Extending sanitation in countries with developing economies: Examining market-based approaches with case studies in rural and urban Malawi

Ben Cole B Sc. (Hons) M. Env. Health (Dist)

This thesis is presented for the degree of Doctor of Philosophy of Murdoch University

2015
DECLARATION

I declare that this thesis is my own account of my research and contains as its main content work which has not previously been submitted for a degree at any tertiary education institution.

Ben Cole
I know that my achievement is quite ordinary. I’m not the only man to seek his fortune far from home, and certainly I am not the first. Still, there are times I am bewildered by each mile I have travelled, each meal I have eaten, each person I have known, each room in which I slept. As ordinary as it all appears there are times when it is beyond my imagination.


I find it very, very easy to be true
I find myself alone when each day is through
Yes, I’ll admit I’m a fool for you
Because you’re mine,
I walk the line

Johnny Cash, I Walk the Line
ABSTRACT

Toilets are a foundation of public health and a basic human right. Yet over 2.5 billion people do not have access to a safe and hygienic toilet in countries with developing economies. Both theorists and practitioners have argued that sanitation programs in countries with developing economies have failed to embrace the principles and tools offered by market-based approaches. Market-based approaches to sanitation have predominantly arisen from the field of social marketing.

This thesis presents an integrated research process conducted in the sanitation sector over a three-year period in both rural and urban settings in Malawi. The core research components include; (a) formative market research of a sanitation program, (b) participatory design of sanitation technologies, (c) financial analysis of sanitation business models and (d) theoretical analysis using diffusion theory to examine the adoption of ecological toilets.

The research applied a pragmatic research paradigm accompanied with mixed methods. The formative market research identified two key market failures; i) a lack of suitable and affordable sanitation products and services and ii) a high awareness of government and donor subsidy programs that reduced consumer and supplier engagement in the market. In response to the market research findings the research validated the use of participatory approaches to engage users in the design of appropriate sanitation products. The participatory approach created a space for dialogue between home owners, builders and government representatives towards the design of sanitation products (and programs). Financial modelling demonstrated that low-cost sanitation options can support sustainable business models. Three components of diffusion theory (a) characteristics of innovators, (b) interpersonal information sources and (c) attributes of products were found to inform the design and analysis of market-based approaches to sanitation in an urban setting.
The research shows that the application of market-based approaches to sanitation can present an evidence base to offer new insights into existing sanitation markets. The research also shows that the application of participatory methodologies can offer an innovative approach to stimulate the creation of appropriate sanitation products and to engage new suppliers and consumers in the sanitation market. The research offers a foundation for future researchers to utilise diffusion theory, and its extensive supporting literature, to design, manage and evaluate market-based approaches to sanitation.
<table>
<thead>
<tr>
<th>CHAPTER</th>
<th>TITLE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction</td>
<td>13</td>
</tr>
<tr>
<td>2</td>
<td>Linkage Chapter</td>
<td>19</td>
</tr>
<tr>
<td>3 – Paper One</td>
<td>Literature review of market-based approaches to sanitation in countries with developing economies</td>
<td>28</td>
</tr>
<tr>
<td>4 – Paper Two</td>
<td>Theoretical and methodological considerations for investigating market-based approaches to sanitation in countries with developing economies</td>
<td>70</td>
</tr>
<tr>
<td>5 – Paper Three</td>
<td>Investigating the dynamic interactions between supply and demand for rural sanitation, Malawi</td>
<td>95</td>
</tr>
<tr>
<td>6 – Paper Four</td>
<td>Engaging government partners to conduct research on the sanitation market: A case-study from rural Malawi</td>
<td>123</td>
</tr>
<tr>
<td>7 – Paper Five</td>
<td>Exploring the methodology of participatory design to create appropriate sanitation technologies in rural Malawi</td>
<td>140</td>
</tr>
<tr>
<td>8 – Paper Six</td>
<td>Modelling potential business models in a rural sanitation market, Malawi</td>
<td>168</td>
</tr>
<tr>
<td>9 – Paper Seven</td>
<td>Exploring the utility of diffusion theory to evaluate social marketing approaches to improve urban sanitation in Malawi</td>
<td>183</td>
</tr>
<tr>
<td>10</td>
<td>Conclusion</td>
<td>214</td>
</tr>
<tr>
<td>APPENDIX I</td>
<td>Title page of peer-reviewed publications</td>
<td>226</td>
</tr>
<tr>
<td>APPENDIX II</td>
<td>Publications submitted but not yet approved</td>
<td>230</td>
</tr>
<tr>
<td>APPENDIX III</td>
<td>Survey tools</td>
<td>231</td>
</tr>
</tbody>
</table>
ACKNOWLEDGEMENTS

This thesis is written for the hundreds of welcoming and warm-hearted Malawians that allowed me into their lives, homes and toilets during my research. Your smiles, generosity and joy for life will stay with me forever. To Stephanie and Walu, without you both, this thesis would not exist - thank you. To my family and loved ones, thank you for the constant encouragement and belief. To my mentors and supervisors, Goen and Martin, you guided me perfectly through choppy and calm waters. To my friends and supporters – thanks for listening and showing interest in my research - you are amazing friends!
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLTS</td>
<td>Community Led Total Sanitation</td>
</tr>
<tr>
<td>DCT</td>
<td>District Coordination Team</td>
</tr>
<tr>
<td>DEHO</td>
<td>District Environmental Health Officers</td>
</tr>
<tr>
<td>EHO</td>
<td>Environmental Health Officers</td>
</tr>
<tr>
<td>EWB</td>
<td>Engineers Without Borders (Canada)</td>
</tr>
<tr>
<td>HSA</td>
<td>Health Surveillance Assistants</td>
</tr>
<tr>
<td>IDE</td>
<td>International Development Enterprises</td>
</tr>
<tr>
<td>JMP</td>
<td>Joint Monitoring Programme (WHO/UNICEF)</td>
</tr>
<tr>
<td>MDG</td>
<td>Millennium Development Goals</td>
</tr>
<tr>
<td>MDHS</td>
<td>Malawi Demographic Health Survey (NSO/ICF Macro)</td>
</tr>
<tr>
<td>MK</td>
<td>Malawian Kwacha</td>
</tr>
<tr>
<td>MoAIWD</td>
<td>Ministry of Agriculture, Irrigation and Water Development</td>
</tr>
<tr>
<td>MoH</td>
<td>Ministry of Health</td>
</tr>
<tr>
<td>NGO</td>
<td>Non-Government Organisation</td>
</tr>
<tr>
<td>NRSM</td>
<td>National Rural Sanitation Marketing (Workshop)</td>
</tr>
<tr>
<td>NSP</td>
<td>National Sanitation Policy</td>
</tr>
<tr>
<td>ODF</td>
<td>Open Defecation Free</td>
</tr>
<tr>
<td>TA</td>
<td>Traditional Authority</td>
</tr>
</tbody>
</table>
**PUBLICATIONS ARISING FROM THE RESEARCH**

- **Published papers in peer-reviewed journals**


  Paper Seven - Exploring the utility of diffusion theory to evaluate social marketing approaches to improve urban sanitation in Malawi. *Journal of Water, Sanitation and Hygiene for Development* (in press)

- **Papers submitted but not yet approved**

  Paper One - Literature review of market-based approaches to sanitation in countries with developing economies submitted to *Waterlines: International Journal of Water, Sanitation and Waste*
• **Papers prepared but not yet submitted**

Paper Two - Theoretical and methodological considerations for investigating market-based approaches to sanitation in countries with developing economies to be submitted to *Waterlines: International Journal of Water, Sanitation and Waste*

Paper Six - Modelling potential business models in a rural sanitation market, Malawi to be submitted to *Journal of Water, Sanitation and Hygiene for Development*
### Citation of article

<table>
<thead>
<tr>
<th>Paper Three – Cole, B., Pinfold, J., Ho, G. and Anda, M. 2012</th>
<th>Role of lead author</th>
<th>Role of co-authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investigating the dynamic interactions between supply and demand for rural sanitation, Malawi. <em>Journal of Water, Sanitation and Hygiene for Development</em> 2(4), 266 - 278</td>
<td>• Conducted literature review and designed methodology</td>
<td>• Provided recommendations for theoretical frameworks</td>
</tr>
<tr>
<td></td>
<td>• Collated all data and conducted qualitative and quantitative analysis</td>
<td>• Provided guidance on selection of methods</td>
</tr>
<tr>
<td></td>
<td>• Drafted manuscript and revised based on peer-review comments.</td>
<td>• Made comments and revisions to original manuscript</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Engaging government partners to conduct research on the sanitation market: A case-study from rural Malawi. <em>Waterlines: International journal of water, sanitation and waste</em> 33(2), <em>in press</em></td>
<td>• Conducted literature review and designed methodology</td>
<td>• Provided comments on research design</td>
</tr>
<tr>
<td></td>
<td>• Collated all data and conducted qualitative and quantitative analysis</td>
<td>• Made comments and revisions to original manuscript</td>
</tr>
<tr>
<td></td>
<td>• Drafted manuscript and revised based on peer-review comments.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Paper Five – Cole, B., Pinfold, J., Ho, G. and Anda, M. 2014</th>
<th>Role of lead author</th>
<th>Role of co-authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exploring the methodology of</td>
<td>• Conducted literature review and designed methodology</td>
<td>• Provided recommendations for theoretical frameworks</td>
</tr>
</tbody>
</table>
| participatory design to create appropriate sanitation technologies in rural Malawi. *Journal of Water, Sanitation and Hygiene for Development* 4 (1), 51 - 61 | • Collated all data and conducted qualitative and quantitative analysis  
• Drafted manuscript and revised based on peer-review comments. | • Provided guidance on selection of methods  
• Made comments and revisions to original manuscript |
CHAPTER 1
INTRODUCTION

Global sanitation crisis

Hygienic sanitation is a foundation of public health and a basic human right, yet over 2.5 billion people in countries with developing economies do not have access to a safe and hygienic toilet (UNICEF & WHO 2014). Lack of access to sanitation contributes to over 2 million deaths each year (Pruss Ustun et al. 2008) and results in more deaths than the combined impact of HIV/AIDS, tuberculosis and malaria (Bartram & Cairncross 2010). Inadequate or absent sanitation also stymies social and economic development in countries with developing economies (Hutton 2012).

Unfortunately, the global sanitation crisis has been met with narrow media attention, limited scientific research and chronic underfunding (Elliott 2007; Dugger 2009; Bartram & Cairncross 2010; Evans et al. 2009; Tremolet et al. 2010). With scarce resources available, sanitation policy-makers and practitioners strive to identify cost-efficient and sustainable solutions to address the global sanitation crisis. The objective of this thesis is to contribute to the body of evidence that investigates the impact of market-based approaches to increase sanitation coverage in rural and urban Malawi.

Purpose of research

Less than 30% of the population living in sub-Saharan Africa have access to improved sanitation (WHO and UNICEF 2014). Conventional development approaches to increase sanitation coverage apply top-down technological solutions supported with heavily subsidised programmes (Cairncross 2004). Evaluations of conventional development approaches to improve sanitation coverage have identified significant failings including poor coverage, inability to go to scale and poor allocation of funds (Jenkins and Sugden 2006). In response, some donor agencies, development organisations and governments have adopted the
application of market-based approaches to sanitation programs (Cairncross 2004; WSP 2009; Jenkins 2010).

The body of research presented in this thesis is significant because it examines a new paradigm to improve access to household sanitation in countries with developing economies – market-based approaches. A common market-based approach to sanitation is the application of social marketing principles and approaches (Cairncross 2004; Devine 2010). Social marketing programs apply commercial marketing techniques to generate demand, encourage supply and create an enabling regulatory environment for sanitation products and services (Cairncross 2004; Jenkins 2010). These approaches are commonly referred to as sanitation marketing programs (Cairncross 2004).

While there are several recent examples of the use of market-based approaches to sanitation, there have been few studies examining their application in Malawi (Jenkins and Scott 2007; WSP 2009; Jenkins 2010). This study will generate knowledge on the impact and suitability of market-based approaches to improve sanitation coverage in rural and urban contexts in Malawi. The research methodology will be transferable to other countries with developing economies and will be relevant to the design, implementation and evaluation of market-based approaches to sanitation in those countries. The research also seeks to support decision makers in Malawi’s government and non-government sector in their work to achieve universal sanitation coverage by 2015 (MoAIWD 2011).

**Definitions**

**What is improved household sanitation?**

A sanitation facility that protects users from contact with their excreta and is located within the boundaries of the home (WHO & UNICEF 2004)

**What is a market?**
A place where buyers and sellers engage in a dynamic exchange of goods and services (Jocknick 2012)

**What is a market-based approach to poverty alleviation?**

The growth and reformation of a market to work better for the poor (Jocknick 2012)

**What is marketing?**

The process by which companies create value for customers to build strong customer relationships in order to capture value from customers in return (Kotler & Armstrong 2011)

**What is social marketing?**

The application of marketing techniques to attain a positive social outcome (Donovan 2011)

**What is sanitation marketing?**

Programs that generate demand, encourage supply and create an enabling regulatory environment for sanitation products and services (Cairncross 2004; Jenkins 2010)
Research objective and research questions

This thesis provides a comprehensive and integrated body of research to address the research objective:

*To investigate how market-based approaches may impact sanitation coverage in rural and urban settings in Malawi.*

Three research questions emanated from the research objective:

**Research Question 1:** What are the practices, motivations and barriers of sanitation suppliers?

**Research Question 2:** What are the constraints and motivations of consumers to select, construct and purchase a toilet?

**Research Question 3:** How do technological, environmental, socio-economic and cultural factors impact upon the appropriate design of sanitation products and services?

References


CHAPTER 2
LINKAGE CHAPTER

As described in the introductory chapter, there has been limited research to explore the use of market-based approaches to sanitation in rural Malawi. This thesis provides a comprehensive and integrated body of research to address the research objective: To investigate how market-based approaches may impact sanitation coverage in rural and urban settings in Malawi. Three research questions emanated from the research objective:

Research Question 1: What are the practices, motivations and barriers of sanitation suppliers?

Research Question 2: What are the constraints and motivations of consumers to select, construct and purchase a toilet?

Research Question 3: How do technological, environmental, socio-economic and cultural factors impact upon the appropriate design of sanitation products and services?

This thesis consists of seven studies that have been submitted, or prepared for submission, to peer-reviewed journals. Each study is herein referred to as a paper and is identified with a number (one to seven). This linkage chapter serves two purposes; the first is to demonstrate the thesis represents a cohesive and integrated body of evidence that addresses one research objective. To achieve this, the linkage chapter will show how each of the seven studies addresses one or more of the three research questions, which emanated from the research objective.

The second purpose of the linkage chapter is to detail how the thesis represents an iterative and responsive body of research. Each study was guided by the central research objective. However, few research processes are linear or predictable. This chapter demonstrates how the design of each new study was informed by the methodologies, findings and analyses from the previous studies.
Paper One – Literature review of market-based approaches to sanitation in countries with developing economies

Paper One addresses the overall research objective by reviewing relevant literature to examine the impacts of market-based approaches to sanitation in countries with developing or emerging economies. The literature review examines formative, process and outcome evaluations of market-based approaches to sanitation in three Southeast Asian and six sub-Saharan African countries. The first paper also establishes the use of social marketing principles within the thesis. The paper applies the six P’s (product, price, place, promotion, partnership and policy) as a contextual framework to categorise the key lessons learnt from the existing body of literature.

The literature review addresses all three of the research questions. Research question one is addressed through collating the evidence surrounding the practices, barriers and motivations of sanitation suppliers in market-based approaches to sanitation. The paper identifies a key barrier for sanitation suppliers are inadequate access to finance and transportation.

