Exploring the utility of diffusion theory to evaluate social marketing approaches to improve urban sanitation in Malawi
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ABSTRACT
This study examines diffusion theory as an explanatory framework for the adoption of an ecological toilet by ‘first-moving’ customers in an urban setting in Malawi. The study was conducted during the early stages of a social marketing programme. A pragmatic paradigm was applied to address three research questions using mixed methods. The qualitative investigation formed the primary component of the study and interviewed 14 customers who were selected to receive micro-finance loans to purchase the ecological toilet. These 14 customers were labelled ‘first movers’. The study identified that ‘first movers’ only partially displayed characteristics of ‘innovators’ and the product met three of five characteristics associated with successful rates of diffusion. Improving the trialability and simplicity of the product, through field-testing, human-centred or participatory design approaches could improve the likelihood of the product attaining the characteristics that support successful diffusion. Organisations that apply social marketing approaches to improve urban sanitation coverage may improve their efficacy, equity and cost-effectiveness by utilising diffusion theory as the theoretical framework to design, implement and evaluate their programmes.

Key words | diffusion, ecological sanitation, innovator, social marketing

INTRODUCTION
More than 180 million people living in urban areas in sub-Saharan Africa do not have access to a safe and improved toilet (United Nations Children’s Fund (UNICEF) & World Health Organization (WHO) 2012). Access to a safe and hygienic toilet, combined with clean drinking water and hand washing with soap, could prevent more than 2 million deaths annually caused by diarrhoea and associated malnutrition (Bartram & Cairncross 2010). The health and economic benefits of improving urban sanitation systems in developing countries are well established (Barreto et al. 2007; Hutton 2012). However, there are limited examples of long-term sustainable improvements in urban sanitation coverage in sub-Saharan Africa as they are often thwarted by technical, financial and legal challenges (Murray & Ray 2010; Scott 2011; Thye et al. 2011).

High-density urban settlements in countries with developing economies predominantly use on-site sanitation systems that are not connected to a sewerage network (Katu kiza et al. 2010; Thye et al. 2011). The most common decentralised toilet designs are below-ground pits. Advocates of ecological toilets suggest they offer environmental and economic benefits that outweigh the use of below-ground pit toilets. For example, Langergraber & Muellegger (2005) argue that above-ground, ecological toilets (internationally referred to as ‘Ecosan Toilets’ and in Malawi commonly called ‘Skyloos’) allow for source separation of urine to allow for recycling of nutrients, a potential source of revenue to users through selling composted faeces, and prevent groundwater contamination. Despite these potential benefits, evaluations of ecological sanitation programmes in sub-Saharan Africa have identified a number of challenges that prevent the widespread uptake of the technology. The challenges include cultural taboos of handling human excreta, inadequate long-term maintenance, low levels of
user satisfaction and financially unviable business models for suppliers (Sustainable Sanitation Alliance (SUSANA) 2010; Roma et al. 2013).

In an attempt to surmount these challenges sanitation managers have applied social marketing approaches to design, implement and evaluate rural and urban sanitation programmes in countries with developing economies (Cairncross 2004; Jenkins & Curtis 2005; Jenkins & Scott 2007; Devine 2010; Sijbesma et al. 2010; Baker et al. 2011; Cole et al. 2012). Social marketing approaches were also introduced to complement existing supply-side efforts of governments and donors to boost demand creation, encourage supply and nurture a supportive regulatory environment (Cairncross 2004). The principle of social marketing is the use of marketing tools and principles to achieve a socially beneficial goal (Kotler & Zaltman 1971 cited in Donovan 2011). The intended socially beneficial goal for social marketing approaches to sanitation is for low-income consumers and suppliers to exchange hygienic sanitation goods and services over the long-term without the need for sustained external funding (Cairncross 2004; Devine 2010; Jenkins 2010).

