Empowering Street Vendors through Technology: an Explorative Study in Dar es Salaam, Tanzania

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Abstract—Street vending business is important for the economy and the livelihood of the poor less educated people in developing countries, as it provides employment, and a means for survival. However, street vendors face a number of challenges, including low levels of education. The main objective of this study was to explore street vendors’ business activities, skills, and strategies in order to propose mobile technology based solutions to improve street vendors’ business prospects. A qualitative data consisting of interviews and focus group discussions was collected from a total of 39 street vendors in Dar es Salaam, which is the economic hub of Tanzania. The data was analyzed using qualitative content analysis, by identifying relevant themes in the data. The findings show that street vendors operate in a challenging environment and have to employ a number of additional activities and strategies as compared to formal businesses. These activities require risk identification and risk alleviation skills and strategies, and ways to deal with various kinds of uncertainty. It was found that street vendors possess low levels of business skills in all domains of business. To improve street vendors’ business prospects, a number of mobile-technology based applications can be developed in the future.

Keywords—informal economy; ICT4D; Tanzania

I. INTRODUCTION

Millions of people in developing countries are currently engaging in informal business activities [1], [2]. The informal economy refers to activities and income that are partially or fully outside government regulation, taxation, and observation [3]. It is estimated that the informal economy sector provided roughly 50%-75% of employment, 72% of non-agricultural employment, and 30%-60% of gross national products (GNP) in sub-Saharan Africa in the 2000s [4]. In general, informal employment is more common than formal employment in developing countries [5], [6]. The most common form of informal retail business activity in developing countries is street vending.

A study [7] has defined street vending as an informal type of business, which offers goods for sale to the public, without having a permanent built-up structure. Street vendors are commonly referred to as hawkers, peddlers, or street traders. In Dar es Salaam, Tanzania, they are commonly known as “Machinga”. Street vendors sell different products including fruits, drinking water, stationeries, clothes, food, electrical equipment, home appliances, mobile phone vouchers, and other goods. Street vending is partly constrained by its undeclared juridical status, and economic and educational issues related to its operational environment [2], [8], [9], [10], [1].

Street vending shares the same basic objective with other businesses, which is to sell goods or services in order to generate profit [11]. One difference between street vending and many other types of economic activities is whether the activities are based on a necessity or an opportunity. Street vending is a necessity-based activity, which means that street vendors often start a business because other employment possibilities are unavailable [11].

An estimated 700,000 street vendors operated in the Dar es Salaam city in 2007, at a time when the city’s population was approximately 2,800,000 [8]. Street vending is an informal business activity undertaken by the people who are less skilled, with low capital, and cannot secure job in the formal sector. Street vendors experience challenges of eviction, limited access to capital, unstable security, unplanned policies on urban development, and low level of education [11]. Although street vending plays a key role in the growth of the Tanzanian national economy, not much is done to strengthen street vendors’ resilience and entrepreneurship. Thus, there is a crucial gap in research about how to empower street vendors, particularly by developing mobile technology-based tools, and providing access to technologies that help to improve street vendors’ business, and by providing street vendors training to improve their business success.

A. Research Questions

To address the research gap mentioned above, this study explores the current business activities of street vendors in Dar es Salaam. The idea is to identify promising ideas for mobile applications to be developed in order to improve street vendors’ business skills, and to help vendors conduct their daily businesses more efficiently. In this study, the business activities of street vendors are investigated from the perspective of street vendors’ skills and strategies. Based on the results, a number of
II. BACKGROUND STUDIES

A. Street Vending Business

Street vending is a diverse business activity. Some vendors are often mobile and sell their products or services in different locations in search for customers. Mobile vendors carry their goods by hand or on a pushcart, shoulders, or in bags or baskets. Some street vendors are more fixed in terms of location, and may sell their products and services from the same location every day [11]. It is also common, especially among female vendors, to offer products or services from their home. Most vendors sell goods, but few of them offer services or a mix of the two. Street vending includes both economical and occupational activities; it is carried out as a full time, part time, seasonal or occasional job.