Paper One addresses research question two through examining the evidence of the constraints and motivators of consumers to select, construct and purchase a toilet. The paper demonstrates that low-income households face significantly higher constraints to construct and purchase a latrine than middle and upper income households.

Paper One addresses research question three by exploring how the technological, environmental, socio-economic and cultural factors impacted upon the appropriate design of sanitation products and services in the nine countries represented in the evaluations. The paper identifies how technological and environmental conditions (e.g. limited space, soil type and groundwater levels), socio-economic factors (e.g. income and education levels) and cultural settings (e.g. ethnicity and religion) impact on the design of appropriate sanitation products and services.
In sum, the first paper of the thesis documents the foundation of knowledge used to design, implement and analyse the following six papers.

**Paper Two – Theoretical and methodological considerations for investigating market-based approaches to sanitation in countries with developing economies**

Paper Two provides the theoretical and methodological foundation of the thesis. The paper identifies four established research paradigms including positivism, post-positivism, constructivism and pragmatism. The four research paradigms are positioned against the overall research objective (to examine how market-based approaches may impact sanitation coverage in rural and urban Malawi). The paper justifies the selection of a pragmatic research paradigm as ‘it places the importance of the research questions above the selection of the theoretical foundation that underlies the method’ (Morgan 2007). Pragmatic research paradigms apply both qualitative and quantitative research methodologies.

Throughout the remainder of the thesis (Papers Three to Seven) qualitative and quantitative methodologies are applied. Papers Three and Seven utilise mixed methods to integrate data from qualitative and quantitative investigations. Both papers demonstrate the benefit of mixed methods to address research questions that investigate market-based approaches to sanitation in countries with developing economies.

Paper Two introduces and justifies the selection of diffusion of innovation theory (Rogers 2003) as the theoretical framework of the thesis. The paper introduces three components of diffusion theory – with each component corresponding to one of the three research questions. Table 1 shows the relationship between each component of diffusion theory and the three research questions addressed in the thesis.
<table>
<thead>
<tr>
<th>Component of diffusion theory</th>
<th>Description of component</th>
<th>Relevant research question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change agents</td>
<td>Provides context to examine how specific individuals in a social network (e.g. opinion leaders) can influence the uptake or rejection of an innovation (Rogers 2003).</td>
<td>Research Question 1: What are the practices, motivations and barriers of sanitation suppliers?</td>
</tr>
<tr>
<td>Adopter categories</td>
<td>Offers a framework to segment the characteristics of individuals based on the timing of their uptake of an innovation (Rogers 2003).</td>
<td>Research Question 2: What are the constraints and motivations of consumers to select, construct and purchase a toilet?</td>
</tr>
<tr>
<td>Characteristics of innovations</td>
<td>Presents five attributes that have been identified to determine the rate of adoption of a new innovation (Rogers 2003; Kotler &amp; Armstrong 2011).</td>
<td>Research Question 3: How do technological, environmental, socio-economic and cultural factors impact upon the appropriate design of sanitation products and services?</td>
</tr>
</tbody>
</table>
Paper Three - Investigating the dynamic interactions between supply and demand for rural sanitation, Malawi

Paper Three presents the formative market research used to address the overall research objective in rural settings. The paper addresses the research objective by providing an overview of the market conditions for sanitation in three rural districts in Malawi. The market research examines the supply and demand within the existing sanitation market and directly addresses research question one (practices, barriers and motivators of existing sanitation suppliers) and two (constraints and motivations of consumers to select, construct and purchase a toilet).

To address research question one the paper demonstrates that suppliers are often prevented from expanding their operations due to an inadequate range of products. The second key barrier to sanitation suppliers was the expectation that households would receive a government hardware subsidy, in the form of free cement, to construct their latrine. The paper addresses research question two through identifying the key constraints and motivators of existing and potential consumers of toilets. The prevailing constraints were found to be the inability of existing products to match the durability and price preferences of rural consumers.

The methodologies and findings of Paper Three directly impacted the research design of Paper Four, Five and Six. Paper Four provides a detailed account of the benefits and challenges of engaging government staff in formative market research. Paper Five utilises the findings from the formative research to identify suitable participatory methodologies for identifying low-cost, durable and locally affordable designs. Paper Six then continues the flow of research by exploring the business case for rural sanitation businesses. The integrated body of research demonstrates the primary importance of utilising formative market research (as presented in Paper Three) to explore market-based approaches to sanitation in rural settings.
Paper Four - Engaging government partners to conduct research on the sanitation market: A case-study from rural Malawi

Paper Four details the methodology used to conduct the formative research (the results being presented in Paper Three) in partnerships with government representatives. The paper addresses the research objective through describing and evaluating the methodology used to investigate the existing market for rural sanitation. The fourth paper validates the selection of a pragmatic paradigm and application of mixed methods as described in Paper Two. The complementary findings of Paper Two and Four suggest future investigations of market-based approaches to sanitation may benefit from the application of pragmatic paradigms that utilise mixed methods.

Paper Five - Examining the methodology of participatory design to create appropriate sanitation technologies in rural Malawi

Paper Five applies participatory methodologies to address research question three - How do technological, environmental, socio-economic and cultural factors impact upon the appropriate design of sanitation products and services? The participatory design methodology provided a space for local builders, householders and government staff to explore, design and test appropriate sanitation products. The participatory sessions were guided by a design challenge that required participants to reflect upon the environmental, socio-economic and cultural conditions of their own and surrounding rural villages. Builders contributed their extensive knowledge of local building materials and building skills to address technical constraints.

The selection of participatory design methodologies is an example of the responsive and integrated nature of the thesis. The formative market research (presented in Paper Three) identified the urgent need for design improvements in existing sanitation technologies and presented a number of limiting factors in the market conditions in rural settings in three districts of Malawi. The limiting factors included inadequate road infrastructure, expensive transport options and high costs of externally produced building materials (including cement). The market
research led to the exploration of a number of methodologies used to identify product innovations for financially constrained, remote communities that had unexplored indigenous knowledge and skills. The selection of the design methodology was chosen by reviewing the impact of participatory methodologies (such as Winschiers-Theophilus et al. 2012) in settings with similar socio-economic and cultural conditions as found in the sanitation market in rural Malawi.

**Paper Six - Investigating the business case for rural sanitation products and services in Malawi**

Paper Six addresses the overall research objective and research question one through modelling the potential financial incentive of sanitation suppliers to offer an innovative sanitation product within a rural market. Creating a profitable business model for the provision of sanitation is an integral component of creating and sustaining a market-based approach to sanitation. Paper Six was designed through integrating the findings of the formative market research (Papers Three & Four) and the outcomes of the participatory design sessions (Paper Five). The formative market research described in Paper Three stated that ‘on the supply side, the development of locally sustainable business models will be required to ensure sanitation suppliers are motivated and engaged to match the demand for affordable and desirable latrines’ (Cole et al. 2012). Paper Six addresses this conclusion through modelling the profit margin of rural sanitation businesses based on a design identified during the participatory design sessions.

**Paper Seven - Exploring the utility of diffusion theory to evaluate social marketing approaches to improve urban sanitation in Malawi**

Paper Seven addresses research questions two (consumer practices, motivations and barriers) and three (technological, environmental, socio-economic and cultural factors that impact appropriate sanitation design) in an urban setting. The paper specifically targets the practices, motivations and barriers of early adopting consumers of an ecological, above-ground toilet (commonly referred to as a Skyloo). The paper also explores what technological, environmental, socio-
economic and cultural factors influenced early adopters purchasing the ecological toilet.

As presented in Paper Two, diffusion theory was identified as a suitable theoretical framework to design and interpret market-based approaches to rural sanitation (Jenkins & Curtis, 2005). Based on the foundation of evidence from rural studies, Paper Seven assesses the utility of diffusion theory as a theoretical framework to evaluate market-based approaches to urban sanitation. The study identifies three components of diffusion theory (traits of early-adopters, opinion leaders and characteristics of innovations) offer a beneficial framework for examining early-stage, market-based approaches to sanitation in urban Malawi.

**Conclusion**

This linkage chapter has demonstrated how the research presented in the thesis was guided by an overarching research objective. The seven papers all address one or more of the research questions and add new evidence to investigate how market-based approaches may impact sanitation coverage in rural and urban settings in Malawi. The chapter also demonstrates how the findings from the preceding papers were utilised to produce a responsive and iterative body of research.

**References**


CHAPTER 3  (PAPER ONE)

LITERATURE REVIEW OF MARKET-BASED APPROACHES TO SANITATION IN COUNTRIES WITH DEVELOPING ECONOMIES

INTRODUCTION

This literature review commences with an examination of the role of household sanitation to reduce the global burden of disease, improve social justice and alleviate poverty. The review then examines the integration of sanitation with water supply and hand washing programs to reduce exposure to faecal pathogens. Sanitation is both a socio-economic and technical challenge and this review provides an overview of the range of policies, systems and technologies used across the globe and specifically in Malawi. The review then moves to examine the history and theoretical foundation of foreign aid programs to attain universal access to sanitation. The review concludes with an up-to-date and in-depth examination of the theoretical foundation and application of market-based approaches to tackle the global sanitation crisis.

GLOBAL SANITATION CRISIS

Sanitation is broadly defined as the hygienic collection, storage, treatment and disposal or reuse of human excreta and associated hygiene promotion (Evans et al. 2009; Tremolet et al. 2010; WHO & UNICEF 2010). Sanitation (commonly referred to as a toilet or latrine) can be provided at the public and household level, this literature review examines only household sanitation. Foreign aid programmes that increase the coverage of household sanitation have been found to be cost-effective and to reduce the burden of disease (Laxminarayan et al. 2006; Bartram and Cairncross 2010).

Inadequate or absent sanitation continues to exact a heavy toll on the health of individuals living in developing countries (WHO & UNICEF, 2010). More than 6%
of the global health burden of disease has been associated with inadequate sanitation, unsafe drinking water and poor hygiene practices (Pruss-Ustun et al. 2008; Bartram & Cairncross 2010). In response to this public health crisis, the international community identified access to adequate sanitation as a foundation to public health (United Nations 2004) and a basic human right (United Nations 2010). In 2000, the United Nations developed the Millennium Development Goals (MDG). Target 7c of the MDG aims to halve (between 1990 and 2015) the proportion of the population without sustainable access to basic sanitation (Bartram & Cairncross 2010). Yet even with these international commitments a conservative estimate found 2.5 billion people (one in three people in the world) will not have access to adequate sanitation by 2015 (WHO & UNICEF 2014). Journalists (Elliott 2007; Dugger 2009), public health experts (Bartram & Cairncross 2010; Evans et al. 2009) and economists (Tremolet 2010) have identified an enormous gap in the political, scientific and financial resources allocated to resolve the global sanitation crisis.

**HEALTH IMPACTS OF HOUSEHOLD SANITATION**

Hygienic sanitation, safe water and correct hand washing practices are essential to good health (Cairncross et al. 2010; Mara et al. 2010). Esrey et al. (1985) identified the five pathways of transmission of pathogens moving from faeces into the mouths of humans. Figure 1 illustrates the five transmission pathways are fingers, food, fluids, flies and faeces. Adequate sanitation, accompanied with safe water sources and correct hand-washing practices have the capacity to break all five transmission pathways (Waddington et al. 2009). In its simplest description, sanitation protects humans from coming into contact with their own excreta and reduces their exposure to faecal pathogens (Esrey et al. 1985; Baltazar & Solon 1989).

*Figure 1: Exposure pathways of faecal-oral pathogen (derived from Esrey et al. 1985)*
Faecal pathogens include virus, bacteria, protozoa and helminths. Exposure to these pathogen result in health impacts ranging from nausea (*Giardiasis*) through to lethal and highly infectious watery diarrhoea (*Vibrio cholerae*). Table 1 displays the species name and health impact of a range of faecal pathogens. The table shows that diarrhoeal disease is a common symptom after exposure to faecal pathogens.

**Table 1: Pathogenic bacteria, virus, protozoa and helminths identified in human faeces**

<table>
<thead>
<tr>
<th>Group</th>
<th>Pathogen spp.</th>
<th>Disease and symptoms</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bacteria</strong></td>
<td><em>Salmonella typhi</em></td>
<td>Typhoid fever</td>
<td>Berry, 2008</td>
</tr>
<tr>
<td></td>
<td><em>Escherichia coli</em></td>
<td>Watery diarrhoea, stomach pain</td>
<td>CDC, 2014</td>
</tr>
<tr>
<td></td>
<td><em>Vibrio cholerae</em></td>
<td>Cholera – watery diarrhoea lethal if not treated</td>
<td>Schonning and Stenstrom, 2004</td>
</tr>
<tr>
<td></td>
<td><em>Shigella</em></td>
<td>Shigellosis – dysentery (bloody diarrhoea) vomiting, cramps, fever, Reiters syndrome</td>
<td>Schonning and Stenstrom., 2004</td>
</tr>
<tr>
<td><strong>Virus</strong></td>
<td><strong>Pathogen spp.</strong></td>
<td><strong>Disease and symptoms</strong></td>
<td><strong>Source</strong></td>
</tr>
<tr>
<td><strong>Coronavirus</strong></td>
<td><strong>Gastro-enteritis</strong></td>
<td></td>
<td>CDC, 2014</td>
</tr>
<tr>
<td><strong>Coxsackie virus A &amp; B</strong></td>
<td><strong>Meningitis</strong></td>
<td></td>
<td>CDC, 2014</td>
</tr>
<tr>
<td>Pathogen spp.</td>
<td>Disease and symptoms</td>
<td>Source</td>
<td></td>
</tr>
<tr>
<td>--------------</td>
<td>----------------------</td>
<td>--------</td>
<td></td>
</tr>
<tr>
<td><strong>B</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Echo virus</td>
<td>Enteritis and meningitis</td>
<td>CDC, 2014</td>
<td></td>
</tr>
<tr>
<td>Poliovirus</td>
<td>Polio</td>
<td>CDC, 2014</td>
<td></td>
</tr>
<tr>
<td>Rotavirus</td>
<td>Gastro-enteritis</td>
<td>CDC, 2014</td>
<td></td>
</tr>
<tr>
<td>Hepatitis A</td>
<td>Hepatitis – relapsing diarrhoea, fatigue, fever and abdominal pain</td>
<td>CDC, 2014; WHO, 2006</td>
<td></td>
</tr>
<tr>
<td><strong>Protozoa</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Balantidium coli</em></td>
<td>Balantidiasis, dysentery</td>
<td>Schonning and Stenstrom, 2004</td>
<td></td>
</tr>
<tr>
<td><em>Microsporidium</em></td>
<td>Gastro-enteritis, encephalitis</td>
<td>CDC, 2014</td>
<td></td>
</tr>
<tr>
<td><em>Blastocystis hominis</em></td>
<td>Acute diarrhoea</td>
<td>Schonning and Stenstrom, 2004</td>
<td></td>
</tr>
<tr>
<td><em>Giardiasis</em></td>
<td>Stomach pain, watery diarrhoea</td>
<td>CDC, 2014</td>
<td></td>
</tr>
<tr>
<td><em>Cryptosporodium parvum</em></td>
<td>Cryptosporidiosis - Watery diarrhoea, abdominal pain, low-level fever. Potentially lethal for persons living with HIV/AIDS</td>
<td>CDC, 2014</td>
<td></td>
</tr>
<tr>
<td><strong>Helminth</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Ascaris lumbricoides</em></td>
<td>Ascariasis, respiratory infection, fever, anemia</td>
<td>CDC, 2014</td>
<td></td>
</tr>
<tr>
<td><em>Ancylostoma duodenale</em></td>
<td>Hookworm, anemia</td>
<td>CDC, 2014</td>
<td></td>
</tr>
<tr>
<td><em>Nectar americanus</em></td>
<td>Hookworm, anemia</td>
<td>Berry, 2008</td>
<td></td>
</tr>
<tr>
<td><em>Trichuris trichiura</em></td>
<td>Trichuriasis</td>
<td>Berry, 2008</td>
<td></td>
</tr>
</tbody>
</table>
Diarrhoea infections have been attributed to cause more than 15% of deaths of children under the age of five living in developing countries (Kosek et al. 2003). Black et al. (2010) predicted 1.3 million children (Uncertainty Range: 0.8 – 2 million) under the age of five die each year due to diarrhoeal infections. Regional segregation of the data identified diarrhoea was the leading cause of death (19%) of children under the age of five living in sub-Saharan Africa (Black et al. 2010).