The practical application of social marketing principles to design, implement and evaluate sanitation programmes has gained rapid pace in the last decade. However, this vigour has not been matched with examinations of the utility of theoretical frameworks to explain, describe and generalise the outcomes of social marketing approaches to sanitation. Applying a suitable theoretical framework would provide sanitation programme managers and evaluators with a conceptual lens to identify causal mechanisms, to generalise key findings to other populations and to determine the significance of the interventions (Evans et al. 2011). Rogers’ (2003) diffusion of innovation theory is a widely used theoretical framework used to design, implement and evaluate social marketing programmes in the public health sector (Haider & Kreps 2004; Dearing 2009). This study was designed to address a fundamental and pragmatic question – should organisations implementing social marketing approaches in the urban sanitation context utilise Rogers’ (2003) theory of diffusion to design, implement and evaluate their programmes?

Diffusion theory has been embraced by marketing theorists and practitioners as a theoretical framework for explaining and predicting consumer behaviour (Gatignon & Robertson 1985; Rogers 2003; Dearing 2008; Cho et al. 2012). Diffusion theory has been proven as a suitable framework for exploring consumer behaviour towards sanitation in rural settings in sub-Saharan Africa (Jenkins & Curtis 2005; Roma et al. 2013). Within social marketing and sanitation-related literature, there has been limited examination of the utility of Rogers’ (2003) theory of diffusion to evaluate the uptake of innovative sanitation technologies in urban settings. This study addresses this gap through critically assessing the utility of specific components of Rogers’ (2003) diffusion theory as theoretical frameworks for the adoption of ecological sanitation facilities in an urban setting in Malawi.

Three elements of Rogers’ (2003) diffusion theory are applied in this study: (a) characteristics of innovators, (b) interpersonal information sources and (c) attributes of an innovation. These three elements were selected for individual focus as they were identified as relevant elements for sanitation managers to consider during the early design phase of social marketing programmes. The study examined the three elements of Rogers’ (2003) diffusion theory by interviewing householders that had purchased an ecological sanitation facility during the early stage of a social marketing programme. These householders are referred to as ‘first movers’.

### Characteristics of innovators

Diffusion researchers categorise individuals into adopter categories (Smith & Findeis 2012). An individual is categorised based on the timing of his/her decision to adopt an innovation relative to other members of a social system (Rogers 2003). The first segment of individuals that accept an innovation are labelled innovators. Innovators are followed by early adopters, the early majority, late majority and laggards (Rogers 2003). Innovators represent the first 2.5% of a social network (Rogers 2003). Two important characteristics of innovative customers are: they have higher social status (income, level of living and possession of wealth) and they are less risk averse than later adopters (Rogers 2003). This categorisation led to the creation of the first research question.
Research Question 1: Do ‘first movers’ display characteristics of innovators including relatively high incomes and risk-taking behaviours?

Interpersonal information sources

Rogers (2003) identifies opinion leaders and change agents as the leading sources of interpersonal information for an innovation. Opinion leaders are people who have the greatest impact on the decision-making process of other consumers (Cho et al. 2012). Due to their influence upon other potential adopters, opinion leaders act as crucial sources of information that can encourage or prevent the diffusion of an innovation (Rogers 2003; Dearing 2008; Smith & Findeis 2012). Dearing’s (2009) literature review found that effective opinion leaders were located nearby those they influence and that they are perceived as influential, credible, popular and accessible. Studies have found that the social norms of a community determine the innovativeness of opinion leaders (Rogers 2003; Dearing 2009). In settings undergoing the process of modernisation, opinion leaders can display high levels of innovativeness (Rogers 2003).

Change agents attempt to stimulate a social network to accept an innovation deemed as beneficial by an external organisation. Change agents advocate, provide information and implement diffusion programmes, and commonly work with opinion leaders to reach a wider segment of the social network (Rogers 2003; Dearing 2009). The second research question explores the role of opinion leaders and change agents on influencing ‘first movers’ to adopt the sanitation innovation.

Research Question 2: What is the role of interpersonal information sources (opinion leaders and change agents) on the decision-making process of ‘first movers’ of the ecological toilet?