Unlike other entrepreneurial activities, street vending business is often entered due to necessity, instead of opportunity [11], [13], [8]. This means that people sell things on the streets because formal employment possibilities are not available to them, partly due to their inadequate education level, skills, and capital. In many countries, street vending is considered as illegal or its juridical status is unclear, and street vendors often face harassment from city authorities, formal business, and the public. Often street vendors work long hours under unhealthy and unsafe conditions [1], [10]. The poor infrastructure where street vendors operate does not only impact their health and livelihood negatively, it also drives up the costs and makes them vulnerable to exploitation [11], [8].

B. Street Vending Business Skills

Possession of relevant business skills has been mentioned by scholars as a critical success factor of small business (see for example: [14], [15], [16]). Often street vendors enter in their business with little or no human skills responsible for such kind of business. However, they acquire skills informally while conducting their business (learning by doing) [11].

The common business skills in small and micro business are marketing, bookkeeping, entrepreneurship, and business management (see for example [15]). For the purpose of this study, four business skills; marketing, bookkeeping, management, and strategic planning have been explored.

1) Marketing: Marketing is a process of creating, pricing, distributing and promoting products to facilitate satisfying exchange relationships with customers and to develop favorable relationships with stakeholders in a dynamic environment [17]. The traditional marketing management decisions for a business involves identifying consumer needs, product decisions, pricing, placing, promotion, and customer management [18]. Marketing is considered to be one of the important key success factors of businesses of all sizes (see for example: [17], [18]).

2) Bookkeeping: Bookkeeping is an art of recording business transactions in a systematic manner. It is concerned with recording and summarizing business transactions accurately so as to know the true state of affairs of a business [19]. There is a strong positive relationship between accounting records keeping and performance of enterprises of all scale. Accounting records keeping is essential for decision making, which invariably affects performance of businesses. The common bookkeeping records kept by small businesses are day books, receipts and payment, inventory, purchases and sales.

3) Management: Management is an art of knowing what to do, when to do and see that it is done in the best and cheapest way [20]. It is the process of harnessing the diverse resources (human, physical, and financial) in order to attain the organization’s missions. Business management requires analytical, time, interpersonal, communication and conceptual skills. Lack of management skills has been highlighted as a cause of business failure. Small business managers require management skills like planning, controlling, evaluation, time, communication, and interpersonal skills for smooth business management.

4) Strategy: Strategy is a path that an organization selects to pass through to obtain its goals. A good strategy provides the way to the business success, whereas a weak or misunderstood strategy leads to moving out of the business [21]. Street vendors employ a number of strategies, including anti coercion strategies, survive strategies, business operating strategies, and strategies to combat losses. Street vendors use strategies like relocation, paying bribes, and group organization in order to minimize the risks of their products being seized by the government authorities [7], [11].

III. METHODS AND DATA

Two types of data collection were used in this research. First, preliminary interviews with 19 street vendors (group A) were conducted in order for the researchers to understand the street vendors’ experiences and opinions on which kinds of skills and activities are necessary for undertaking their daily vending activities. Each of these interviews lasted approximately 15 minutes. Notebook data, photos, and researcher diaries were collected during the preliminary interviews. Second, four groups, each consisting of four or five street vendors, were interviewed by using focus group discussion (FGD). A total of 20 street vendors (group B) participated in the focus group discussions, with 11 males and 9 females. The focus group discussions were semi-structured in such a way that the interview questions were not tightly settled, but instead the interviews were designed as spontaneous conversations on several important themes in relation to the street vending activities. The selected themes were derived from common business areas that are listed in section II-B (marketing, bookkeeping, management, strategy). Each of the focus group
The data analysis was performed by using qualitative content analysis [22, pp. 281]. In the case of focus group discussion data, the analysis was performed by transcribing the recorded interviews. The interviews were translated from Swahili to English and transcribed. In the analysis phase, the data was broken down into smaller units, after which distinct themes of the data were created. The data analysis was guided by the seek to identify potential technology application ideas that have potential to improve the street vendors’ business prospects, and which in a later phase of this research, a team of software designers and engineers can develop and test together with the street vendors.