Access to household sanitation reduces the risk of other chronic diseases (Bartram and Cairncross 2010). The incidence of trachoma (Emerson et al. 1999, Emerson et al. 2004, Emerson et al. 2005) and prevalence of intestinal worms (Verle et al. 2003) reduced in communities with higher coverage rates of adequate sanitation. Consistent exposure to faecal pathogens, due to inadequate sanitation, has been hypothesised to cause tropical enteropathy. Tropical enteropathy results in poor absorption of nutrients in the stomach lining and leads to malnutrition and growth stunting (Humphrey 2009).

Systematic reviews, although limited by the availability of rigorous research, have consistently proven the success of sanitation interventions to reduce diarrhoeal infections (Fewtrell et al. 2005; Waddington & Snilstveit 2009). Fewtrell et al. (2005) identified only two studies which met the quality standards to include in a meta-analysis. These studies included an examination of cholera incidence in a Philippine city (68% reduction) and diarrhoeal disease in Lesotho (24% reduction in households with sanitation facility).

A recent meta-analysis of three systematic reviews, including two of them Cochrane Collaborations, found access to adequate sanitation produced a risk reduction of diarrhoeal disease by 36% (Cairncross et al. 2010). However, it should be noted that due to the challenging experimental design of community-
based interventions it was difficult for Cairncross et al. (2010) to disaggregate the impact of sanitation interventions within integrated sanitation, safe-water and hand washing programs. Perhaps more convincingly, quasi-randomised studies found access to sanitation in urban areas of Brazil reduced city-wide rates of diarrhoeal disease by 21% and up to 43% in high-risk areas (Barreto et al. 2007). The paucity of research that isolates the health impacts of sanitation is a result of the challenging research methodology in randomising large-scale sanitation programs (Rai 2011) and the provision of ‘hundreds of latrines is expensive’ (Cairncross et al. 2010).

In summary, the health impacts of household sanitation have been demonstrated using the theoretical model of breaking the transmission pathways of faecal pathogens. Existing epidemiological evidence supports the theoretical model and meta-analysis found an overall reduced risk reduction of diarrhoeal disease by 36%.

**SOCIAL IMPACTS OF HOUSEHOLD SANITATION**

In 2010, the United Nations recognised access to water and sanitation as a basic human right (United Nations 2014). Access to sanitation has been linked to improved social outcomes, specifically for women, including personal safety, education and self-respect (WSSCC 2006). WSSCC (2006) identified women are particularly aware of the personal safety risks including physical assault or rape when finding and using a secluded area to open defecate, urinate or undertake menstrual hygiene activities. Household sanitation provides a safe and private place that has the potential to provide women with ongoing security and peace of mind.

Research has demonstrated a positive association between girls attending school with access to school sanitation (Freeman et al. 2011). Freeman et al. (2011) found in Kenyan schools with latrines, and not affected by political violence, had a 58% reduction in girls not attending schools, compared to schools without latrines. A recent review of school sanitation in Malawi identified that school sanitation with user-friendly menstrual hygiene practices had dramatically improved school
attendance by women reaching the age of puberty (DeGabriele 2011). These examples present the important social role that adequate public sanitation can offer to young women. The social benefits would also be expected for young women living in homes with household sanitation.

Improved social status has been identified as an important outcome of ownership of household sanitation (Jenkins & Curtis 2005). Cole et al. (2012) found improved social status was linked to the ownership of cement-lined pit latrines in rural Malawi. Jenkins & Cairncross (2010) found sanitation ownership was clustered within villages and concluded the clusters of latrine ownership demonstrated the powerful impact of socially normative behaviour to drive sanitation coverage. The social benefits of sanitation ownership are now recognised as important promotional drivers to improve sanitation coverage.

ECONOMIC IMPACTS OF HOUSEHOLD SANITATION

The economic benefits of household sanitation have been reported at the macro-economic (WSP 2008; Hutton 2012) and household level (WSSCC 2006). At the macro-economic level, cost-benefit analysis of the impacts of sanitation in four South-East Asian countries estimated absent sanitation was responsible for a 2% reduction in Gross Domestic Product (GDP) (WSP 2008). The loss of GDP was calculated through expenditure on health services, drinking water contamination, loss of environmental services and decreased tourism (WSP 2008). Large-scale sanitation programs have been found to display strong returns on investment. Hutton (2012) reported a saving of five times the costs required to attain universal access to adequate sanitation. The savings include reduced health costs (not treating diarrhoeal disease), increased time spent in productive employment (due to not contracting diarrhoeal disease) and reduced infant mortality (Hutton 2012).

INTEGRATED APPROACHES TO SANITATION, WATER SUPPLY AND HYGIENE

A literature review on sanitation would be incomplete without a discussion of the associated environmental health interventions used to break the transmission pathways of faecal pathogens. It has been internationally recognised that
sanitation programmes have the greatest health impacts when integrated with water supply and hygiene promotion programs (Bartram & Cairncross 2010;). The accompanying interventions include: 1) Clean water supply and storage, 2) Correct hand washing practices and 3) Safe food handling and preparation. Foreign aid programs aggregate these interventions together into the water, sanitation and hygiene (WASH) sector.

CLEAN WATER SUPPLY AND STORAGE

Clean water supply and storage programmes attempt to prevent faecal-oral disease by providing uncontaminated water to the household. More than 700 million people do not have access to a clean water source in close proximity to their homes (UNICEF & WHO 2014). Clean water supply programmes can be divided into two groups: 1) Provision of improved sources via piped systems or protected boreholes and 2) Point-of-use treatment via household water treatment systems (HWTS).

Improved water sources via piped systems and boreholes are community-based interventions. They are capital intensive and require ongoing operation and maintenance costs. Failure to operate and maintain piped systems and boreholes systems can result in breakdowns and irregular supply (Bartram and Cairncross 2010). Households returning to the use of unprotected or ‘raw’ water are exposed to high levels of exposure to faecal-oral pathogens. The majority of improved water source programmes increase the quantity of water available to the household. Increased access to water in a household increases the likelihood of washing food correctly, washing food preparation surfaces and utensils and correct hand washing practices (Environmental Health Project 2004). These practices all have a positive association with reduced diarrhoeal disease at the household level.

Alternatively, HWTS use interventions at the household level. HWTS that have been shown to reduce diarrhoeal disease include chlorination sachets (Luby et al. 2006), ceramic filtration containers (Clasen et al. 2006), solar disinfection and boiling (Waddington & Snilstveit 2009). Safe storage and distribution of drinking
water is a vital component of HWTS interventions. This often includes the provision of storage vessels that can hold enough volume for one household’s daily use plus a bowl with a handle to allow the users to remove the water without contaminating the water with their hands (Luby et al. 2006).

**CORRECT HAND WASHING PRACTICES**

A systematic review of hygiene programmes identified that hand washing with soap reduced diarrhoeal infections by 47% (Curtis and Cairncross 2003). Hand washing with soap (or cleaning agent) can break the transmission of faecal pathogens via the fingers, fluid and food pathways (Waddington and Snilstveit 2009). Behavioural change campaigns encourage hand washing with soap at critical times. Critical times include handwashing before eating, after defecating, prior to breastfeeding and prior to food preparation. A systematic review also found that hand washing at delivery and postpartum reduced neonatal mortality (Chant 2008 in Bartram & Cairncross 2010).

The World Bank has sponsored a multi-country, private-public partnership to encourage hand washing with soap (Curtis et al. 2007). The initiative is called the Handwashing Initiative. The Handwashing Initiative applies commercial marketing approaches (e.g. consumer focus, segmentation of target audience, testing, campaign execution, marketing mix and project management) to encourage sustained change in attitudes and behaviour towards hand washing with soap (Curtis et al. 2007). The Handwashing Initiative has attempted to use the combined strengths of academia, government and the private sector to create sustained behaviour change in hand washing with soap in Ghana, Vietnam, India, Nepal, Peru and Madagascar (Curtis et al. 2007).

**SAFE FOOD HANDLING AND PREPARATION**

Unsafe food preparation can result in exposure to a number of faecal pathogens that can lead to gastro-intestinal illness. Research has identified crops grown in wastewater present a greater likelihood of exposing farmer workers and consumers to microbial pollutants. *Giardia* spp. and *Cryptosporidium* spp. were
identified as the most prevalent microbial pathogens (WHO 2006). The risk from faecal pathogens is significantly reduced if foods are eaten after proper handling and adequate cooking (WHO 2006).

SANITATION DEFINITIONS AND COVERAGE

In September, 2000 members of the United Nations agreed to a series of targeted, time-defined Millennium Development Goals (UNICEF & WHO 2004). Goal 7, to ensure environmental sustainability included a target directly related to sanitation. Target 7c states to “(h)alve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation”. However, to set a target, you have to be able to measure progress. In 2000, UNICEF and the World Health Organisation (WHO) developed definitions for improved and not improved sanitation facilities (WHO & UNICEF 2000). Improved sanitation included connection to a public sewer, connection to septic system, pour-flush latrine, simple pit latrine and ventilated improved pit latrine. Unimproved sanitation included service or bucket latrines (where excreta are manually removed), public latrines and open latrines (WHO & UNICEF 2000 p.4)

The JMP’s definitions have been criticised widely as they do not account for quality and reliability of sanitation systems nor their maintenance and related hygiene practices (Kvanstrom 2011; Bartram & Cairncross 2010). Kvarnström et al. (2011) recommend the JMP’s definition must shift from a ‘technology-based’ to a ‘function-based’ definition. They (2011) argue a function-based definition to measure the MDG target would: measure the public health outcomes of sanitation systems, encourage donors and government to shift their mentality away from specific sanitation technologies and encourage local, innovative solutions within the sanitation sector.

SANITATION SYSTEMS AND TECHNOLOGIES

Hundreds of different variants of sanitation systems and technologies have been recorded and described (Tilley et al. 2008). Each system responds to the surrounding environment, social, economic and cultural context within the lens of
available building materials and local construction techniques. Tilley et al. (2008) developed a sophisticated categorisation system to describe the wide range of sanitation options. They (2008) identified five decentralised systems, including: single pit system, waterless system with alternating pits, pour-flush system with twin pits, waterless system with urine diversion and blackwater system with infiltration.

SANITATION IN MALAWI

Rural Malawian households predominantly use single pit systems as their household sanitation facility (Cole et al. 2012). Cole et al. (2012) described the system to consist of a pit up to three meters in depth and one and half meters in width. The pit is unlined in clay soil environments, or may be lined by a cage constructed with reeds or logs in sandy soil environments. The pit hole is covered with interwoven logs or stones to create a smaller drop hole. These logs are smeared in mud. The walls and roof, when present, are constructed using local reeds and logs. Cole et al. (2012) found the average time of use of single pit systems was less than 12 months. The short time of use was the result of the pit lining or flooring collapsing due to water logging or termite attacks. Overcoming these technological constraints was identified as vitally important to improve sanitation coverage in Malawi (Cole et al. 2012).

Limited country-wide information is available on the type of sanitation systems and technologies used in towns and cities across Malawi. In urban environments, scarce land requires filled pit latrines to be emptied which due to inadequate planning are often cost-prohibitive or logistically impossible (Murray & Ray 2010). The above-ground, waterless, urine diversion sanitation system, commonly referred to as Ecosan has been posited as offering a sustainable and safe solution for urban household sanitation (Ramani et al. 2011). Ecosan systems have been used across south-east Asia (Cole et al. 2009), southern Asia (Ramani et al. 2011) and Africa (Tumwebaze et al. 2011).

DEFINITIONS
The inconsistent use of definitions for latrine technologies has resulted in wide differences being reported for Malawi’s sanitation coverage. The Ministry of Agriculture, Irrigation and Water Development (MoAIWD) (2011b) identified the need to harmonise the Joint Monitoring Program (WHO & UNICEF 2010) and National Sanitation Policy (Malawi Government, 2008) definitions of basic and improved sanitation. The MoAIWD (2011b) recognized that consistency in definitions would allow for consistency in the evaluation of sanitation programs. The definitions provided by the National Sanitation Policy are provided in Table 1. A key difference between the JMP and NSP definition is in respect to sharing of latrines. The JMP does not include ‘shared’ latrines as improved, whereas the NSP is silent on this issue.

Table 2: Definitions of improve and basic sanitation, National Sanitation Policy 2008 (GoM 2008)

<table>
<thead>
<tr>
<th>Basic sanitation</th>
<th>Improved sanitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Should allow for the safe disposal of faeces into a pit or other receptacle</td>
<td>As in basic sanitation, plus:</td>
</tr>
<tr>
<td>where it may be safely stored, composted or removed and disposed of safely elsewhere</td>
<td>Should have an impermeable floor and a tight fitting lid to the latrine</td>
</tr>
<tr>
<td>Should offer privacy for the user</td>
<td>In the case of ecological sanitation (ecosan) where no lid is needed, the ecosan latrine</td>
</tr>
<tr>
<td>Should be safe for the user to use, for example not in a dangerous state, liable to</td>
<td>should be properly looked after with the regular addition of soil, ash and other organic material</td>
</tr>
<tr>
<td>imminent collapse or dangerously unhygienic</td>
<td>Should have access to safe hand washing facilities with water and soap</td>
</tr>
<tr>
<td>The latrine pit or receptacle should be functional, i.e. not full or over flowing</td>
<td></td>
</tr>
<tr>
<td>The latrine should be at least 30 meters from a ground water source or surface water course</td>
<td></td>
</tr>
</tbody>
</table>

RURAL SANITATION COVERAGE

Significant differences in the reported coverage of improved and basic sanitation are observed between national and international reports. Table 3 shows the Malawi Demographic Health Survey (MDHS) (NSO & ICF Macro 2011) reported a 50% reduction in improved sanitation coverage than reported by the JMP (WHO & UNICEF 2010). The disparity in these figures suggests further scrutiny of the source of JMP’s improved sanitation coverage rate is required. A correction of the JMP’s figures would significantly impact on Malawi’s progress towards achieving the Millennium Development Goal (MDG) sanitation target.
Table 3: Sanitation coverage in rural Malawi as reported by MDHS (2010) and WHO & UNICEF (2012)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Open defecation</td>
<td>10%</td>
<td>11%</td>
</tr>
<tr>
<td>Unimproved and sharing</td>
<td>39%</td>
<td>82%</td>
</tr>
<tr>
<td>sanitation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improved sanitation</td>
<td>51%</td>
<td>7%</td>
</tr>
</tbody>
</table>

In comparison to other sub-Saharan countries, Malawi has a relatively low rate of open defecation in rural districts with approximately 1 in 10 households (11%) open defecating (NSO/ICF Macro 2010; WHO & UNICEF 2010). A study of sharing arrangements found the majority of sharing was structured under a negotiated and formal arrangement between households (MoIWD 2011b). Sharing a sanitation facility offers savings as households share the capital cost of construction. However, costs may increase as a greater number of users increases pressure on maintenance of the latrine and the pit will fill more rapidly than a non-shared latrine.