Attributes of an innovation

Rogers (2003) identified five attributes that are positively associated with the rate of diffusion of an innovation. They are as follows:

- Relative advantage: the perceived superiority of the innovation compared against existing products, services or ideas;
- Compatibility: the level that the innovation aligns with potential adopters’ values, experiences and needs;
- Simplicity: the degree to which people can easily use or understand an innovation;
- Observability: the extent to which the impacts of an innovation can be described or are visible to others;
- Trialability: the ability of potential adopters to use and experiment with the innovation on a limited basis.

The third and the final research question examines whether innovators of the sanitation innovation reported the five attributes of an innovation described by Rogers (2003).

Research Question 3: Do ‘first movers’ report all five attributes described by Rogers (2003) (relative advantage, compatibility, simplicity, observability and trialability) as positive reasons for purchasing the ecological toilet?

METHODS

Study area

Mzuzu city is the third largest city in Malawi and the largest city in the Northern region. Mzuzu city has a population of 120,000 and has an annual growth rate over 4% (Mzuzu City Assembly 2008). Mzuzu city radiates from a low-lying valley and experiences annual rainfall of 1,200 mm. The low-lying valleys (‘dambos’) are subject to seasonal flooding and remain waterlogged throughout most of the year (Mzuzu City Assembly 2008). This study was conducted in three city wards: Zolozolo upper, Zolozolo lower and Chipitula during June–October 2012.

The study was conducted during the first 12 months of the Sanitation in Peri-Urban Areas (SPA) Programme conducted in Mzuzu city, Malawi. SPA was funded by an international non-government organisation, WASTE International. SPA was implemented through a local sanitation business (LSB), a local business consultancy, Mzuzu University and Mzuzu City Council. The SPA Programme attempted to develop a market for a low-cost ecological toilet and provided sanitation microloans to customers. The product and service innovation are presented.
The innovation – Skyloo and sanitation micro-loans

The ecological sanitation facility, called Skyloo, is a urine-diverting, dehydrating toilet. The facility is constructed above ground and has two vaults (Figure 1). The vaults are identified as storage and in-use. The in-use vault collects human excreta for 6–12 months, whilst the storage vault remains closed. The in-use vault is closed after 6–12 months use to alternate with the storage vault. Within the storage vault, the human excreta dries to form a compost. The Skyloo allows for source separation of the urine and faeces. The urine can be used as a source of nutrients to promote agricultural crop growth. The faeces, when adequately composted, can be utilised as a source of wetting agent that can act as a soil conditioner (Langergraber & Muellegger 2005). The compost from the storage vault is emptied every 6–12 months depending on the level of use.

The SPA Programme used a competitive tender process to recruit one business to act as the LSB. The LSB was responsible for marketing, sales and construction of Skyloos. A national financial institution provided the administrative services for the sanitation micro-finance. The financial institution was a commercial bank that had limited experience in providing micro-finance and had not previously engaged in a sanitation-related programme. The monthly repayments were based on an interest rate of 30% per annum. This high rate was in part due to Malawi’s high inflation rate of 25–30% during 2013. The repayment period was 12 months.

The selection of applicants for the sanitation micro-loans was managed by a local business consultancy. Loan applicants were asked about their employment status, wage, home ownership, rental properties, business ownership and business income. Applicants could request a loan amount that covered both the cost of constructing the Skyloo and also provided surplus capital. The surplus capital was provided for households to invest in an income-generating activity. The material and labour costs for the Skyloo ranged from USD 164 to 207. The total loan available ranged from USD 260 to 400.

Research methodology

Traditionally, diffusion research has applied positivist paradigms to collate quantitative data via surveys (Meyer 2004; Brennan et al. 2011). The repeated use of such methodologies may have limited the breadth and diversity of knowledge gained from diffusion research (Rogers 2003; Meyer 2004; Brennan et al. 2011). This study applied a non-traditional methodology through applying a pragmatic paradigm using mixed methods to address the study’s research questions.