A. Participants and Area of Study
The study was carried at Dar es Salaam, the economic hub of Tanzania. A total of 39 respondents were drawn from different areas of the city. The study used street vendors whose age ranged between 18-35 years, who had business experience more than one year, and who sold legal, non-food products. Respondents were selected based on their convenience, accessibility and proximity to the researcher. We came across many street vendors, but they refused to participate in this study fearing their security. We used incentives like giving them a token of money in the range of 4000-6000TZS, and buying their products so as to encourage them to participate in the study. The level of formal education among the participants was also low, as most participants had completed only primary school. The participants explained that they had entered street vending because of the lack of other opportunities due to their low level of access to capital and low education.

IV. RESULTS

A. Gender Issues
When seeking for study participants, it seemed that in Dar es Salaam, street vending is dominated by males. When discussed about the issue with the study participants, they considered female vendors to be less in number due to their incapability to confront with the police, and due to family hierarchies. For example, study participants noted that parents do not allow girls to enter street vending as often as boys. This was explained to be caused by various risks. The participants explained that their income levels are very low, and that the profits from their daily business activities are used directly to finance the daily life of themselves and their families.

B. Business Profile
The study participants explained that they have been conducting street vending business for a period of one to five years. To start their business the participants explained to have invested a sum of somewhere between 30,000 to 3,000,000 TZS. The approximate profit they reported ranged between 5,000TZS to 40,000TZS per day. A typical business day was explained by the participants to start around 6AM and end up around 9PM. However, female street vendors’ business hours differed due to their family. Also, some of the study participants started their business at 7PM and worked until midnight, and explained that these business hours are better in order to avoid confrontation with the police.

C. Selecting and Obtaining Products
The interview data revealed the following themes in relation to selection and obtaining of the products to be sold: Range of products sold, Stability of product type per vendor, Restocking behaviour, Source of obtained products, Upgrading from informal to formal business.

First, the interviewed participants explained that street vendors in general sell various things ranging from electronics, DVDs and CDs to art and goods such as sweets, soft drinks, used clothes, fruits, and headphones. Second, the participating vendors explained that typically vendors are fixed with a group of goods such as electronics or fruits, and they do not often change the profile of offered products. One participant explained: “I buy what I can sell easily; I don’t want to be a risk taker of slow moving consumer products.” However, some of the study participants explained that from time to time some vendors may change their products to be sold. For example, some of the study participants explained that they were selling stationary products before, but moved to another product group that was considered more profitable. The participants also explained that after successes in street vending, some vendors have been able to upgrade their activities to open formal shops and stop vending on the street.

Third, the participants explained that typically they restock products every day, which means that at the beginning of the day they get the products to be sold during the day from a wholesaler. They explained this to be done because of low capital, and difficulty of storage for large stash of products. Fourth, a few of the participants explained that they obtain products through a service called MALI KAULI.3

D. Determining Product Price
The interview data revealed the following themes in relation to setting product price: Product price setting method, Bargaining behavior, Customer profiling based on outlook, Street vending as a sales channel of formal shops.

The interview data revealed that street vendors do not have systematic pricing policies but instead they set the product price based on their own experience and recommendations from their fellow street vendors. One participant who sold t-shirts explained that at some times he attempts at a 100% profit: “When I buy a shirt for 500 TZS, I sell it for 1000 hence make a profit of 500.” For all of the interviewed study participants, bargaining behavior was found to be very important. In terms of bargaining, the vendors explained that with some customers they

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1Credit transaction in which a vendor obtains goods in credit without collateral and is allowed to return unsold stock at the end of the day. Usually, a MALI KAULI transaction is initiated by a request for assistance by a retailer, who claims to have no capital. For further info, see for example [23].
aim at very high prices: “Frankly speaking, we don’t have a maximum price, but we know the lowest price in which we can’t go beyond.” To do this, they explained customer profiling behaviours that are based on outlook. For example, foreigners or perceived high income earners indicated by fine clothing or fine cars were explained to be charged with initially higher prices. In some cases, the participants also explained that they have to sell at loss, if they are in need of a bus ticket. The participants explained the pricing to be competitive compared to formal shops, because street vendors do not have to pay rent, taxes, or salaries to employees. It is an interesting phenomenon that formal shops recruit street vendors to sell the same products that shops sell themselves. In that sense, street vending sometimes seems to operate as a sales channel for formal shops, but further studies are required to understand the issue more thoroughly.