**URBAN SANITATION COVERAGE**

A city-specific study conducted in Blantyre found that 65% of latrines were made of traditional materials, with the remaining 35% were constructed using cement (MoIWD 2011b). Although, the study found very high reported levels of access to latrines (97%), it was reported by 21% of respondents that open defecation occurs ‘often’. This result is intriguing as the practice of open defecation continues to occur even though the coverage of sanitation is high (98%), suggesting something is preventing people from accessing a sanitation facility at critical times.

**SANITATION POLICY**

The Government of Malawi (GoM) (2008) has recognized more progress is required to overcome the disparities in sanitation coverage across rural districts. Malawi’s National Sanitation Policy (GoM 2008) and the recent National Open Defecation Free Strategy by 2015 (MoAIWD 2011a) identify community-led total
sanitation (CLTS) and sanitation marketing as the key mechanisms to improve rural sanitation coverage. A national program for CLTS has been implemented in 12 rural districts (Maulit and Kang 2011). In contrast, there have been fewer attempts at sanitation marketing in rural districts and there is a lack of cohesion and capacity in rural sanitation marketing programs in Malawi (DeGabriele 2009).
HISTORY OF FOREIGN AID

To provide context to sanitation programs supported by foreign aid it is important to understand its historical and theoretical foundations. To start the conversation on foreign aid it is important to understand the size of the aid sector. Since the 1960s, it is estimated more than $2.3 trillion dollars have been spent to alleviate poverty in countries with developing economies (Easterly 2006a, p. 4). African countries have been the largest recipients of foreign aid money (Moyo 2009 p.28)

Aid programs commenced in the 1900s as colonial powers sort to improve the infrastructure of their colonies (Moyo 2009 p.10). At the completion of World War II, the Bretton Woods conference launched the first stages of international cooperation to overcome economic disparities between countries (Moyo 2009 p.13). Bretton Woods created three international bodies including the World Bank, International Monetary Fund (IMF) and International Trade Organisation. During the 1960s and 1970s aid began to shift their focus from large infrastructure projects (transport and power) to programs that specifically targeted the poor (housing, education, health, agriculture and immunisation) (Moyo 2009 p. 16).

During the 1980’s, libertarian philosophy advocated by Milton Freidman began to influence both domestic and international policy in the United States and United Kingdom (Moyo 2009 p. 20). The Washington Consensus was a standardised approach to attain and measure market-liberalisation and was implemented by the World Bank, International Monetary Fund (IMF), and the U.S. Treasury Department’s Office of International Affairs (Heckelman and Knack 2005). The IMF commenced a determined program of Structural Adjustments that offered low-interest loans in return for privatisation of government industries, removal of trade subsidies and reductions in the power and number of government staff (Moyo 2009 p. 21).

The 1990s brought a new focus to foreign aid with donor government’s promoting and new emphasis on improved governance (Moyo 2009 p.24). This shift was dominated by the two largest aid agencies, the World Bank and the United Nations
Development Programme (UNDP). The focus on governance produced aid programmes with greater emphasis on building stronger government systems to create transparent and uncorrupted processes (Moyo 2009 p. 25).

During the 2000s resurgence for the application of market-based approaches took place. Recent market-based approaches arose through recognition of the failings of the Washington Consensus applied during the 1980s (Rodrik 2006). United States and European donor governments have developed strategies to incorporate market-based approaches that specifically focus on outcomes for the poor and marginalised communities. These programs included markets for the poor (M4P) and value-chain programs (Mendoza & Thelen 2008).

The impact of foreign aid programs is a fiercely debated topic. Detractors argue that Western aid programs have shackled and retarded natural economic growth across the developing world and particularly Africa (John & Storr 2009; Moyo 2009). Alternatively, advocates of foreign aid programs respond with evidence of vital infrastructure, health, agriculture and educational programs that lay the foundation for economic prosperity (Sachs 2005). An in-depth discussion of the merits of foreign aid is beyond the scope of this literature review. The following section provides a brief overview of the discourse on foreign aid. It is offered to the reader to provide context to the development of sanitation programs supported by foreign aid.

**BRIEF OVERVIEW OF THE FOREIGN AID DISCOURSE**

**CENTRAL-PLANNING**

After the Great Depression in the 1930s up until the 1980s, foreign aid was founded upon Keynesian economics of strict government control and demand management (Birdsall & Fukuyama 2011). Sachs (2005) advocated that centrally-planned programs of foreign-aid have created infrastructure (roads, water, electricity) and human capacity (health and education) to support poor people to move onto the first rung of the ladder of prosperity. More recently, Sachs (2008) continued his call for additional foreign aid expenditure in a form that is centrally-
planned but is specific and targeted to each country, to fuel the engine of private investment.

**MARKET-BASED APPROACHES**

Market-based approaches are centred on the belief that private companies are the most effective engines of economic growth, and offering finance to these companies offers the most successful approach to alleviating poverty in countries with developing economies (Birdsall & Fukuyama 2011). Jochnick (2012) identified three mechanisms used to apply market-based approaches, they are:

1. ‘Watchdogs’ that advocate for change amongst large, multinationals companies;

2. ‘Enablers’ that focus on macro-economic change that will ‘naturally trickle down to the poor through stronger national economies, job creation and access to service; and

3. ‘Leveragers’ who focus on the meso or micro-level of economic growth through the creation of pro-poor markets

It is the third approach - ‘leveragers’ that provides the theoretical underpinning for market-based approaches to sanitation programs.

Easterly (2006) and Moyo (2009) are leading proponents of market-based approaches to alleviate poverty in Africa. Easterly (2006) argues that two types of practitioners; ‘planners’ and ‘searchers’ dominate foreign aid. Easterly (2006) argues that ‘planners’ (including multilateral donors and international non-government organisations) are focussed only on the development and writing of central-level plans (as advocated by Sachs [2005]). Easterly (2006) argues the central plans are wasteful and often unsuitable to local conditions as they are governed not by local government objectives but by international donor policy. Most scathingly, Easterly (2006) suggests millions are spent on the research and preparation of central plans and yet they are rarely implemented.
Easterly (2006) argues ‘searchers’ offer a more suitable approach to deliver foreign aid programs. ‘Searchers’ include private firms, entrepreneurs and small-scale aid practitioners “who explore solutions by trial and error, have a way to get feedback on the ones that work, and then expand the ones that work, all of this in an unplanned, spontaneous way”. Other commentators on social progress for economically disadvantaged communities have embraced the importance of incentives and their rational alignment to allow individuals and their families to develop economically (Pearson 2011).

John & Storr (2009) presented an argument to refute both Sachs (2005) and Easterly’s (2006) positions. Using evidence from economists, John & Storr (2009) posit that all foreign aid is ineffective, stymies economic growth and encourages corruption (both from the recipient and the donor country). John & Storr (2009) conclude with a neo-conservative argument that ‘the bottom billion needs to put “themselves” on the path to prosperity – via (Adam) Smith’s famed peace, easy taxes and a tolerable administration of justice – more than they need a helping hand from us.’

COMMUNITY-ORIENTATED APPROACHES

Mehmet (1999) argues the premise of Western governance and capitalism, which underpin the arguments of Sachs (2005), Easterly (2006) and John & Starr (2009), are culturally inappropriate for the majority of countries with developing economies. Mehmet (1999) puts forward that mainstream foreign aid paradigms have a ‘blind faith’ in the supremacy of market economy driven by rationalism and the profit motive. The ‘blind faith’ has resulted in the creation of programs that have denied the cultural diversity that exists in non-Western branches of humanity, where group and community rights are often held in higher esteem than individualism (Mehmet 1999 p.8). Mehmet’s (1999) arguments present significant challenges to the application of Western market-based approaches to foreign-aid programs.

FOREIGN-AID ASSISTANCE TO SANITATION PROGRAMS
Sanitation programs have been influenced by the historical and theoretical paradigms of foreign aid programs. Early approaches to sanitation programs were centrally planned and provided hardware subsidies (Mara 2010). Recently the centrally planned approach of hardware subsidies have lost there appeal with foreign aid programmers and have been replaced by ‘demand-led approaches’ such as community-led total sanitation (Chambers 2009) and sanitation marketing (Cairncross 2004; Jenkins 2010). The following section will describe and review the approaches and evidence base of hardware subsidy and ‘demand-led’ approaches.

CENTRAL PLANNING – HARDWARE/INFRASTRUCTURE SUBSIDY

Hardware subsidies are the provision of financial assistance (cash, materials or labour) paid to an individual or households to construct a sanitation facility. A typical example of a hardware/infrastructure subsidy is for a foreign-aid program to support a local government or NGO to provide free cement for households to construct a household sanitation facility. The moral argument put forward to support the use of hardware subsidies include the moral duty to provide a minimum set of services to citizens that allows them to live a healthy and productive life (Evans et al. 2009). Evaluations of some hardware subsidy programs have demonstrated positive and sustained outcomes (Tremolet et al. 2010). An evaluation conducted 12 months after the completion of a hardware subsidy program in Kabul, Afghanistan found the program saved lives (235 children <5 years) and was highly cost-effective (Meddings et al. 2004). However, Meddings et al. (2004) recommended the importance of follow-up studies to validate their initial findings.

Deleterious outcomes of hardware subsidies have been identified at the National program and household level (Evans et al. 2009). For National programs the negative outcomes include increasing costs of sanitation facilities, reduction in householders willingness to allocate funds towards sanitation and the stifling of innovation within the local sanitation sector (Evans et al. 2009). Negative impacts at the household level include the subsidy being captured by the relatively
wealthy, materials or cash being misappropriated and the creation of a subsidy dependency syndrome amongst householders (Evans et al. 2009). These arguments against hardware subsidies have led foreign aid policy-makers to focus their attention upon demand-led approaches – including community-led total sanitation and sanitation marketing.

COMMUNITY-BASED – COMMUNITY LED TOTAL SANITATION (CLTS)

In late 1999 and early 2000, Kamal Kar began trialling the use of participatory rural appraisal to raise awareness of the public health risks of open defecation (Kar & Chambers 2008). From these early experiences, CLTS developed into a formal methodology that applies the principles of participatory rural appraisal to facilitate the community to analyse the problems associated with open defecation and to trigger all members of a community to construct a household sanitation facility (Chambers 2009). The CLTS methodology provides numerous tools for a facilitator to draw out the villagers’ negative experiences with open defecation and to generate community action to eliminate the risks associated with open defecation (Kar & Chambers 2008). Four key principles underpin CLTS programs, they are; communities must install their sanitation facilities with their own resources, no hardware subsidies are provided, the local community are solely responsible for the development of appropriate latrine designs and only facilitation is offered by an external person to the community (Chambers, 2009).

Rigorous outcome evaluations of CLTS programs are limited. The available evaluations of CLTS programs have recorded rapid uptake of basic latrines and the identification of communities as open-defecation free (ODF) (Chambers 2009). In Bangladesh (400 villages recorded as ODF), Indonesia (262 villages recorded as ODF) and Zambia rapid increases in sanitation coverage have been recorded at the completion of CLTS programs (Evans et al. 2010; Harvey 2011). The originator of CLTS, Kamal Kar has recognised the challenges of attaining long-term impacts through CLTS programs (Kar 2012). Kar (2012) recommends CLTS programmes must pay attention to suitable technologies that prevent long-term contamination of ground-water and environmental contamination.
Commentators have recently attacked CLTS programs that ‘fail to meet basic ethical criteria and infringe human rights’ (Bartram et al. 2012). They (2012) argue that in some cases the excessive use of community coercion upon individuals to build a sanitation facility is both unethical and unproductive for long-term improvements in sanitation coverage. Additional evaluations of CLTS programs have recognised the supply capacity of local markets have failed to meet the demand for improved sanitation (Mudkerjee and Shatifan 2009; Evans et al. 2010). Another criticism of CLTS programs is locally-designed sanitation facilities may not meet the criteria required to improve public health (Cole 2012; WHO & UNICEF 2010). The following section will discuss market-based approaches. It should be noted that CLTS with market-based approaches are not mutually exclusive and their combination could dramatically improve sanitation coverage (Mudkerjee and Shatifan 2009; WSP 2009).

MARKET-BASED APPROACHES - SANITATION MARKETING

In essence, market-based approaches to sanitation attempt to build the supply and demand of sanitation products and services for people living in poverty. By creating a ‘market’ for sanitation the intended outcome is for people living in poverty to exchange sanitation goods and services. Poor people engage in the sanitation market as consumers, business people, producers and workers (Jochnick 2012). Market-based approaches to sanitation attempt to strengthen local enterprises, develop microfinance and local business services, aggregate producers and make essential products and services more accessible to poor consumers (Jochnick 2012).

The application of market-based approaches to sanitation interventions was first referred to as ‘sanitation marketing’ by Cairncross (2004). Cairncross (2004) recognised the vast majority of sanitation facilities are provided by the private sector. Cairncross (2004) argued that social marketing approaches could enhance the growth of the supply and demand of the sanitation private sector. "In its simplest definition, social marketing is defined as the application of marketing principles and tools to achieving socially desirable goals (Kotler and Zaltman, 1971 in Donovan 2011). The use of social marketing interventions has proven successful
for increasing the demand and supply of public health-related products and services including condoms, mosquito nets and vaccines in countries with developing economies (Lefebvre 2011).

Cairncross (2004) states:

*(Social) Marketing goes far beyond mere advertising. It is often said to have four components, the four Ps: product, price, place and promotion.*

*Since 2004, social marketing practitioners have included an additional two Ps to the framework (Donovan 2011; Devine & Kullman 2012). The additional P’s are Partnerships and Policy. Figure 2 and Box 1 display and define the six P’s used to describe sanitation marketing programs.*

**Figure 2: The six P’s of sanitation marketing**

<table>
<thead>
<tr>
<th>Box 1: Definition of the six P’s of sanitation marketing programs (derived from Devine and Kullman 2012)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Product:</strong> can be a physical product (for example, a toilet), a service (for example, pit emptying) or behaviour (for example, regularly cleaning a toilet).</td>
</tr>
<tr>
<td><strong>Price:</strong> includes the financial cost of the toilet and supporting services (such as maintenance and desludging) as well as nonmonetary cost a household might incur (time lost to productive employment or harvesting of crops)</td>
</tr>
</tbody>
</table>
**Place**: The location and business entity where a product or service is sold and how it is distributed

**Promotion**: Two main approaches to promotion, or communication; 1) Branded advertising and promotion aims to create awareness of a particular product, point-of-sale, or brand and 2) Behaviour change communication (BCC) aims to motivate people to modify and adapt a desirable behaviour

**Policy**: The enabling and regulatory environment (for example, National government sanitation policy) that impacts upon the creation and maintenance of a market for sanitation

**Partnerships (or people)**: The potential of alliance platforms and other mechanisms to engage and link public and private institutions.

---

Large-scale interventions that apply the principles of sanitation marketing have commenced in Indonesia, Tanzania and India (WSP 2009). The mid-term evaluation estimated that over 4.45 million people had access to improved sanitation in 2011 as a result of the program (WSP 2009). Smaller-scale sanitation marketing projects have been implemented in Cambodia (WSP 2008), Vietnam (Sijbesma et al. 2010), and Ghana (Jenkins 2010). The sanitation marketing intervention in the central region of Vietnam was found to dramatically improve sanitation coverage from 16% to 46% in 3.5 years (Sijbesma et al. 2010). However, Sijbesma et al. (2010) identified a number of challenges in the monitoring system used in the sanitation program. Sijbesma et al. (2010) concluded there was an urgent need to develop rigorous monitoring approaches to determine the impact and financial viability of sanitation marketing programs in countries with developing economies.