Figure 1 | Front and side view of dehydration ecological sanitation toilet taken from Tilley et al. (2014).
Qualitative investigation

The dominant component of the study was a descriptive qualitative investigation. This took place over a 3-month period during the first 12 months of the implementation of the SPA Programme. The descriptive study applied open-ended, in-depth interviews. Purposive sampling was used to identify customers that were in the first 25 households to be accepted to the micro-finance loan scheme and to have committed to purchase a Skyloo during the first 12 months of the SPA Programme.

Only households that purchased a Skyloo via a micro-finance loan facilitated through the SPA Programme were recruited as ‘first movers’ and interviewed as part of the study. As indicated in the data provided by the financial institution that provided the micro-finance loan, many other households applied, but were denied a loan to purchase a Skyloo. In effect, these households were ‘first movers at heart’, but were hampered in their aspiration to be sanitation innovators by virtue of the fact that their loan application was denied.

The decision to recruit only interviewees who had been granted a loan reduced the sample size of the study. It also passed up the opportunity to generate a body of knowledge on those ‘first movers at heart’. The decision not to identify and interview households that did not receive the loan was made in collaboration with a local non-government organisation (NGO), a sanitation small business and a finance consultancy. Staff members from all three organisations stated that identifying and interviewing households that had been rejected by the financial institution may have caused tension and confusion within their community. Based on this advice, the researcher agreed not to identify and interview households that had been rejected by the financial institution.

A total of 14 customers were interviewed including 6 women and 8 men. The lead researcher conducted line-by-line analysis of the interview transcriptions after each interview. At the completion of the 14th interview, it was identified that no new information was derived. In keeping with qualitative research methodologies, it was decided to cease the interviews as saturation had been reached (Leininger 1994).

Quantitative surveys

Quantitative data were provided through the sanitation micro-loan programme. The micro-loan programme manager provided the de-identified data of 385 loan applicants. The de-identified data were analysed using IBM® SPSS® v.21 to compare means between loan applicants that were accepted and declined by the micro-loan programme manager.

Data analysis

The characteristics of innovators (Research Question 1) were analysed by integrating the findings from the sanitation micro-loan application process and through deductive content analysis of the in-depth interviews (Elo & Kyngas 2008). The content analysis was conducted line-by-line to identify significant meaning to a relevant sentence or groups of sentences (Graneheim & Lundman 2004). Each significant meaning was then categorised into groups. The groups were then formed into clusters derived from Rogers’ (2003) diffusion theory. The role of interpersonal information sources (Research Question 2) was analysed using inductive content analysis (Schilling 2006).

Deductive content analysis was used to examine Rogers’ (2003) five attributes of an innovation as perceived by customers of the Skyloo (Research Question 3). The matrix of analysis was developed based on the description of each of the five attributes presented in Rogers (2003). The meaning unit was a sentence or group of sentences (Graneheim & Lundman 2004). Relevant meaning units were categorised into groups. Groups were then clustered into Rogers’ (2003) five attributes of an innovation that increases the rate of diffusion using QSR NVivo® v.10 (see Table 1) (Elo & Kyngas 2008).

Ethics

The research was approved by Murdoch University’s Research Ethics Office on 18 August 2011 (permit number 2011/91). All participants were verbally informed of the aims and outcomes of the study. It was explained to all participants that the information they provided could not be linked to them and all notes would be held securely. Due
to some participants having low literacy levels, the participants were asked to provide verbal consent to participate in the study. It was explained to all participants that they could withdraw from the study at any point in time. Participants were informed they could call the lead author or interpreter to request that all records of their interview should be destroyed.

**Limitations**

A common methodological challenge in diffusion studies is the use of self-reported interviews that occur after a significant period of time from adopting an innovation (Rogers 2003). As time extends between adoption and the interview, there is a growing opportunity for inaccuracies and biases to form in the adopter’s recall. This challenge is identified as recall bias (Rogers 2003). This study combated the challenge of recall bias by interviewing customers within 3 months of purchasing and constructing their Skyloo.