E. Selection of Place to Sell

The participants of the study reported that they do not have a permanent place for conducting business but they move from one point to another. However, they reported that they have familiar and typical routes that they do business in. The route selection was affected by tacit knowledge, which means street vendors use their estimates of the availability of customers, for example based on estimates of traffic jams, and estimates of police movements. Typical good places to do business were reported to be places, which are crowded, such as places with traffic jams, places near big offices, near to marketplaces, near bus stands, and near to worship places. In general, the respondents did not report to have a systematic way of finding the best potential customers. One participant noted: “We walk all over the day, we don’t have a permanent market, we follow the customers where they are, however, and sometimes we don’t get them.” Most of the street vendors reported that they have a product stash nearby their home, or with their friends and relatives, or in a room rented jointly with other street vendors. The interview data did not indicate whether street vendors have competition with each others, or if they have certain own areas or territories where other street vendors are not welcome. This is an important question for further studies.

F. Promotion of Products

The interview data revealed that the participants’ product promotion models are simple. The products are put to display on the ground, and the products are marketed to passing potential customers by verbal introductions and marketing slogans. This was sometimes explained to be done with the help of a loudspeaker. The participants explained that typical forms of product promotion such as advertising, personal selling, or sales promotion are not available methods for them to use. In terms of promoting products, street vendors were found to be collaborating in groups. This means that once a vendor did not have products that a customer required, street vendors were in general explained to be happy to recommend other fellow street vendors to the customers, or even recommend formal nearby shops.

G. After Sales Customer Care

The participants explained that they rarely take customers’ phone numbers in order to contact them again for example to inform them when new or required products come available. One participant noted: “I don’t have a means to make some repeat purchase, what I can say is welcome again.” The study participants were of the opinion that street vendors rarely have any kind of customer database that they can use to keep in touch with their customers. However, one study participant explained that sometimes customers who were satisfied with their products called them afterwards and asked to deliver certain products to their offices and or homes. Sometimes, customers were also explained to pay premium prices for such extra services.

H. Bookkeeping

All of the interviewed study participants reported that they do not keep systematic records of sales, purchases, and what they are supposed to buy from wholesalers and suppliers. They did not see the benefit from doing bookkeeping activities. One study participant commented: “My business is very small; I think there is no need to put it on records, rarely I record sales and the products to buy in the next day.” It was found out from the interview data that the study participants do sell on credit, but only to customers they deem trustworthy. The study participants reported that they do not have bank accounts, but instead many of them save their spare money in a “special box”, or through mobile services such as MCHEZO, or M-money. Most of the study participants reported that they keep part of their profit in order to meet unforeseen family and business expenses. In general, study participants reported that they do not have the correct means to conduct bookkeeping: “Although I know that it is important to do bookkeeping, I don’t know what is supposed to be recorded in the books.”

I. Future Prospects and Management Issues

The following themes were identified: Hopes to upgrade from informal to formal, Conceptions about means to improvement (business education, means to access capital), Loyalty between vendor groups, No systematic management of activities.

In terms of their future plans, prospects, and hopes, all of the participants of this study noted that they hope to one day become a formal business with a built up structure. They also discussed their hopes of getting business education and to become entrepreneurs. Some of the participants’ narratives indicated a positive attitude and belief for a better future. For example, one participant commented that: “I’m here temporary, one day I shall become the biggest entrepreneur in this country, but what I need is business education and capital.” Thus, the participants’ conception about what is needed to improve their situation included business education, and better means to access capital.