Sanitation marketing interventions attempt to improve the community’s exposure to toilets and hence increase their diffusion. Studies have applied the theory of diffusion to evaluate their understanding of the workings of the market for sanitation.

---

1 Policy is not listed in Devine and Kullman (2012a) however the role of ‘Policy’ has been identified as a central element in the evaluations of sanitation marketing programs in Vietnam (Sijbesma et al. 2010), Indonesia (Mukherjee 2009), Benin (Scott et al. 2011), Lesotho (Blackett 1994) and Tanzania (Robinson 2011). Donovan (2011) also argues strongly that advocacy for the creation of legislation is an important component of effective social marketing campaigns.
sanitation (Jenkins & Cairncross 2010). Jenkins & Cairncross (2010) identified that contagion was the most important factor in explaining the adoption of latrines in Benin, West Africa. The study further identified that villages could be grouped into four distinct types of villages to explain the drivers for toilet adoption (Jenkins & Cairncross 2010).

Social, cultural and environmental factors have been identified to dictate a household’s decision to purchase a toilet. In rural Benin, the purchase of a toilet by a household was found to be constrained by social and physical conditions of the village environment, past exposure to toilets and the lifestyle aspirations of a household (Jenkins and Curtis 2005). Social conditions that can impact toilet adoption include education and income. In Amhara, Ethiopia household heads adopting sanitation systems were 1.9 times (95%CI 1.3-2.8) more likely to have an education and 1.5 times (95%CI 1.1-2.0) more likely to have a larger family (O’Loughlin et al. 2006). In the city of Kampala in Uganda the environment was found to dictate the uptake of a toilet due lack of open-space, soil type and groundwater levels (Katukiza et al. 2010).

The lifestyle goals of a household have been identified to impact on the decision to adopt or reject a toilet. Jenkins and Curtis (2005) identified four lifestyle aspirations were key drivers in householder’s decision to purchase a latrine in rural Benin. The aspirations included affinity with urban elite, desire to experience a new lifestyle, higher status with younger generation and to aspire to royal class status. Katukiza et al. (2010) determined social suitability to be the most influential factor in the selection of a sanitation technology in an urban town in Uganda (Katukiza et al. 2010).

LESSONS LEARNT FROM SANITATION MARKETING INTERVENTIONS

The following section provides an overview of 22 program reports of sanitation marketing interventions conducted in Asia (13 reports) and Africa (9 reports). The overwhelming majority (21 of 22) of the reports were not submitted to peer-reviewed journals and are regarded as grey literature. To align with the programming convention of social marketing the following section has been
categorised by the six Ps - product, price, promotion, place, policy and partnerships.

PRODUCT

Formative market research should be used to identify suitable and beneficial products based on the segmentation of customers

Programs in Vietnam (Sijbesma et al. 2010; McGrath et al. 2010), Cambodia (Baker et al. 2011) and Lesotho (Blackett 1994) demonstrated strong demand for innovative toilet products. The products were designed through extensive customer research and testing. In all examples, the toilet products were designed using participatory and responsive design principles (e.g. human-centred design\(^2\)).

In the Vietnamese programs, four toilet products were offered to customers (Sijbesma et al. 2010). The range of products was designed to allow customers to identify a suitable toilet based on their perceptions of the benefits of the product, ability to pay and soil type. In contrast, the iDE Cambodian program offered only one, pour-flush latrine product, the Easy Latrine (Baker et al. 2011). Evaluations of the program recommended the addition of dry, pit latrine products to provide greater options for lower-income households (Robinson, 2011).

An extensive program in East Java found that formative market research was a vital element of identifying sanitation products that matched consumer preferences (Mukherjee 2012). A multiple-country program in five Asian countries also reinforced the need to address all customer segments particularly 'special needs groups, households living in poverty, ethnic minorities and low caste groups' (SNV/IRC 2012). The SNV/IRC (2012) multiple-country program also reported that specific product innovation must occur to match the needs and preferences of each consumer group.

\(^2\) Download IDEO’s Human Centred Design toolkit for further information - http://www.ideo.com/work/human-centered-design-toolkit/
PRICE

Consistent and competitive pricing is important to provide households with confidence in the sanitation market

Programs in Cambodia (Baker et al. 2011), Vietnam (Sijbesma et al. 2010), Indonesia (Mukherjee 2009) and Benin (Scott et al. 2011) all encouraged consistent pricing of latrine products and services. This was achieved through a number of mechanisms including; developing standardized and modular manufacturing processes, training and accreditation of suppliers and printing prices on marketing materials (Baker et al. 2011; GRET & IDE 2010; Scott et al. 2011).

Poor and disadvantaged households require greater attention to ensure access to the sanitation market

Evaluations of programs have identified the challenges of reaching poor and disadvantaged households through sanitation marketing programs (McGrath et al. 2009; Sijbesma et al. 2010; Robinson 2011). The provision of low-cost, locally available Sangura slabs were identified as a suitable pro-poor approach in Tanzania (Devine & Kullman 2012). Innovative financing options, including micro-finance options, supplier credit and voucher systems have been identified as potential mechanisms to support poor households to enter the sanitation market (Tremolet et al. 2010).

Place

Franchise and network models were the favoured business model in Asian programs

Programs in Vietnam (McGrath et al. 2009; Sijbesma et al. 2010), Cambodia (Baker et al. 2011) and Indonesia (Mukherjee 2009) focused on franchising and networking business models. These models focus on identifying existing or new entrepreneurs to provide products and services from their existing shop front or place of work. The Indonesia program was found to create high levels of household
contribution to sanitation which in turn produced strong cost-effectiveness (Mukherjee 2009).

An alternative business model to franchising and networking models is the construction of sani-centres. Sani-centre programs construct infrastructure (retail shop) specifically for the sale of sanitation related products and attempt to encourage a local business person to act as the focal point for sanitation sales and marketing. Evaluations of sani-centre programs in Nigeria (Robinson 2009), Tanzania (Robinson 2011) and Malawi (MoAIWD 2011b) reported low levels of cost-effectiveness. The Nigeria evaluation reported that sani-centres failed to provide sanitation products to poor households (Robinson 2009).

**Limited access to finance for suppliers can cause: a) inconsistent supply of toilets, which can not match consumer demand and b) reduce geographical coverage due to inadequate transportation**

Undercapitalised suppliers may results in the unsatisfied household demand. Failure to meet this demand may take significant efforts to reignite household’s interest in sanitation. Overcoming the challenges of finance and transportation for suppliers was recommended in the evaluations of programs in Benin (Scott et al. 2011), Vietnam (McGrath 2010) and Cambodia (Baker et al. 2011). The inability of suppliers to match demand displays the importance of paying close attention to an integrated marketing approach.

**Identifying active and committed business people is important for adequate supply**

Committing personal resources to a business venture was identified as an important driver for success in sanitation businesses in Vietnam (Sijbesma et al. 2010) and Cambodia (Baker et al. 2011). Evaluations of programs in Vietnam recommended the selection of suppliers should be competitive and based on the submission of oral or written demonstration of their commitment to support the sanitation market (McGrath et al. 2009). In Tanzania, it was recommended that course fees should be paid for by attendees and only refunded after successful completion (Robinson 2011).
PROMOTION

Formative market research can identify the underlying constraints and motivations for specific customer segments

WSP’s Global Scaling Up Sanitation program has applied formative research to create targeted promotional campaigns (Devine & Kullman 2012). Mukherjee (2012) recommended that distinct behaviour change campaigns should be developed for targeted audiences including open defecators and households that share a toilet.

Formative market research in Malawi identified a number of customer segments including households that had never owned a toilet, households that share a toilet and households with a pit latrine that had recently collapsed. The research identified each of these customer segments had specific constraints and motivations to construct and/or purchase a toilet (Cole et al. 2012).

Local government staff within the health sector can play an important role in promotional campaigns

Programs in Benin (Scott et al. 2011), Lesotho (Blackett 1994) and Ethiopia (Faris & Rosenbaum 2011) demonstrated strong uptake of promotional tools and activities by local government health staff. The programs provided marketing tools that allowed health staff to conduct group and individual promotional activities. Sanitation marketing programs in Cambodia have utilised local government staff to monitor, provide CLTS triggering, verification and enforcement of the sanitation program (Baker et al. 2011).

Sanitation suppliers require ongoing support to continue promotional activities to poor and disadvantaged households

In Vietnam, only 50% of suppliers were found to continue promotional activities three years after the completion of the project (Sijbesmba et al. 2010). In
Cambodia, it was identified that ‘private enterprises can only be expected to promote sanitation adoption to the extent that it is profitable for them to do so. As the marginal cost of making the next sale becomes too high, they will naturally seek opportunities in less costly regions, market segments and products’ (Baker et al. 2011).

Motivational and aspirational messaging has proven to attract households to the sanitation market

The evaluation of a sanitation program in Benin demonstrated the success in replacing traditional health-based messages with motivational messages (Scott et al. 2011). The program used picture-based images that demonstrated five key motivations for constructing a toilet. In Cambodia, an integrated social marketing campaign has been developed to allow numerous partners to trial, adapt and disseminate aspiration-focussed promotional messages (Baker et al. 2011).

POLICY

Creating and maintaining a supportive enabling environment is important for taking sanitation marketing programs to scale

High-level and sustained political advocacy was a key ingredient for success in creating a strong enabling environment for sanitation in Benin (Scott 2011), Ethiopia (Faris and Rosenbaum 2011) and Indonesia (Mukherjee 2012). Developing consistent government support for sanitation programs has been identified as key for taking CLTS and sanitation marketing to scale throughout East Africa (Coombes 2011).

Measuring cost-effectiveness of programs provides a strong evidence-base for decision-making

Evaluations of sanitation programs in Indonesia provided detailed information on the cost-effectiveness of programs (Mukherjee 2009). At the district level, health offices were reporting the costs per output (construction of toilets) (Mukherjee
Baker et al. (2011) demonstrated how monitoring data was used to continuously adapt and refine iDE Cambodia’s program implementation.

**Unregulated subsidies within a project area can distort and destroy sanitation markets**

A clear body of evidence is building on the damage caused by unregulated hardware subsidies in the development of a sanitation market. Evaluations of programs in Vietnam (Sijbesma et al. 2010), Indonesia (Mukherjee 2009), Benin (Scott et al. 2011), Lesotho (Blackett 1994), Ethiopia (Faris & Rosenbaum 2011) and Tanzania (Robinson 2011) consistently reported an adverse impact of sanitation subsidies on market-based programs. The adverse impacts included; a) reducing household demand to allocate their own funds towards sanitation (Scott et al. 2011) and b) distorting suppliers’ willingness to commit resources to grow and develop their sanitation enterprise (Baker et al. 2011).

**PARTNERSHIP**

**Competition between districts and implementing partners can encourage innovative and dynamic programs**

Information sharing and cooperation between iDE Cambodia, WASH-M, WSP and USAID resulted in creative and effective programs across Cambodia (Baker et al. 2011). The combined efforts of the NGOs and donors ensured the dissemination of lessons learnt to national and district government, donors and other international/local NGOs.

**All parties engaged in sanitation programs should link within a monitoring and evaluation system with clear definitions and frameworks**

Coombes (2011) suggested that organisations must work collaboratively to develop a set of ‘minimum indicators that break down current JMP/national descriptors into components that are easily understood by practitioners’.
CONCLUSION

The literature review exhibits the fundamental health benefits that are attained from constructing and maintaining household sanitation. Household sanitation reduces diarrhoeal disease, trachoma, intestinal worm infestations and malnutrition. A strong body of evidence demonstrates the additional social and economic benefits of household sanitation. It would therefore appear straightforward that the provision of foreign aid towards sanitation programs is justified. However, as the literature review presents, the mechanisms used to achieve the objectives of foreign aid (and sanitation programs) is widely disputed. Market-based approaches that are focussed on pro-poor inclusion have been put forward as a mechanism to improve sanitation coverage. Yet, the current evidence base is limited and few evaluations appear in peer-reviewed publications. This research aims to contribute rigorous evidence to investigate how market-based approaches may impact sanitation coverage in Malawi. It is hoped this research will add to the growing body of evidence that helps to eliminate the global sanitation crisis.

NOTE: A comprehensive literature review has been presented in this chapter to provide detailed context for this thesis. An abridged version of the literature review has been submitted to Waterlines: International Journal of Water, Sanitation and Waste. The abridged version examines the utility of applying the six P’s framework (price, product, place, promotion, policy and partnerships) to identify commonalities in the experiences of rural sanitation marketing programs in south-east Asia and Africa. The paper demonstrates the six P’s framework is an effective tool to dissect and understand the commonalities between rural sanitation marketing programs.

REFERENCES


Berry G. 2008 *A transdisciplinary study into the potential for safely managing human excreta by utilizing as a fertilizer via alternating batch composting toilets*, Doctor of Philosophy thesis, University of Tasmania


CDC (Centres for Disease Control) 2014 *Environmental Public Health Indicators Project*, Centres for Disease Control. Viewed 6 May 2014 http://ephtracking.cdc.gov/showIndicatorsData.action

Chambers, R. 2009 *Going to scale with CLTS: Reflections of experience, issues and ways forward*. Institute of Development Studies, University of Sussex, United Kingdom.


DeGabriele, J. 2011 School sanitation review in Malawi. UNICEF Malawi, Lilongwe.


Evans, B., Colin J., Jones H. & Robinson A. 2010 *Sustainability and equity aspects of total sanitation programmes: A study of recent WaterAid-supported programmes in three countries. A global synthesis report.* WaterAid, United Kingdom.


Moyo D. 2009 *Dead Aid: Why aid is not working and how there is a better way for Africa*. Farrar, Straus & Giroux, New York.


NSO (National Statistical Office) & ICF Macro 2011 Malawi Demographic and Health Survey 2010. NSO and ICF Macro, Zomba, Malawi, and Calverton, Maryland, USA.


SNV & IRC 2012 *Rural Sanitation Supply Chains and Finance: Progress Brief. Sustainable Sanitation and Hygiene for All (SSH4A) programme funded by AusAID, DFID and DGIS*


WSP (Water and Sanitation Program) 2008 Economic impacts of sanitation in Southeast Asia: A four-country study conducted in Cambodia, Indonesia, the Phillipines and Vietnam under the Economics of Sanitation Initiative (ESI). Water and Sanitation Program, Jakarta.


WSSCC (Water Supply and Sanitation Collaborative Council) 2006 For her it’s the big issue: Putting women at the centre of water supply, sanitation and hygiene. Water Supply and Sanitation Collaborative Council, Geneva.
CHAPTER 4  (PAPER TWO)

THEORETICAL AND METHODOLOGICAL CONSIDERATIONS FOR INVESTIGATING MARKET-BASED APPROACHES TO SANITATION IN COUNTRIES WITH DEVELOPING ECONOMIES

INTRODUCTION

This chapter commences with an examination of the existing research paradigms applied by social scientists. A justification for the selection of a pragmatic paradigm is discussed and described. Effective pragmatic research should be designed, implemented and evaluated through an appropriate theoretical framework (Evans et al. 2011). The diffusion of innovation theory is put forward as the theoretical framework that offers the best conceptual lens to design, examine and discuss this research project. Pragmatic research is aligned to the use of mixed methods research. The background, critics and approaches to mixed methods research are discussed. The final sections of the chapter examine the study sites and the approaches used to mitigate the methodological challenges of conducting cross-cultural research.