The second challenge in this study was the language barrier. Six of the 14 interviews were conducted in Chichewa and translated into English. The interpreter played a crucial and visible role during the interviews to overcome the language barrier. To overcome challenges associated with language barriers, the interpreter was trained for 2 days prior to conducting the interviews (Squires 2009). The training developed a rapport between the lead researcher and interpreter and clarified the interview process and terminology (Pitchforth & Teijlingen 2005). The lead author and interpreter also identified potential biases and addressed these through the process of ‘bracketing’ described by Ahern (1999).

The third limitation of the study was the selection process used to identify ‘first movers’ into the micro-finance loan scheme. The selection process was managed by a local business consultancy through assessing income, business and home ownership. However, it should be acknowledged that personal bias may have impacted the selection of successful applicants. This potential bias may have distorted the selection of ‘first movers’ by the consultancy staff.

**RESULTS AND DISCUSSION**

**Research Question 1: Do ‘first movers’ display characteristics of innovators including relatively high incomes and risk-taking behaviours?**

Rogers (2003) identified relatively high incomes and venture-someness as two important characteristics of the first segment of adopters, the innovators. Households that were ‘first movers’ to purchase the Skyloo displayed characteristics that partially aligned with these characteristics.

**Wealth**

Innovators were found to have relatively high incomes amongst their social network. The innovators reported having stable incomes through rental properties, pensions, managing second-hand clothing businesses and raising poultry. The loan application data found customers that received the sanitation micro-loan (including all innovators) reported an average monthly wage three times higher than loan applicants that were declined (USD 260/month as compared to USD 73/month). Access to these relatively high and secure financial resources may have allowed the innovators to absorb potential losses from an unprofitable innovation (Rogers 2003).

Social marketing programmes that support higher-income households to adopt a new sanitation product or service are commonly justified through the expectation the product or service will diffuse through a wider social network that includes middle- and lower-income households. If a sanitation product or service fails to diffuse to middle- and lower-income households the cost-effectiveness, efficacy...
and equity of a social marketing approach to sanitation could be questioned. The application of diffusion theory as an evaluative lens for social marketing programmes could improve the ability of sanitation programme managers to measure their contribution towards attaining universal sanitation coverage.

**Risk taking**

‘First movers’ demonstrated some willingness to accept risk. All ‘first movers’ reported that they had used their own money to purchase materials prior to receiving funds from the sanitation micro-finance loan. ‘First movers’ stated that although they were unsure of when the funds from the loan would be disbursed, they wanted to proceed with the construction of their new Skyloo. Rogers (2003) identified that a willingness to accept an innovation under uncertain conditions is a characteristic of innovative customers.

So I filled the forms and they said “Okay, your loan is now ready”. So that means you can start construction of the toilet. But we haven’t received the money yet. The money will be given later. So that is why I am going ahead with paying for my toilet. But I am frustrated. The money now when am I going to see my money (H5, male).

‘First movers’ did however report using risk reduction strategies prior to accepting the innovation. One important risk reduction strategy, taken up by all ‘first movers’, was the identification of a plan to ensure the generation of income from the surplus capital provided from the sanitation micro-finance loan. This demonstrated a keen interest in reducing exposure to financial risk associated with purchasing the Skyloo.

So our aim with that, if we can get that money we want to start keeping poultry. Poultry farming. So we can have enough money to pay back the (national financial institution) (H3, female).

A second important risk reduction strategy (reported by 13 of the 14 ‘first movers’) was the creation of small, informal groups of ‘first movers’ prior to purchasing their Skyloo. The first group formed during a sales event for the Skyloo. The group consisted of seven retired men aged over 65 years that sourced income from rental properties and pensions. The second group to form were six females, aged 40–49 years who managed second-hand clothing businesses and raised poultry. The group reduced an individual’s exposure to risk in two ways: the first was through sharing information about the innovation and the second was through reducing and sharing the financial costs associated with purchasing the Skyloo amongst members of the group. Financial savings occurred through members sharing the cost of transportation of materials and through making savings through purchasing in bulk resulting in lower unit costs.