TABLE I•: SUMMARY OF QUALITATIVE FINDINGS
### Risks and Risk Prevention

In relation to risks and risk prevention strategies, the following themes were identified: Risks of products confiscated by police, Risk of weather ruining products, Risk of theft, Risk minimization strategies: stashing, alerting, escaping, grouping.

The study participants explained that their business involves a number of risks. They explained that the most serious risks are that their products are confiscated by the police, heavy rain ruining their products, and theft. In order to minimize these risks, the participants explained several risk minimization strategies. For example, they aim to carry the minimum possible amount of stocks with them to avoid loss to theft or police, they maximize their running speed and optimize the escape routes when police comes, and often walk as groups rather than individuals to be less vulnerable to theft. One participant noted: "This is only a quarter of my products, the rest is there (shows a house), because if I will be caught by police everything will be lost."

In addition, street vendors used mobile phones to alert their fellows when the police is coming.

### Discussion

A summary of the results is presented in Table I.

Research question RQ: asked, "What skills and strategies do street vendors need in order to succeed in their business environment?" The results of the study strengthened the understanding about the factors that contribute to the street vendors’ daily business activities, skills, and strategies, and helped to identify possible points where technology-based improvement efforts can be applied. The results also revealed a number of areas where further research is needed in order to understand the various aspects of street vending in more depth.

The results show that—generally speaking—the interviewed street vendors operate within a one-day planning and operating cycle. The day starts with selecting the products to be sold during the day and obtaining those products from wholesalers, through MALI KAULI -services, or from formal shops. After obtaining the products a number of crucial strategic and managerial decisions need to be taken. This includes selection of selling routes, determining of product pricing, profiling of customers based on outlook, promotion of products, handling the business transactions, keeping business records (or not keeping them in most cases) through bookkeeping, planning for the future, and employing various risk prevention strategies, for example to avoid confrontation with the police or criminals.

The study identified skills gaps in business skills specifically in marketing, bookkeeping, management, bookkeeping and strategies.

#### Marketing

From a marketing viewpoint, it is clear that street vendors do not have the skills or means to consider factors that might benefit their business, but their modes of operation are simple. For example, when obtaining products, the vendors can’t make very informed decisions in terms of competition, profitability, product quality, or originality of the products, because of their lack of information on products and prices. Also, because of the nature of their one-day-operational cycle, they can’t enjoy economies of scale as they buy products in small quantities.

When selling products, street vendors operate on very simple pricing policies, and do not have the means or skills to take into account factors like business expenses, transport costs, storage costs, security, return inwards, or their own “salary”, or competition, while they set their product prices. The prices they are selling at do not reflect the actual business costs, and hence the street vendors are not well aware how optimal their business operations are, they mostly seem to act only on their intuition about the best decision or action.

1) Customers: When the street vendors make decisions on their daily routes between wholesalers and places to sell, they do not have any reliable information available about number of potential buyers, nature and demand on different products, market concentration, or the competition in the particular route. Also, street vendors do not have strong strategies for product promotion. Moreover, street vendors do not have effective means or strategies for creating and maintaining long-run customer relationships, but in most cases their customer relationships end after they close the sale. Thus, they lack a customer database, means to communicate with customers, and to make follow-ups with customers after initial sales. These improvements would improve their chances for better sales, profitability, and business sustainability.

#### Bookkeeping

The results show that many street vendors do not record business transactions at all, and for those who do, they record them in an unsystematic manner. By not recording they miss all the data of their daily activities, for example, daily sales, business expenses, profitability, cash flows, and stock flow.
Without any data available, it is hard to control for example their saving habits, as they do not have a fixed percentage or formula about deciding how much to save. In terms of saving, they also keep their money in unsafe places like boxes. Thus, street vendors are constrained by low capital, skills, access to market data, access to capital, access to banking, but they do not have the means or skills to improve their situation.