IDENTIFICATION OF RESEARCH PARADIGM

Morgan (2007) describes research paradigms (or epistemologies) to be ‘shared world beliefs amongst members of a speciality area’. Credible research design requires methodology to be nested within a research paradigm. The research paradigm and methodology must align and support each other to create a ‘voracious design that can stand up to the highest levels of scrutiny’ (O’Leary 2010 p.89). Exploring social science research paradigms offers this research a foundation to select an appropriate paradigm and accompanying methodology.
POSITIVISM

Positivism was the main research paradigm applied to social science conducted up to and during the 19th and early 20th century. Positivists argued that approaches used in natural sciences should be applied to social sciences (O’Leary 2010 p.106). Observations should be ‘free of interests, values, purposes and the psychological schemata of individuals’ (Howe 1988). To undertake social science research, positivists engaged with a theory, generated specific hypotheses and gathered quantitative data to refute or support the hypothesis. Positivists commonly apply large-scale, random samples using surveys that are analysed statistically using means and variances (Ponterotto 2005). The positivist paradigm is deductive and is aligned with quantitative methodologies in social science.

POST-POSITIVISM

After World War II, scientists began to question the limitations imposed by the positivist paradigm (Howe 1988). The pillars of the positivist scientific method began to be challenged on numerous fronts. Post-positivists contended that positivist methods were failing as they were constrained by hypothesis generation and testing, skewed by the prevailing theory and failed to obtain objectivity (O’Leary 2010 p.106).

CONSTRUCTIVISM

During the 1970s, a group of social scientists further distanced themselves from positivist and post-positivist epistemologies to create revolutionary paradigms (Tashakkori & Teddle 2003 p. 7). The most popular of the revolutionary paradigms was constructivism (also referred to as interpretivism) (Tashakkori & Teddle 2003 p. 7). The constructivist paradigm regards the creation of knowledge through multiple perspectives and applies inductive reasoning. The constructivist paradigm naturally aligns to qualitative methods conducted in natural settings, with small sample sizes, non-random sampling and rich qualitative data. The constructivist paradigm created a theoretical platform for the creation of new
paradigms including feminism, post-colonialism and ‘queer’ research (Denzin 2010).

**PRAGMATISM**

The perceived differences between positivist (objective and deductive reasoning) and constructivist (subjective and inductive reasoning) paradigms led to a period of mistrust towards research that worked simultaneously under the two paradigms (Teddlie and Tashakkori 2003 p.18; Alise and Teddlie 2010; Evans et al. 2011). This period of distrust between advocates of the two paradigms has been labelled the ‘paradigm wars’ (Alise & Teddle 2010). In response to the ‘paradigm wars’, Howe (1988) presented his ‘compatibility thesis’. He (1988 p.10) argued the incompatibility between the positivist and constructivist paradigms was overstated and should not restrict the combination of qualitative and quantitative methods. Howe (1988) argued using a pragmatic paradigm of “what works” overcomes any concern between incompatibility in the research paradigms that underpin quantitative and qualitative investigation.

Creswell (2007) argued pragmatism moves the focus on the ‘social and historical context rather than on the method, and multiple relevant forms of data collection are used to answer the research questions (s)’. Through allowing ‘multiple relevant forms’ pragmatism offered a theoretical foundation for the complementary integration of qualitative and quantitative methods. The complementary approach has developed into the rapidly expanding field of mixed methods (Evans et al. 2011; Alise & Teddlie 2010). The rise of mixed methods across numerous fields of social science research has resulted in its classification as the ‘third methodological movement’ (Teddlie and Tashakkori 2003 p.7). Mixed methods have been defined as “(R)esearch in which the investigator collects and analyses the data, integrates the findings, and draws inferences using both qualitative and quantitative approaches or methods in a single study or program of inquiry” (Tashakkori & Creswell 2007 p.4).
SELECTION OF RESEARCH PARADIGM

The objective of this research was to examine how market-based approaches may impact sanitation coverage in Malawi? The research questions (presented in the below table) were created to add knowledge to objective (technical design and coverage of toilets) and subjective (socio-economic and cultural features) fields of inquiry. Hence, the research questions contain elements that could be investigated by applying either a positivist or constructivist research paradigm.

Rather than limit the study by applying a positivist or constructivist paradigm, and thereby compromising the study by eliminating research questions, a pragmatic paradigm was chosen to guide the research. A pragmatic paradigm was chosen as it places the importance of the research questions above the selection of the theoretical foundation that underlies the method (Morgan 2007). The selection of a pragmatic paradigm led to the application of mixed methods research.

<table>
<thead>
<tr>
<th>Research Question 1: What are the practices, motivations and barriers of sanitation suppliers?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Question 2: What are the constraints and motivations of consumers to select, construct and purchase a toilet?</td>
</tr>
<tr>
<td>Research Question 3: How do technological, environmental, socio-economic and cultural factors impact upon the appropriate design of sanitation products and services?</td>
</tr>
</tbody>
</table>

A pragmatic approach using mixed methods is further justified on the following grounds:

• Mixed methods provide researchers with tools to “simultaneously answer confirmatory and exploratory questions, and therefore verify and generate theory in the same study” (Tashakkori and Teddlie 2003 p.15). Theories and hypothesis have been developed by commentators on the motivations and barriers for householders to adopt sanitation in developing countries.
(Jenkins & Curtis 2005; Devine 2010; Jenkins & Cairncross 2010). The existing theories provide a framework for deductive and confirmatory reasoning (used in quantitative methods). The existing theories were not informed from data collected in Malawi and provide limited knowledge on the motivations and behaviours of sanitation suppliers. The creation of new inferences from the emerging data requires inductive and exploratory reasoning (used in qualitative methods). The application of mixed methods provides the tools for this research to be both deductive and inductive.

- The intent of this research is to provide useful information for future market-based approaches to sanitation interventions conducted in Malawi and other developing countries. As with all foreign-aid programs, funding is limited and decisions must be based on the best available information. The design of this research required a balance between a level of breadth and generalisability (provided by quantitative methods) combined with a deep understanding of motivations and behaviours of key actors in the sanitation market (provided by qualitative methods). Mixed methods allows the research to offer insights ‘into both the particular and general’ (Greene 2008) of the potential impact of market-based approaches to sanitation in Malawi.

THEORETICAL FRAMEWORK

BACKGROUND

The application of a theoretical framework is critical to the design of pragmatic research that applies mixed methods (Hesse-Biber 2010). Layering a theoretical framework over a pragmatic study provides the researcher(s) with a conceptual lens to design, implement and analyse their research (Evans et al. 2011). Evans et al. (2011) offers a well-argued justification for the necessity of applying a theoretical framework to pragmatic research:
Without the theoretical framework, set within the context of mixed methods to capture complexity, we would find it difficult to determine casual mechanisms, rely on generalisability to other populations, or establish clinical significance of intervention effects.

IDENTIFICATION OF THEORETICAL FRAMEWORK

Three suitable theoretical frameworks were identified to address the objective of this research and the accompanying research questions including; the theory of planned behaviour (Ajzen 1985), models of goal-orientated consumer decision-making (Bagozzi & Lee 1999) and the diffusion of innovations (Gatigon & Robertson 1985; Rogers 2003).

The use of the diffusion of innovation theory was chosen as the theoretical framework for this research. The following reasons justify the selection of the diffusion of innovation theory:

1. Theory of planned behaviour was ruled out as it failed to offer a framework to address the three research question that examine aspects of human behaviour and their interaction with existing technologies and future innovations. Theory of planned behaviour (Ajzen 1985) offers a conceptual lens of the self-efficacy and internal control of human behaviour but does not provide a framework for examining the attributes of sanitation facilities that enhance or reduce adoption.

2. Goal-orientated consumer decision-making (Bagozzi & Lee 1999) was not selected as the theoretical framework as it focusses on the emotional and cognitive roles of goal setting and striving. This research did not require an in-depth examination of the psychological factors that determined adoption or rejection of sanitation.

3. Diffusion of innovation theory does provide a framework to; identify the characteristics of the innovation (e.g. the characteristics of the sanitation facility), record the human response to the system (decision to adopt or
reject the technology) and examine the network of communication (Rogers 2003).

4. The diffusion of innovation theory has been used widely in the field of social marketing. More specifically, previous sanitation research has recommended the use of the diffusion of innovation theory as a suitable framework for research into sanitation marketing programs (Jenkins and Curtis 2005). Jenkins and Curtis (2005) stated diffusion theory was:

(P)articularly insightful for understanding the spread of new demand for latrines, which are innovations that replace existing defecation and excreta disposal practices for most target households and entail significant opportunity cost with respect to other purchases.

DIFFUSION OF INNOVATIONS

Diffusion of innovation theory is a widely used theoretical framework used to examine the uptake of new innovations (Bagozzi & Lee 1999). Innovations include products, services or information delivered into a social system or community. Diffusion theory has been used widely as an explanatory framework in the fields of public health, social marketing, commercial marketing and communications (Rogers 2003 p. xv).

The foundation for diffusion of innovation theory was laid down in 1902 in the book, The Laws of Imitation (Dearing 2008). Diffusion theory was used intermittently by sociologists to explain the movement of ideas across the globe. During World War II, the theory became prominent through Ryan and Gross’ (1943) pioneering research that identified the demographic traits of farmers that adopted the use of hybrid corn over a period of time. Ryan and Gross (1943) presented the first evidence of an S-shaped (or sigmoidal curve) as a model for the uptake of an innovation over time (Dearing 2008).

Ryan and Gross’ (1943) work also demonstrated the influence of communication channels on the decision-making process of individuals to adopt a new technology
(Rogers 2003 p.34). The study established a standardised methodology for diffusion research which applied ‘retrospective interviews to ask adopters why they adopted, where and from whom they obtained information about the innovation, and the consequences of adoption (Rogers 2003, p. 33).

Rogers (2003 p.11) defines diffusion as a process by which an innovation is communicated through certain channels over time among the members of a social system. This definition contains four central elements found in traditional diffusion research: 1) innovation, 2) communication channels, 3) time and 4) social networks. More recently, Peres et al. (2010) offered a definition of diffusion that placed greater emphasis on the relationships and interdependencies between consumers and market players. They (2010) defined the diffusion of innovation as:

(T)he process of the market penetration of new products and services, which is driven by social influences. Such influences include the interdependencies among consumers that affect various market players with or without their explicit knowledge.

Rogers (2003) definition of diffusion of innovation theory casts a wide net that captures a wide array of elements that explain and examine the adoption or rejection of an innovation. This research will apply Rogers (2003) definition of the diffusion of innovation theory. The research applies three aspects of Rogers (2003) definition:

i) Characteristics of innovations,
ii) Adopter categories and
iii) Change agents

An overview of these three categories is provided below.

CHARACTERISTICS OF INNOVATIONS

Rogers (2003) and Kotler & Armstrong (2011) identify five attributes that determine the rate of adoption of a new innovation. They are:
- Relative advantage: the perceived superiority of the innovation compared against competing and existing products, services or ideas.

- Compatibility: the level that the innovation aligns with potential adopters values, experiences and needs.

- Complexity: the perceived difficulty to use or understand an innovation. Rogers (2003) argues innovations that are perceived as simple to use or understand have a higher rate of adoption.

- Trialability: the ability of potential adopters to use and experiment with the innovation on a limited basis.

- Communicability: the extent to which the impacts of an innovation can be described or are visible to others. An innovation with high visibility will have faster adoption (Kotler & Armstrong 2011).

ADOPTER CATEGORIES

The definition of a successful innovation is one that is adopted by an ever-widening group of users over time. Rogers (2003) developed a categorisation system that allowed researchers to segment adopters based on the timing of their uptake of the innovation. Rogers (2003) identified five categories of adopter based on their willingness to accept an innovation relative to others in the social network. Rogers (2003) also estimated each category’s proportion of a social network. The proportion was based on the assumption that a sigmoidal curve of adoption approaches normality. The five groups are: innovators (2.5%), early adopters (13.5%), early majority (34%), late majority (34%) and laggards (16%).

Attracting innovators to a new product or service is a vital process in generating consumer demand for a new product or service. The first adopters or ‘innovators’ therefore play a crucial role in determining a product’s success. A significant body of marketing research has examined the characteristics and motivations of
innovators. Innovative consumers have a ‘predisposition to buy new and different brands rather than remain with previous choices and consumer patterns’ (Steenkamp et al. 1999 cited in Roehrich 2004). Numerous theories have been put forward to explain innovators’ motivations to act before their peers. The main theories are; i) need for stimulation, ii) novelty seeking, iii) independence toward others’ communicated experience and iv) need for uniqueness (Roehrich 2004). A consensus has not been reached within the literature on which theory offers the strongest match to reality. The lack of consensus demonstrates the importance of further research into the motivations of innovative consumers.

CHANGE AGENTS

The diffusion network is the process by which an innovation is communicated into and within a social network. Opinion leaders and change agents are identified as key influencers in the successful adoption of an innovation (Rogers 2003). Opinion leaders are people within a social system that have the ability to influence the adoption practices of other individuals (Cho et al. 2012). Change agents are individuals that are external to a social system. Rogers (2003 p.368) states ‘the main role of change agents is to facilitate the flow of innovation from a change agency to an audience of clients’. The adoption of an innovation is influenced by the degree to which change-agents are similar in socio-economic and cultural features to the intended audience (referred to as homophily) (Rogers 2003 p. 305).

CRITIQUES OF THE DIFFUSION OF INNOVATION THEORY

As with all theories that attempt to explain social behaviour there are biases and deficiencies within the diffusion of innovation theory (Rogers 2003). An important bias is the expectation of researchers that an innovation offers benefits to individuals and society and should be rapidly adopted across a social network with neither rejection nor re-invention (pro-innovation bias) (Rogers 2003). The pro-innovation bias is particularly relevant to international aid projects that fund a change-agency to promote social change via innovation. The pro-innovation bias also encourages researchers to focus on innovations that have rapid rates of adoption (Rogers 2003). This bias results in diffusion theory being predominantly
influenced by the response to fast-changing product sectors such as information technology and fast-moving consumer products (Song & Parry 2009).

Another deficiency of diffusion theory is the focus on the individual's ability to accept an innovation (individual blame). The ability of households to make decisions to accept an innovation may be beyond their control due to structural and legal impediments. Jenkins and Scott (2007) recognised the role of legal constraints as an important structural impediment that could impact a household’s decision to install a latrine. Recognising the legal and environmental influences (demographic, economic, cultural, natural, political and technological) that impact upon an individual’s ability to accept an innovation offers a stronger appreciation of the process of social acceptance of an innovation (Donovan 2011).

The time between being exposed to the innovation and being approached by a researcher may introduce recall bias into a diffusion study. The process of social change is continuous and making conclusions from cross-sectional data based on participant's recall offers only a brief snapshot of the experience of consumers (Rogers 2003).

The fourth and final criticism of diffusion research identified by Rogers (2003) is the equity of innovations. ‘The diffusion paradigm implied that the transfer of technological innovations from development agencies to their clients lay at the heart of the development process’ however this paradigm has often failed to attain its goal (Rogers 2003 p. 132). Poor and marginalised groups are commonly unreached by the diffusion process of new innovations – resulting in a widening gap of inequity.