But it came to a time there were some delays … if we are going to wait for loans it may take time. But for those who are willing to start immediately can start provided they have got their own (building) materials … a group of five people said “no we cannot handle this issue individually. Let us make a group”. So we organised a group, namely a cooperative group so that whenever someone is lacking materials the other side can assist (H6, male).

Innovators reported that group membership had additional benefits including sharing information about the innovation, organising visits to observe an existing Skyloo and travelling together to apply for the sanitation micro-loan. This finding aligns with Rogers’ (2003) assertion that innovators form groups or cliques to share information within their close social network. This finding suggests sanitation programmes introducing an innovative toilet may improve adoption through shifting their focus away from targeting individuals towards developing strategies that encourage individuals to form groups. Micro-finance programmes that target groups rather than individuals have been commonplace in India and Bangladesh for some time (Karlan & Appel 2011).

Rogers’ (2003) definition of innovators focuses on relatively high incomes and risk-taking behaviours. This study found that the ‘first movers’ only partially met this definition. The ‘first movers’ were found to be relatively wealthy and therefore did align to this characteristic of ‘innovators’. However, this finding is unsurprising as the ‘first movers’ were selected to engage in the programme due to their capacity to repay the micro-finance loan. This study supports the findings from previous diffusion studies.
conducted in low-income communities in sub-Saharan Africa that reported that all adopter categories, including innovators, require reduced risk and financial security prior to accepting an innovation (Smith & Findeis 2012). The ‘first movers’ demonstrated some willingness to accept risk; however, they developed important risk mitigation strategies (including forming groups). These findings suggest the ‘first movers’ partially meet Rogers’ (2003) definition of ‘innovators’. This suggests that ongoing diffusion of the innovation, from innovators to early adopters and beyond, may face challenges.

**Research Question 2: What is the role of interpersonal information sources (opinion leaders and change agents) on the decision-making process of ‘first movers’ of the ecological toilet?**

**Opinion leaders**

The majority of ‘first movers’ (13 of 14) reported that the first customer to construct a Skyloo (identified as H7, male) was a vital source of information that motivated them to purchase. All ‘first movers’ reported travelling to observe the constructed Skyloo at H7’s house and discussed the purchase with H7. H7 was identified as a leader in his local community. His older age and relatively high wealth were identified by ‘first movers’ as providing him with high levels of connectivity and social status amongst the community. H7 was aware of his leadership role to introduce the Skyloo to his community:

> I started this group, it’s me, I am not proud. I said, (you) come here and that one come, come, come. Because I knew those people and that we can work together and so they agreed. That’s why we made this group. So that time it was better for us to stand on our own. Our own money, whatever is available, so we started. Now from there people were flocking to see the sample because (we used) our money (H7, male).

‘First movers’ perceived the opinion leader to satisfy all four of Dearing’s (2009) attributes of a reliable information source – influential, credible, popular and accessible. The opinion leader self-selected and played a central role in gathering new customers from his extended social network. The opinion leader offered a place to view a Skyloo, demonstrated his commitment to the innovation through purchasing a Skyloo with his own savings and allowed potential adopters to meet with him to discuss the innovation.

By definition, the opinion leader was an authentic local opinion leader (Dearing 2009). The opinion leader was not pre-determined by an outside group but rather naturally evolved as an opinion leader during the implementation of the diffusion intervention. This finding supports previous studies that have found that allowing opinion leaders to naturally evolve, rather than through nomination by the community, can enhance the diffusion process (Dearing 2009). However, the opinion leader did arise from a small group (25 ‘first movers’) and no evidence was found to suggest this opinion leader would have arisen from a wider social group. The self-selection process made by opinion leaders may improve the long-term outcome of programmes that attempt to diffuse innovative sanitation options into urban settings.