Without well written business records, an entrepreneur can not ascertain the rate of business growth, take appropriate measures in time, budget, how much to spend per given period of time, know the stock levels, or undertake business planning. It is widely known that there is a strong positive relationship between accounting and the performance of small scale enterprises. Also, without well written bookkeeping records a street vendor can’t easily access loans. Similar findings have been reported in studies from Kogi, Nigeria, which found that micro enterprises often do not keep business records and therefore do not even know whether their businesses are growing or not [24].

C. Management

Management can be observed from the five functions of planning, organizing, commanding, coordinating, and control. The results of this study show that street vendors’ plans are neither specific, measurable, attainable nor realistic. For example, all vendors interviewed in this study state that their goal is to upgrade into formal business, but they don’t have the concrete plans, means, or skills to do that. For example, they don’t have daily, weekly or monthly selling targets, hence it is impossible for them to evaluate business performance accurately. They don’t have the benchmark to monitor and evaluate their business progress. Furthermore, the findings show that there is no clear distinction between street vending business and family affairs. For example, street vendors use their income from sales to finance family expenditures instead of using salary paid for their business. This practice inhibits business growth, makes difficult to monitor the growth and sustainability of business, particularly when the records are not kept.

D. Strategy

The results of this study show that the strategies used by street vendors are not strong enough to bring about competitive advantages. For example, the results show that it is common to find a group of vendors, selling similar products with relatively similar business strategies, moving together from one point to another, hence competing for the same customers. The surveyed vendors do not have well-thought business strategies to persuade someone to buy and repeat purchase. The street vendors’ source of supply, type of products, price, promotion, and after sell services are relatively similar. In addition, street vendors have to tackle with risk prevention strategies including running away from police, changing business route, or optimizing the amount of stocks carried.

E. Education and Training

Research question RQ2 asked, “What are the street vendors’ perceptions on how to improve their success in street vending?”

The results show that the studied street vendors possess low levels of business skills. This is due to the fact that they have not had any opportunities of attending formal schools or getting proper on-the-job training. All interviewed street vendors showed high interest in developing their business skills and strategies through training in a number of areas, such as bookkeeping, marketing, and entrepreneurship. Their current means for learning business skills and strategies are mainly following the example of others, and through trial and error. However, due to the lack of appropriate business skills, the vendors can’t develop competitive business strategies.

The findings of this study support previous research in Tanzania, which has concluded that small businesses are constrained by inadequate business training (see for example: [14]). However, previous studies did not go into detail to identify inadequate business skills. This is in line with [11], whose review about research on street vending concludes that street vending skills and skills development are an unstudied area. There is no doubt that business skills are important for the growth and sustainability of any kind business, whether it is small, medium, or large in scale. The findings of this study show that street vendors possess rudimentary skills, e.g., the skills of negotiating with customers, the skills to select products for sale, and skills for forecasting customers’ needs.

However, the results of this study clearly show that there is a crucial need for intervention in skills development in small and micro business, in order to empower small business entrepreneurs to be more productive and improve their business prospects. Improving the productivity of the informal business is critical for employment, income growth, and poverty reduction in the developing world. Several factors affect this productivity. Among them is not only access to finance, infrastructure, and macro business environment, as is explained by previous research [14], but also the level of human capital, particularly skills relevant to the business they undertake. Therefore, it is important to develop interventions that aim to develop business skills of small entrepreneurs. Since street vendors do not necessarily have time to attend to the normal classes for the skills development, the use of mobile technology based platforms (e-learning) can be fruitful for developing street vendors’ business skills.

VI. PROPOSED TECHNOLOGY DEVELOPMENT

Information technology is often considered to hold high potential for human development and economic growth [25], [26]. However, information technology does not automatically lead to success in human development, as it does not do so in any other field. Instead, the application of information technology must be carefully designed to respond to the needs of its users for any positive impacts. In sub-Saharan Africa, the widespread use of mobile technology provides a fruitful platform for research and development efforts of information technology applications in order to boost economic and human development [27].