**METHODOLOGY - MIXED METHODS RESEARCH**

**BACKGROUND**

Mixed methods research has a long and established history in social research dating back to the 1800s (Hesse-Biber 2010). Over the last two decades, mixed
methods research has rapidly gain acceptance across a wide range of research disciplines. Applied researchers in the health, education, social and behavioural sciences regularly use mixed methods to comprehend and develop inferences of phenomena (Tashakkori & Teddlie, 2003, p.43). A meta-analyse of studies from psychology, sociology, nursing and education disciplines found the prevalence rate of mixed methods was 16% for applied research and 6% for pure disciplines (Alise and Teddlie 2010). The higher rate of use of mixed methods by applied sciences demonstrates its utility for investigating practical research questions.

CRITICS

Bergman (2011) presents a direct criticism of the inappropriate use of mixed methods by doctoral students. He (2011) argues that limiting a research project to one method can reduce time, costs and allow for simpler communication of results to peers. Yet, in response to his own criticisms, Bergman (2011) recognises that applying mixed methods can develop the researchers abilities and provide strong outcomes so long as researchers critically assess their selection of ‘sampling, data collection and analysis methods with regard to their assumptions, assertions, and widespread mantras’.

TYPOLOGY

Mixed methods research covers a wide spectrum of research designs (Morgan 2003; Teddlie and Tashakkori 2003; Creswell 2007;). Morgan (2003 p.196) suggested the theoretical drive of a study as either inductive or deductive should determine the design of mixed methods research. Inductive reasoning examines new phenomena as it creates and forms new theory (Morgan 2003 p.196). Deductive reasoning examines how new data may align or contrast with existing theories, models or hypotheses (Elo & Kyngas 2008).

INTEGRATION

Creating a narrative that integrates the analysis and interpretation of qualitative and quantitative data within a single study is a core task in mixed methods
research (Fielding 2012). Bryman (2006) argues that ‘mixed methods research is not necessarily an exercise in testing findings against each other. Instead, it is about forging an overall or negotiated account of the findings that brings together both components of the conversation or debate’. Figure 1 illustrates a approach to integration that applies a mixed methods design that included a quantitative phase to explore phenomena which was used to form hypothesis that are then tested by applying qualitative methods (Nicca et al. 2012).

Figure 1: Example of an integrated approach to the design of mixed methods taken from Nicca et al. (2012)

Systematic reviews of mixed methods studies have revealed deficiencies in the integration of quantitative and qualitative data (Ivankova & Kawamura 2010 cited in Fielding 2012). Practical challenges to integration of qualitative and quantitative data include; the structural design of research projects, the preference of social scientists (and journals) to one methodological approach and different timelines required for data analysis and collection (Bryman 2006). Fielding (2012) argues that mixed method researchers must know when to synthesise ‘equivalent and commensurate’ findings and also recognise when to further examine ‘contradictory findings’.

**EVALUATIVE, MIXED METHODS RESEARCH**

Evaluative research has been found to be an integral component in the development and design of effective education, health and social interventions (Young et al. 2006; Berkowitz et al. 2008). Evaluations are intended to generate
information that allows decision-makers to make rational, informed and evidence-based decisions (O’Leary 2010 p.138).

Evaluations are categorised according to their timing and role within the intervention. The two main categories are formative/process evaluations and summative/outcome evaluations

• Formative/process evaluation ‘aims to provide data and information that will aid further development of a particular change initiative’ and ‘inform decision making related to programme improvement, modification and management’ (O’Leary 2010 p. 140)

Formative research has been used to design sanitation marketing programs in Asian and African countries with developing economies (Devine 2010). Devine & Kullman (2012) identify formative evaluations as the ‘first and essential step in developing evidence-based and effective sanitation marketing program’.

• Summative/outcome evaluation occur at the end of project and investigate the intended and unintended impacts of an intervention (O’Leary 2010 p.138).

STUDY SITES

Malawi was chosen as the study site for the following reasons:

- Sub-Saharan countries have the lowest coverage rates of improved sanitation in the world (30% of population have access to improved sanitation) (WHO & UNICEF 2012). Malawi has an improved sanitation rate of 51%, resulting in 30% of the population sharing, 9% using unimproved latrines or 10% open defecating (WHO & UNICEF 2012).

- National government policy recently identified the use of market-based approaches to sanitation (MoAIWD 2011). The research adds to the
growing body of knowledge in the design and implementation of the contemporary and growing approach to increase sanitation coverage in Malawi.

- The researcher has an established network with a key stakeholder in the sanitation sector. The stakeholders provided the researcher with access to government, non-government and private sector networks throughout Malawi.

- English is spoken throughout Malawis government sector. This provided the researcher with the ability to discuss and negotiate the development of the research projects with national, district and village-level government representatives.

- In comparison to neighbouring countries (such as Kenya and Zimbabwe) Malawi had experienced strong social cohesion and low levels of political unrest3. This offered a more stable setting to conduct the research over a three-year period.

Sanitation marketing programs have received limited attention in Malawi (DeGabriele 2009). Small, uncoordinated market-based sanitation programs have been trialled in the two major cities, Lilongwe and Blantyre (DeGabriele 2009). However, initial discussions between the researcher and the program implementers of the interventions identified significant challenges in the program design and implementation. Review of project documents found these interventions would not present suitable case studies for formative or summative evaluation.

It was decided to identify two case studies that were in the early stages of design and implementation and therefore would be supported by formative evaluations. The two programs were:

---

3 The July 2011 political demonstrations that resulted in 26 fatalities in Malawi demonstrates the challenges of forecasting social stability in sub-Saharan countries - [http://www.guardian.co.uk/world/2011/jul/21/malawi-protesters-killed-anti-regime-riots](http://www.guardian.co.uk/world/2011/jul/21/malawi-protesters-killed-anti-regime-riots)
• *Rural case study* - Rural sanitation marketing in Nkhata Bay, Salima, Mangochi and Dowa districts

• *Urban case study* – Ecological sanitation marketing program in Mzuzu city

Both programs were earmarked with future funding to implement sanitation marketing interventions. It was intended the formative/process evaluations would contribute to the design and implementation of these programs. This improved the likelihood that the outcomes of the research would contribute to the body of knowledge to improve, modify and manage existing and future sanitation programmes in Malawi.

**CROSS CULTURAL RESEARCH**

Numerous public and environmental health issues confront individuals and communities living in sub-Saharan Africa. Researchers from Western democracies (particularly United States, Europe, Canada and Australia) are often attracted to this region with the intent of understanding and supporting the lives of ‘vulnerable’ people. ‘Vulnerable’ people include individuals that are living with no or low incomes, are homeless and/or living with chronic illnesses (Liamputtong 2009 p. 227). Cross-cultural research of ‘vulnerable populations’ offers a number of challenges to the researcher (Liamputtong 2009 p.228; Squires 2009). These challenges include logistical and practical challenges of conducting research in remote areas with limited infrastructure (such as poor roads, irregular electricity supplies and no internet coverage). The logistical and practical challenges are also combined with methodological challenges. Two important methodological challenges are ‘outsider bias’ and ‘language barriers’.

**CHALLENGE OF OUTSIDER BIAS**

Social scientists that conduct research in a community that is not their own are subjected to numerous challenges. These challenges are intensified when conducting research in a developing country as an ‘international researcher’. Community leaders and members have often been exposed to previous research
projects conducted by ‘international researchers’. The international researchers are often the prelude to the design and implementation of a project funded by a non-government organisation (NGO). Therefore the appearance of an ‘international researcher’ is often associated with an expectation of being provided with future tangible benefits provided via an NGO project. The expectation of villagers can sway participants to provide answers that they believe will appease the researcher (and the design of the future NGO project), rather than provide a genuine and truthful response.

**APPROACHES TO OVERCOME OUTSIDER BIAS**

An international researcher and an interpreter conducted the interviews during this research project. The presence of ‘outsiders’ may have influenced the response of householders. It was attempted to overcome this influence by providing a clear briefing to the village chief prior to the research team arriving at the village. The briefing stressed that the team was conducting formative research and it was not associated with a donor organisation or funding body. The importance of honesty and openness was also stressed to all householders prior to conducting the interviews and group discussions.

**CHALLENGE OF LANGUAGE BARRIER**

Language barriers present significant challenges to public health researchers working in cross-cultural settings (Pitchforth & van Teijlingen 2005; Squires 2009). The two official languages in Malawi are Chichewa and English. The official languages are accompanied with regional languages. In this research one additional regional language (Tumbuka) was used during the interviews.

**APPROACHES TO OVERCOME THE LANGUAGE BARRIER**

Squires (2009) identified 14 methodological approaches to overcome the challenges of using an interpreter during cross-cultural qualitative research. The approaches included; ensuring a clear understanding of the context of the interview and technical words between the interpreter and researcher, describing
the interpreter's language skills and qualifications, describing the interpreter's role in the study and pilot testing the translated interview guide prior to conducting the study.

A local interpreter was chosen through an interview process conducted by the author. The criteria for the successful applicant were fluent in Chichewa and Tumbuka or Tonga, previous experience working as a translator and a high school certificate. The interpreter was trained for two days prior to conducting all qualitative interviews. The training developed a rapport between the lead researcher and interpreter and was used to clarify 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).

All surveyors engaged during the quantitative research were fluent in English and the regional language. Surveyors were trained for one day prior to conducting the surveys. The training explained the survey, question by question, to ensure the surveyors understood the intent of the question and the coding system. The quantitative interview guide was prepared in English and then translated to Malawi's national language, Chichewa. Forward-backwards translation as described by Bullinger et al. (1998) confirmed the accuracy of the translation.

**TRUSTWORTHINESS, RIGOUR AND VALIDITY**

*Geographical coverage*

It is important that the findings of this study are interpreted in the context of their limited geographical coverage. Malawi consists of 28 districts however this study covers on five districts. The rural case study examined four districts, the urban case study only one district. It is recognized that within each district there is wide variation in socio-economic, cultural and environmental conditions. For example, in Dowa the study site was located in the eastern region of the district. The eastern region does not grow tobacco, whereas the western region is a large supplier of
tobacco. Growing and selling tobacco would have a substantial impact on the socio-economic condition of the households.

Reliability

The structured survey, in-depth interviews and focus group discussion guides were all pre-tested and revised. Logistical and financial constraints determined the sample sizes for the structured survey \( n = 221 \) & \( n = 561 \). The moderate size of the sample reduces the statistical power and hence the level of confidence that can be placed on the findings. There is also the risk of clustering in each village, whereby results for one village are influenced by each other and therefore should be regarded as only one data point.

In-depth interviews were conducted until saturation was attained i.e. no new topics of discussion were introduced during additional interviews. The focus group discussions were used to validate the key findings from the in-depth interviews.

Recall and interviewer bias

The householders were asked to recall their previous purchasing habits of latrines. In some cases, the purchase had occurred up to eight years prior to the survey. This presents the risk of householders being unable to recall the exact conditions at the time of constructing their latrine.

The use of local health staff as interview staff presented a risk of ‘insider bias’. The risk of insider bias was reduced using; a) researcher bracketing, b) triangulation and c) member checking (described by Teddlie & Tashakkori 2009, pp. 208-213).

Researcher bracketing: Existing biases and pre-conceptions were discussed during the one-day training sessions with local health workers.

Triangulation: Findings of the local health workers were triangulated with the findings of the first author during a one-day workshop in each district.
**Member checking:** Prior to leaving each district, the findings were presented, discussed and verified/refuted through discussions with assistants to the village chief.

Insider bias was a potential risk in the focus group discussion as the village chief and local health workers selected the participants. This risk was minimized through discussing topics that had been captured during the one-to-one interviews. This allowed the research team to triangulate findings between the interviews and focus group discussions.

**ETHICS APPROVAL**

Murdoch University’s Human Research Ethics Committee approved the research proposal on 20 July 2011. A local advisory group in Malawi consisting of UNICEF staff and a local consultant provided guidance on local ethical considerations (Howatt & Stevens in Hay 2010 p.55). All participants were provided with a clear description of the aims, processes and outcomes of the research. After providing time for questions and discussions about the research, participants were asked to provide their consent. Consent was provided verbally due to low literacy rates in the majority of participants. Participants were informed they could withdraw from the research at any stage. All data was recorded anonymously and held in a secure location.

**REFERENCES**


Creswell, J. W. 2007 Qualitative inquiry and research design: Choosing among five traditions (2nd ed.), Sage, California


Denzin N.K. 2010 Moments, Mixed Methods, and Paradigm Dialogs. *Qualitative Inquiry* **16** (6), 419-427


Howe, K.R. 1988 Against the Quantitative-Qualitative Incompatibility Thesis or Dogmas Die Hard. *Educational Research* 17 (10), 10-16


Jenkins, M.W. & Scott, B. 2007 Behavioural indicators of household decision-making and demand for sanitation and potential gains from social marketing in Ghana. *Social Science and Medicine, 64*, 2427-2442.


CHAPTER 5       (PAPER THREE)

INVESTIGATING THE DYNAMIC INTERACTIONS BETWEEN SUPPLY AND DEMAND FOR RURAL SANITATION, MALAWI

ABSTRACT
Formative market research is the first step in developing evidence-based sanitation marketing programs. In Malawi, the design, implementation and evaluation of rural sanitation marketing programs has been limited. This study applied a mixed methodological approach to examine the dynamic interactions between the supply and demand of sanitation in three rural districts. The supply assessment identified an extremely limited range of latrine options. Sanitation suppliers reported very low household demand for their existing latrine options. An additional constraint reported by suppliers was householders’ perception of a hardware subsidy for latrine construction. The demand assessment found a key constraint of constructing an unlined pit latrine was their short time-in-use (11-13 months). Householders expressed despondency at having to consistently rebuild collapsed, unlined pit latrines. For brick-lined latrines, a key barrier was affordability combined with an over-estimation of construction costs. Key motivations to construct brick-lined latrines included product attributes and social drivers. Wide variations in access to income and use of micro-finance organisations were recorded within and across the study sites. Formative market research is an iterative process from which new lines of investigation arise. This study provides information that will provide a foundation for the ongoing research, design, implementation and monitoring of rural sanitation marketing programs in Malawi.

Key words  | constraints, financing, motivators, sanitation, social marketing
INTRODUCTION

Top-down, supply-led approaches to sanitation programs have failed to generate sustained improvements in sanitation coverage in countries with developing economies (Cairncross 2004; Jenkins & Sugden 2006). In response, a growing consensus has developed amongst donor agencies, development organizations and governments to engage the local community to generate demand for sanitation (IWA 2008; Murray & Ray 2010). Two common approaches to support community engagement and generate demand for sanitation are; community-led total sanitation (CLTS) (Chambers 2009) and sanitation marketing (Cairncross 2004; Jenkins 2010).

In comparison to other sub-Saharan countries, Malawi has a relatively low rate of open defecation in rural districts with approximately 1 in 10 households (11%) open defecating (NSO/ICF Macro 2010; WHO & UNICEF 2010). In rural districts, basic sanitation has been reported to range from 32% to 82%, while improved sanitation ranges from 7% to 57% (NSO/ICF Macro 2010; WHO & UNICEF 2010). The Government of Malawi (GoM) (2008) has recognized more progress is required to overcome the disparities in sanitation coverage across rural districts. Malawi’s National Sanitation Policy (GoM 2008) and the recent National Open Defecation Free Strategy by 2015 (MoAIWD 2011) identify CLTS and sanitation marketing as the key approaches to improve rural sanitation coverage. A national program for CLTS has been implemented in 12 rural districts (Maulit & Kang 2011). In contrast, there have been fewer attempts at sanitation marketing in rural districts and there is a lack of cohesion and capacity in rural sanitation marketing programs in Malawi (DeGabriele 2009).