**Change agents**

All ‘first movers’ reported a change agent was another vital source of regular and sustained information about purchasing the Skyloo. The change agent was employed by the LSB as a marketing and sales manager. ‘First movers’ reported that the change agent worked in close association with the opinion leader (described above as H7, male). The relationship between the change agent and the opinion leader involved the change agent recommending potential customers to visit the Skyloo constructed by the opinion leader. This role was formalised when the opinion leader was employed by the LSB to supervise the construction of new Skyloos.

**Research Question 3: Do ‘first movers’ report all five attributes described by Rogers (2003) (relative advantage, compatibility, simplicity, observability and trialability) as positive reasons for purchasing the ecological toilet?**

Innovators identified three product attributes as positive reasons for purchasing the sanitation innovation: relative...
advantage, compatibility and observability. The two remaining attributes, simplicity and trialability, were reported as negative or absent attributes by the innovators.

Relative advantage

Studies have identified that access to sufficient capital is an important determinant of toilet ownership in developing countries (Jenkins & Scott 2007; Cole et al. 2012). In this study, all ‘first movers’ confirmed they would not have purchased the Skyloo if their application for a sanitation micro-finance loan had not been approved. ‘First movers’ stated that the sanitation micro-loan removed the barrier of saving the upfront capital to purchase the Skyloo. The challenge of saving in an environment with numerous competing priorities was described by one ‘first mover’ as follows:

‘First movers’ also stated that the loan offered them extended time to repay the upfront costs of the Skyloo. This finding is consistent with an earlier study that found offering a loan structure that provided smaller repayments over a longer period motivated households to build a new sanitation facility (Tremolet et al. 2010). Although limited in scope, this finding should encourage sanitation managers to trial innovative financial schemes that offer customers innovative credit options such as micro-loans and delayed repayment schedules.

‘First movers’ reported that a further relative advantage offered by the sanitation micro-loan was the provision of surplus capital. ‘First movers’ stated that the surplus capital would be invested in home-based or small businesses. The profits from the business activities were intended to provide the source of revenue to repay the loan. A flow-on but no less important benefit of the loan reported by ‘first movers’ was that it established their relationship with a respected national financial institution. The ‘first movers’ stated they hoped that successfully repaying their sanitation loan would provide a foundation to source additional loans from the national financial institution in the future.

A further relative advantage of constructing a Skyloo, as reported by ‘first movers’, was the space-saving benefits. Space-saving benefits arise as the Skyloo is a permanent, above-ground toilet, which replaces the need to build a below-ground pit latrine. Below-ground pit latrines are commonly rebuilt on an annual basis as they fill up with ground or surface water during seasonal rain events and flooding. Other studies have identified access to space as a key determinant of toilet ownership in rural and urban settings in sub-Saharan Africa (Jenkins & Scott 2007; Katukiza et al. 2010). The protection of land assets is particularly crucial in urban areas that are experiencing rapid population growth. Increased demand for land is commonly matched by an increase in the value of the land as it could be converted to additional housing, manufacturing facilities or small-scale crop production. The promotion of the economic benefits of protecting land assets, through the construction of above-ground ecological toilets, may offer a simple and direct promotional message that is compatible with the needs of the target audience.

Two additional relative advantages were reported by ‘first movers’. Firstly, the Skyloo was a durable solution and would save households from paying for labour and materials to construct a new below-ground pit latrine each year. Secondly, the Skyloo offered potential revenue from selling or using the human manure. One innovator illustrated this point as follows:

I heard that apart from using the toilet also there will be manure. And to me that is a double win, so going to the toilet and manure (at the) same time. So we are not using money to buy fertilisers (H8, female).