It is known that street vendors have low funds. However, most street vendors do already now possess mobile phones that are capable of running services on the Unstructured Supplementary Service Data (USSD) -protocol [28]. In Tanzania, the USSD platform has been successfully used in m-Banking (for example M-PESA), and in m-Farming (applications for Small Scale Farmers [29]). On the other hand, smartphones are becoming more and more popular and cheaper in prize. It can be
estimated that in the forthcoming decade smartphones will be reachable to an increasing number of street vendors. Thus, it is important to work both on the platform that is currently available, as well as on the platform for the future.

Based on the findings of this study, the following two tracks of technology development are proposed:

- Design and engineering of business applications that help street vendors automate important parts of their business.
- Design and engineering of educational technology tools that help street vendors educate themselves.

1) Business tools: Based on the findings of this study, a number of ideas for application development have emerged. These include development of tools to get the current wholesaler product availability, tools for optimising restocking behaviours, tools for more optimal route selection for street vendors including customer location advice, various customer and street vendor matchmaking tools that connect the buyer and seller, location distribution optimisation tools for better collaboration between locations among different street vendors. Other important application development domains include customer database applications, customer profiling services, applications to boost marketing and promotion of products of street vendors, tools that help customers to order goods of their preference, and tools that help vendors access capital.

One important domain for application development is bookkeeping, which will help the street vendors to control their money flows, and to calculate their profits and expenses systematically, allowing them to make more informed decisions and plan their business.

2) Educational technology: The results of this study show that street vendors would benefit from training on a number of topics. Educational technology tools and applications include a range of applications that help to train street vendors. This includes training basic business skills and strategies to street vendors, including basics in marketing, bookkeeping, customer relationship, and management. Educational technology solutions can also help to educate street vendors on best means to upgrade their businesses from informal to formal businesses. Various modes of delivery can be considered, ranging from technologies that support classroom-based courses into blended learning where part of the learning activities, learning tasks, and educational materials are online and part of the teaching is conducted face to face, to in-service training supported by educational technology. Also, fully electronic learning platforms, such as MOOCs (Massively Open Online Course) can be designed for street vendors in the future.

1) Software Engineering Models: An overview of the identified domains for potential research and development efforts are summarised in Table II.

The management and organization of software teams to prototype and test these applications must be carefully planned. In regards of software process models, Agile software develop-

4 http://www.uef.fi/en/edtech
5 http://tanzict.or.tz
6 http://buni.or.tz
7 http://www.kinu.co.tz

**TABLE II- FUTURE R&D DOMAINS FOR STREET VENDING SOFTWARE**

<table>
<thead>
<tr>
<th>Business tools</th>
<th>Educational technology</th>
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<tbody>
<tr>
<td>1) Wholesaler product availability</td>
<td>1) Teaching basics in business skills and strategies with BL</td>
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<tr>
<td>2) Restocking behavior optimisation</td>
<td>2) Training how to use business tools (see left column)</td>
</tr>
<tr>
<td>3) Optimal route selection</td>
<td>3) Designing MOOCs to teach various business topics</td>
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<tr>
<td>4) Customer location advice</td>
<td>4) Training how to upgrade from informal to formal business</td>
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<td>5) Customer and vendor matchmaking</td>
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<td>6) SV location distribution optimisation</td>
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<td>7) Customer database applications</td>
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<td>8) Customer profiling</td>
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<td>9) Marketing and promoting products</td>
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<tr>
<td>10) Order and delivery management</td>
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<tr>
<td>11) Tools that help access to capital</td>
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<tr>
<td>12) Upgrading from informal to formal</td>
<td></td>
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<tr>
<td>13) Bookkeeping (calculation of cash flows, profit, expenses, planning)</td>
<td></td>
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<td>14) Management and planning</td>
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(£V = Street Vendor, BL = Blended Learning, MOOC = Massive Open Online Course)

ment (see for example [30]) is a common software engineering model that has several characteristics that fit developing street vending software well. In Agile software development a group of software engineers develop software in situations where requirements and solutions evolve through constant collaboration between self-organizing, cross-functional teams. Agile development promotes flexible change of requirements, early delivery, and continuous improvement, and encourages rapid response to change. Also, living labs is an ideology that provides useful insights to developing street vending software. For example, a number of studies about living labs projects have confirmed the paramount importance of engaging users at the earlier stages of the design process, which is also one of the basic principles of living labs (see for example [31]).

