for Development Economics (UNU-WIDER), No. 2003/06, ISBN 9291903930.
- Dixon, T., McAllister, P. and Thompson, R. (2002). The value of ICT for SMEs in the UK: a critical literature review. Small Business Service Research Programme. 02/1377. Report. Department for Business Innovation & Skills.
- Donner, J. (2008). Research approaches to mobile use in the developing world: A review of the literature. *The Information Society*, 24(3), 140–159.
- Donner, J. (2009). Blurring livelihoods and lives: The social uses of mobile phones and socioeconomic development. *Innovations: Technology, Governance, Globalization*, 4(1), 91–101.
- Donner, J., and Escobari, M. X. (2010). A review of evidence on mobile use by micro and small enterprises in developing countries. *Journal of International Development*, 22, 641–58.
- Duncombe, R. (2009). *Impact Assessment of Mobile Phones on Development: Concepts, Methods and Lessons for Practice*. Development Informatics Working Paper Series No. 39. Institute for Development Policy and Management, University of Manchester.

- Duncombe, R., and Heeks, R. (2005). *Information & Communication Technologies (ICTs), Poverty Reduction and Micro, Small & Medium-scale Enterprises (MSMEs): A Framework for Understanding ICT Applications for MSMEs in Developing Countries*. Vienna: United Nations Industrial Development Organization.
- Esselaar, S., Stork, C., Ndiwalana, A., and Deen-Swarrray, M. (2007). ICT usage and its impact on profitability of SMEs in 13 African countries. *Information Technologies and International Development*, 4(1), 87–100.
- Ghanem, H. (2013). The role of micro and small enterprises in Egypt's economic transition. Global Economy and Development Working Papers 55. Global Economy and Development at Brookings. Retrieved 15 Oct 2013 from <http://www.brookings.edu/~media/research/files/papers/2013/1/egypt%20economic%20transition%20ghanem/01%20egypt%20economic%20transition%20ghanem.pdf>
- Heeks (2008). ICT4D 2.0: The next phase of applying ICT for international development. *Computer*, 41(6), 26-33.
- Ilavarasan, P. V. (2004). Small software firms in India: A descriptive analysis. *Journal of Systems and Information Technology*, 8 (1/2), 30 - 39.
- Ilavarasan, P. V., and Levy, M. (2010). *ICTs and urban microenterprises: Identifying and maximizing opportunities for economic development: Final report*. Ottawa, Ontario, Canada: International Development Research Centre. Retrieved from http://www.idrc.ca/uploads/user-S/12802403661ICTs_and_Urban_Microenterprises_104170-001.pdf.
- Ilavarasan, P. V. and Levy, M. R (2012). ICT access and use by microentrepreneur in Mumbai, India: A value chain model analysis. *ICTD2012*, 259-267. (ACM Press)
- Jensen, R. (2007). The digital divide: Information (technology), market performance, and welfare in the south Indian fisheries sector. *The Quarterly Journal of Economics*, CXXII (3), 879–924.
- Katz, R. (2012), The impact of broadband on the economy: Research to date and policy issues. International Telecommunications Union. Retrieved 16 Nov 2013, from www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR10/documents/documents.html
- Kauffmann, C. (2005). *Financing SMEs in Africa*. Policy Insights No. 7. OECD Development Centre. Retrieved 10 Nov 2013 from <http://www.oecd.org/dev/34908457.pdf>
- Liedholm, Carl, and D. Mead. (1999). *Small Enterprises and Economic Development: The Dynamic Role of Micro and Small Enterprises*. London: Routledge.
- Mead, D., & Liedholm, C. (1998). The dynamics of micro and small enterprises in developing countries. *World Development*, 26(1), 61–74.
- Ongori, H. and Migiro, O. S. (2010). Information and communication technologies adoption in SMEs: literature review. *Journal of Chinese Entrepreneurship*, 2 (1), 93 - 104. *Problems and Perspectives in Management*, 5 (1), 103-114.
- Piscitello, L and Sgobbi, F. (2004). Globalization, e-business, and SMEs: Evidence from the Italian District of Prato. *Small Business Economics*, 22 (5), 333-347.
- Stein, P., Goland, T. and Schiff, R. (2010). *Two trillion and counting: Assessing the credit gap for micro, small, and medium-size enterprises in the developing world*. International Finance Corporation and McKinsey & Company.
- Qiu, J. L. (2009). *Working-Class Network Society: Communication Technology and the Information Have-Less in Urban China*, Cambridge, MA: MIT Press.
- United Nations Department of Economic and Social Affairs Population Division (2006). *World*

Urbanization Prospects: The 2005 Revision. New York: United Nations Publication. Retrieved March 22, 2007, from <http://www.un.org/esa/population/publications/WUP2005/2005wup.htm>.

Waddington, H and Hombrados, J. G. (2012). *Risk of bias assessment for experimental and quasi-experimental designs based on statistical methods*. Retrieved on 25 April 2013 from http://www.3ieimpact.org/media/filer/2012/12/26/jorge_hombrados_and_hugh_waddington_conference-session12-b_3ie_dhaka_colloquium.pdf

Waddington, H and Hombrados, J. G. (2012a). *Effect size calculation for experimental & quasi-experimental methods*. Retrieved on 25 April 2013 from http://www.3ieimpact.org/media/filer/2012/12/24/jorge_garcia_hombrados-hugh_waddington_3ie_dhaka_colloquium.pdf