Compatibility

All ‘first movers’ reported that the Skyloo was highly compatible with their needs of living in an environment that was consistently waterlogged. They reported that the Skyloo was a durable solution as it was above ground and therefore avoided filling with water during rainfall events. One ‘first mover’ described the Skyloo as offering a life-time solution as follows:

And the main reason to me – these toilets we don’t dig. It is just (on the) surface. It’s permanent so people were
very happy without digging because when the rain comes the Skyloo won’t fill up with water. And the foundation is really decent. Decent, like concrete. So you can die and you will still leave it (H7, male).

**Observability**

All ‘first movers’ reported observing a Skyloo prior to purchase. As discussed above, the majority of ‘first movers’ observed a Skyloo at the home of the first Skyloo customer (H7, male). The first customer reported visiting another NGO project that had recently constructed urine-diverting dehydration toilets that had similar design principles as the Skyloo. This finding demonstrates that observing the Skyloo was an important contributing factor for ‘first movers’ in adopting the innovation. Improving the visibility of innovative latrine products, for example, by constructing in market places for use as public facilities, may increase the visibility of the product to a greater number of potential adopters. Increasing the number of people that observe an innovative latrine, through construction of public latrines that were supported with service contracts, may be a useful strategy to allow potential adopters to observe and trial innovative sanitation products and services.

**Simplicity**

Over half the ‘first movers’ (8 of 14) expressed concern about the complexity of the urine-diverting component of the Skyloo and the overall maintenance required. The complexity was related to the control of smell, the removal of waste from the storage vaults and carrying out repairs. Two ‘first movers’ captured the concerns about the complexity of the Skyloo as follows:

When the project was coming. You see, urine going somewhere, faeces going somewhere. If urine and faeces meet they produce smell. They told us if they don’t meet they don’t produce smell. But still there was some question marks (H12, female).

We have learnt theoretically that this is a permanent toilet. But we have never used it. It may end up opposite (H6, male).

**Trialability**

None of the ‘first movers’ trialled using the toilet nor emptying the storage vault after 6 months of use.

This finding reveals that the ‘first movers’ will be the first people in their social network to trial the simplicity of the use and maintenance of the Skyloo. The ‘first movers’ experiences will influence and inform the decision-making process of later adopters. Evaluations of ecological sanitation programmes have identified that inadequate training on the operation and maintenance of the innovation resulted in low user satisfaction (Cole et al. 2009). Allowing the ‘first movers’ to trial the use and maintenance of latrines may have improved or reduced their willingness to accept the innovation. This finding suggests that allowing potential customers to assess all five characteristics of the innovation (relative advantage, compatibility, simplicity, observability and trialability) during the programme design may have resulted in changes to the innovation upstream. Approaches to allow potential customers to assess the innovation could include field-testing, human-centred design (IDEO 2009) and participatory design approaches (Cole et al. 2014).

Addressing the issues of simplicity and trialability through field-testing, human-centred or participatory design may also address the key challenges of operation and maintenance that have been recorded for ecological sanitation programmes. A recent large-scale evaluation of more than 17,000 households provided with ecological sanitation facilities in South Africa reported low levels of consumer satisfaction due to poor construction and bad odours (Roma et al. 2013). Roma et al. (2013) suggested both of these issues could be overcome through technical and educational support. Similarly, Ramani et al. (2012) found that long-term engagement of sanitation suppliers with their customers was essential for sustaining sanitation markets. A longitudinal study that explored the practices and perceptions of suppliers and customers would offer essential insights into the diffusion or non-diffusion of the Skyloo innovation.

**CONCLUSION**

The recognition and use of social marketing principles and tools is in its infancy in urban sanitation programming in
developing countries. This paper found that specific components of Rogers’ (2007) diffusion theory (innovators’ characteristics, interpersonal information sources and product attributes) offered a useful theoretical context to evaluate this early-stage, urban sanitation programme in Malawi. Future research should continue to follow the diffusion (or non-diffusion) process beyond the ‘first movers’. Most importantly, the impact of long-term use and maintenance of the ecological toilet should be examined to determine its impact on the rate of diffusion.

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