Of paramount importance is also to research the availability and usefulness of existing software to prevent reinventing the wheel. Another important issue is to find functional ways to develop learning materials and content in Swahili language. Currently, the College of Business Education (CBE) is in the process of establishing a Street Vending Business School, and an important part of the project includes a software laboratory. The project and the software laboratory is planned and implemented in collaboration between CBE, edTech-s, research group at the University of Eastern Finland’s School of Computing, The Information Society and ICT Sector Development Project in Tanzania (TANZICT), and technology hubs BUNI and KINU. In addition to careful planning of the most optimal software development and engineering model, we consider as a highly important aspect to add a research component to the software laboratory in order to gain solid understanding about the best solutions and processes for building street vending software.

Also, it is important to connect the planned software engineering practices to entrepreneurship activities in order to support software developers and researchers to start entrepreneur activities around street ending software. In Dar es
Salaam, support structures in the area of business incubation for technology start-ups are provided for example by DTBI8.

VII. LIMITATIONS AND FUTURE RESEARCH

It is important to note that the research design of this study is qualitative. Therefore, the results can be only considered to be a “slice of life”, and it is not possible to make any generalizations based on the findings into larger street vending populations. However, that is not the purpose of qualitative research. To gain a more comprehensive picture of street vending in Dar es Salaam, the results of this study form an excellent basis for extending this study into a mixed-methods study, and more specifically the exploratory sequential design where qualitative exploration is followed by quantitative data collection [32].

On the other hand, the results of this study can be considered, at best, “descriptive”. This means that any one of the identified issues could benefit from research of greater depth. For example, one track of future research might target to better understand the flow of different products to build a comprehensive picture about which actors are involved in the chain of product flow, and what are the exact roles of wholesalers, middlemen, MALI KAULI, and formal shops in the ecosystem of street vending. It is quite clear that street vendors are only one link in the ecosystem of street vending, but probably they are in the weakest position in terms of risk taking, earnings, and unclear juridical status.

Other important future research directions include action research efforts to find best means of education street vendors, and design research [33] about new technology-based solutions for street vendors as proposed in section VI. In addition, future research might seek to understand what differentiates between success and failure in street vending. For example, this research has shown that the daily profit of street vendors may range quite substantially, but this research did not reveal the factors that contribute to higher or lower levels of income.

VIII. CONCLUSIONS

Informal sector in developing countries is important, inevitable, and growing very fast. Basing on the evidence from the drivers of informal economy, street vending business will continue to mushroom in low income countries, therefore calls for immediate intercession in the areas of weakness e.g., skills development. Removing barriers for street vendors’ productivity through technology is needed in order to make street vending work effectively for poverty reduction and economic growth. The business skills of street vendors are often low in all domains of business. Currently, very limited efforts are targeted towards empowering street vendors by training them skills, and by introducing new technologies to them. Mobile technologies and educational technologies have potential for street vendors to improve their business prospects anywhere and anytime, with relatively low cost, and through formal and non-formal channels.

Street vending is an important part of the innovation ecosystem of many African countries. However, partly due to street vending’s informal state, limited efforts are currently targeted towards improving street vending business. Currently, street vending as a domain provides a number of such societal challenges, which could potentially be solved with engineering solutions. Thus, a number of promising opportunities for research, development, software engineering, and education exist in the area of street vending. One important direction for research and development is to find best ways to upgrade street vendors from informal businesses to formal businesses in order for street vending to contribute fully to the economic system. With this research about street vendors’ skills and strategies, presented in this paper, we have opened a new avenue for research, development, and entrepreneurship opportunities in the area of education and technology for street vendors.

REFERENCES


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