Sanitation marketing programs apply social and commercial marketing techniques to generate householder demand, matched with adequate and appropriate supply within a supportive policy environment (Cairncross 2004; Jenkins 2010). Over the last decade, government and non-government organizations have partnered with private sector, academia and civil society organizations to implement rural sanitation marketing programs across Asia (Devine 2010; Sijbesma et al. 2010; Baker et al. 2011) and Africa (Jenkins & Curtis 2005; Jenkins & Scott 2007; Water
and Sanitation Program (WSP) & PricewaterhouseCoopers 2008). The first-stage of evidence-based sanitation marketing programs is formative market research (WSP 2011). In sanitation marketing programs, formative market research attempts to identify the practices, perceptions and attitudes of householders, suppliers and government representatives towards the existing sanitation market (Jenkins 2010).

To date, there are limited published accounts of sanitation market research conducted in rural Malawi. The main aim of this study was to investigate the dynamic interactions between the supply and demand of sanitation in three rural districts. To achieve this aim the study’s objectives examine the supply and demand of rural sanitation through:

• Examining existing latrine options together with the practices and perceptions of sanitation suppliers

• Identifying the constraints and motivations of householders to construct a latrine

Examining the dynamic interactions between sanitation suppliers and householders can reveal important gaps in an existing sanitation market. Cairncross (2004) suggested that existing sanitation suppliers often fail to offer a range of latrine options and predominantly target only the wealthiest households. Lack of access to sanitation products that allow households to move up the sanitation ladder was identified as an important constraint in the evaluation of sanitation programs in Zimbabwe (Whaley & Webster 2011). In Asia, the development of innovative products and services was recognised as an important driver for increased demand for sanitation (Sijbesma et al. 2010; Baker et al. 2011). Understanding the relationship between existing latrine options, suppliers and householders provides a foundation for the development of evidence-based sanitation marketing programs.

Understanding the motivations, opportunities and abilities of householders to purchase/construct a latrine provides insights into the determinants of demand in
a sanitation market (Jenkins 2004). Motivation includes the social, physical and emotional drivers to own a latrine (Devine 2009). Jenkins and Curtis (2005) identified 11 behavioural drivers for latrine adoption in rural Benin. The 11 drivers were classified into three categories; prestige/status-related, well-being and situational goals. Research in Ghana demonstrated that households move through sequential decision-making phases prior to constructing a latrine (Jenkins & Scott 2007). In low-income communities the affordability of a sanitation option is an important determinant of demand. Socio-economic conditions such as level of education, family size, life stage and income have been associated with a household’s ownership of a latrine (Jenkins & Curtis 2005; O’Loughlin et al. 2006). Whaley and Webster (2011) found a household’s ability to afford a latrine was a significant barrier to construction in Zimbabwe. Formative research provides vital information on the determinants that can trigger or prevent demand in a sanitation market.

SITE SELECTION

The three rural districts chosen were Nkhata Bay, Dowa and Mangochi (Figure 1). Nkhata Bay and Mangochi were chosen due to their proximity to the lakeshore. Lakeshore districts, with sandy soils, were reported to have high rates of open defecation due to collapsing pit latrines. Dowa was selected to represent a district with clay/loamy soils. The next administrative level below the district is the traditional
authority (TA). Within each TA, one group of villages was selected using the following criteria: more than 3 villages and/or population greater than 300 households and not more than 90 minutes drive from the central market place. Local government staff were asked to select a group of villages that represented typical population density and occupations in the TA.

METHODS
The research methodology was influenced by previous formative research conducted in Benin (Jenkins & Curtis 2005) and Ghana (Jenkins & Scott 2007). The research tools were predominantly derived from Jenkins (2010). The research instruments and tools were trialled and pre-tested for one-week prior to use. The study applied a mixed-methodology that utilised qualitative and quantitative methods to investigate the existing market for sanitation. Three research tools were used: in-depth interview, focus group discussion and a close-ended, pre-coded questionnaire survey.

Table 1 shows in-depth interviews were conducted with: 1) household heads and 2) sanitation suppliers. For each group a discussion guide was pre-tested and revised. If an issue was consistently reported by participants (i.e. the topic had reached saturation) the interviewer introduced new topics of discussion. Household participants were selected by purposive convenience sampling to represent male and female head of households with no latrine, different latrine types and to capture a range of ages and occupations in the group of villages (Jenkins & Curtis 2005). Supplier participants were purposively sampled by requesting the village chief and local health worker to identify between four to six masons that had constructed a latrine in the last 12 months. The first author was introduced to the household and supplier participants by a local Health Surveillance Assistant (HSA). Manifest content analysis was conducted on each transcript as described by Graneheim and Lundham (2004) using NVivo software 9.

In-depth interviews were conducted by the first author with a translator. Interviews were conducted in Chichewa or the local dialect. All interviews were
recorded and transcribed to English by an independent translator. Additional interviews were conducted by two local environmental health officers (EHOs). The EHOs were trained for one-day prior to commencing the interviews. The training covered the intent of the research, ethics and discussion guides.

### Table 1: Number of in-depth interviews recorded and transcribed.

<table>
<thead>
<tr>
<th></th>
<th><strong>Household heads</strong></th>
<th></th>
<th><strong>Suppliers</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>No latrine</strong></td>
<td><strong>With latrine</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>Dowa</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Nkhata Bay</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Mangochi</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td><strong>Totals - female</strong></td>
<td><strong>7</strong></td>
<td></td>
<td><strong>11</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Totals - male</strong></td>
<td><strong>4</strong></td>
<td></td>
<td><strong>8</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>11</strong></td>
<td></td>
<td><strong>19</strong></td>
<td></td>
</tr>
</tbody>
</table>

Gender segregated focus group discussions (FGD) were conducted at each study site. The participants were identified through informal discussions with the village chief and local health surveillance assistants (HSAs). The participants were selected to include households with and without latrines and with a wide range of age groups (18-68 yrs). Food and drink was provided during the discussions. The key themes and statements were recorded by an independent translator and scribe. Key statements from the transcript were coded into themes (Catterall & Maclaren 1997).

Three local surveyors were trained for one-day in the delivery of the questionnaire survey and recording of pre-coded answers. The surveyors included local HSAs and assistant environmental health officers (aEHOs). The surveyors were instructed to move in different directions (North, East, South or West) from a random point in the village. Householders were selected randomly by each surveyor randomly counting the 'Nth' house from the starting point. The ‘N’ being identified as the last digit on a randomly chosen bank note in the surveyor's purse.
or wallet. A total of 221 households were surveyed. Frequencies, means and standard errors were calculated for each question and compared across study sites using PASWStatistics v18.0.

One-day participatory workshops were conducted with the local EHO, aEHO and HSAs at each study site. The participatory workshops were used to collate, debate and synthesise the findings of the research. The participatory workshops followed the structure outlined by Jenkins (2010 p.89).

**Ethical considerations**
Murdoch University’s human ethics committee approved the research. All participants were informed of their right to not participate in the research. The participants were informed that all comments would be recorded anonymously. The outcomes of the research were described and discussed with all participants. The research tools did not encourage or promote any specific sanitation options or promote any specific set of responses.

**Limitations**

*Geographical coverage*

Malawi consists of 28 districts. This study examined only three districts. The study sites were selected to focus on sandy soils. It is recognized that within each district there is wide variation in socio-economic, cultural and environmental conditions. For example, in Dowa the study site was located in the eastern region of the district. The eastern region does not grow tobacco, whereas the western region is a large supplier of tobacco. Growing and selling tobacco would have a substantial impact on the socio-economic condition of the households. It is important that the findings of this study are interpreted in the context of their limited geographical coverage.

*Reliability*

The structured survey, in-depth interviews and focus group discussion guides were all pre-tested and revised. Logistical and financial constraints determined the sample sizes for the structured survey ($n = 221$). The moderate size of the sample reduces the statistical power and hence the level of confidence that can be placed
on the findings. There is also the risk of clustering in each village, whereby results for one village are influenced by each other and therefore should be regarded as only one data point. In-depth interviews were conducted until saturation was attained i.e. no new topics of discussion were introduced during additional interviews. The focus group discussions were used to validate the key findings from the in-depth interviews.

Recall and interviewer bias

The householders were asked to recall their previous purchasing habits of latrines. In some cases, the purchase had occurred up to eight years prior to the survey. This presents some risk of householders being unable to recall the exact conditions at the time of constructing their latrine. District-government staff, an international researcher and a translator conducted the interviews. The presence of ‘outsiders’ may have influenced the response of householders. It was attempted to overcome this influence by providing a clear briefing to the village chief prior to the research team arriving at the village. The briefing stressed that the team was conducting formative research and it was not a prelude to a sanitation program commencing in their village. The importance of honesty was also stressed to all householders prior to conducting the interviews and group discussions.

The use of EHO, aEHO and HSA as interview staff presented a risk of insider bias. The risk of insider bias was reduced using; a) researcher bracketing, b) triangulation and c) member checking (described by Teddlie & Tashakkori 2009, pp. 208-213).

Researcher bracketing: Existing biases and pre-conceptions were discussed during the one-day training sessions with EHOs, aEHOs and HSAs.

Triangulation: Findings of the EHOs, aEHOs and HSAs were triangulated with the findings of the first author during a one-day workshop in each district.

Member checking: Prior to leaving each district, the findings were presented, discussed and verified/refuted through discussions with senior assistants to the village chief.
Insider bias was a potential risk in the FGD as the village chief and HSA selected the participants. This risk was minimized through discussing topics that had been captured during the one-to-one interviews. This allowed the research team to triangulate findings between the interviews and FGDs.

RESULTS AND DISCUSSION

Supply assessment

*Existing latrine options represent extremes in cost and durability*

The study found an extremely limited range of latrine options was available at each of the three study sites (Figure 2). In the sandy soil sites, only three options were identified. In clay soils, only two options were identified. In study sites with sandy soils (Mangochi and Nkhata Bay), temporary latrines were predominantly unlined pits (hereafter ‘unlined’) or pits lined with a woven basket frame (hereafter ‘nkhokwe-lined’). Circular pits were dug to a depth of 2-3 m and width of 1-1.5 m. The pits had no supporting structure around the collar of the pit. Slabs were constructed using local wood and smeared with clay. Nkhokwe were assembled using local trees and reeds and are scaled-down models of cages used to store maize (see Photo 1). In Mangochi and Nkhata Bay, brick-lined latrines had a rectangular pit with a depth of 2-3 m and width of 1-1.5 m. The walls were brick-lined with cement mortar. A cement slab was placed across the brick collar of the pit to create the floor of the latrine.
In Dowa, with clay soils, two types of latrines were observed. The first type, referred to as temporary, had a rectangular, clay-based unlined pit (3 m depth, 1 m width) and wood slab, which was prone to termite attack and rotting. The permanent latrine type also had a rectangular, clay-based unlined pit (3 m depth, 1 m width) but this was accompanied with a cement or stone slab. These slabs are resistant to termite attack and are impermeable to water. The stone slabs were sourced from hills surrounding the villages. These findings demonstrate the role of the surrounding environment, particularly its soil structure and availability of local building materials, to dictate the availability and type of existing latrine options in the three rural sites.
The estimated time-in-use of a latrine was determined by asking the household two distinct questions in the structured survey. The first question asked the household to recall the time since installing the latrine (in months), the second question asked the household to predict the length of time the latrine would remain in use (in months). The estimated time-in-use was calculated through the addition of these two questions and provides a measure of the householder’s actual and perceived use of their latrine.

Clear distinctions were found between the estimated time-in-use of unlined pit latrines based on the soil substrate (Table 2). In Dowa, with clay soils, pit latrines with unlined pits were reported to have an average time-in-use (49 months) that was approximately four times the average time-in-use of unlined pits in Mangochi (11 months) and Nkhata Bay (13 months). Future sanitation programs would need to recognise that the development and promotion of pit linings in areas with clay soils may be redundant. Alternatively, in rural districts with sandy soils, the introduction of affordable pit linings that align with householders’ preferences and needs should be a priority in future sanitation marketing programs.

**Table 2: Average cost and estimated time-in-use of latrine options.**

<table>
<thead>
<tr>
<th>District/Building materials</th>
<th>Construction</th>
<th>Time-in-use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dowa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nkhata Bay</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mangochi</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Soil type          | Unlined pit, wood slab, grass walls and roof 
<table>
<thead>
<tr>
<th></th>
<th>$(n = 37)$</th>
<th>cost (MKW*) ± S.D.</th>
<th>(months) ± S.D.</th>
</tr>
</thead>
</table>
| Dowa / Clay        | Unlined pit, cement/brick slab, brick walls and grass roof 
|                   | $(n = 21)$                          | 180 ± 500         | 49 ± 50         |
|                    | Unlined pit, wood slab, grass walls and roof 
|                   | $(n = 18)$                          | 420 ± 1200        | 88 ± 37         |
|                    | No costs reported by householders  | 11 ± 13            |                 |
|                    | Nkhokwe pit lining, wood slab, grass walls and roof 
|                   | $(n = 25)$                          | 4000 ± 700        | 28 ± 15         |
| Mangochi / Sandy   | Brick lined pit, cement/brick slab, brick walls and grass roof 
|                   | $(n = 11)$                          | 9200 ± 2800       | 85 ± 53         |
|                    | Unlined pit, stone/cement slab, clay walls and grass roof 
|                   | $(n=77)$                            | 170 ± 500         | 13 ± 21         |
|                    | Nkhokwe pit lining, wood slab, grass walls and roof 
|                   | $(n = 8)$                           | 610 ± 1300        | 32 ± 33         |
Householders in Mangochi that owned nkhokwe-lined or brick-lined latrines reported significantly higher costs of construction in comparison to Nkhata Bay householders (Table 2). Construction cost was calculated by summing the external labour (internal or family labour costs were not included) and building material costs reported by the head of each household. Mangochi households reported up to 20 times higher costs than those in Nkhata Bay. In regard to brick-lined pits, the higher average costs in Mangochi may be the result of the construction of high-quality, high-priced latrines. Interviews with suppliers in Mangochi found they were capable of constructing sophisticated ‘wet’ and flushing latrine options including pour flush, cistern flush latrines and double-septic tanks. Mangochi residents are predominantly Muslim. Previous sanitation studies have reported a strong preference for flush latrines in Muslim communities (Nawab et al. 2006). Future sanitation marketing programs should remain aware of the impact of religious and cultural norms upon the supply and demand for specific latrine options.

The use of nkhokwe-lined pits demonstrates that some product innovation has occurred to overcome the challenge of collapsing pits in sandy soils. Figure 3 illustrates that nkhokwe-lined pits act as an intermediate step between unlined pits and brick-lined pits in cost and estimated time-in-use. The use of nkhokwe was significantly higher in Mangochi (46%) than Nkhata Bay (10%). The time-in-use of nkhokwe-lined pits in Nkhata Bay (32 ± 33 months) exhibited a standard deviation double that of Mangochi (28 ± 15 months). The higher standard deviation suggests a higher variability in the time-in-use of nkhokwe at the Nkhata Bay study site. High variability in time-in-use could result in the dissemination of negative customer reviews of nkhokwe, which could adversely impact uptake rates. The higher usage rates of nkhokwe in Mangochi may be due to; more
effective demand creation, effective and responsive supply chain and strong religious and social drivers towards the use of nkhokwe-lined pit latrines.

Mangochi householders reported paying more than six times the construction costs for nkhokwe-lined pits in comparison to Nkhata Bay householders. The higher costs in Mangochi (Table 2) may be the result of inadequate wood supplies resulting in higher costs for construction and transportation fees. Very few trees were observed in the vicinity of the Mangochi study site. In contrast, the Nkhata Bay study site had abundant and varied tree coverage. Further exploration of the perceptions, attitudes and awareness of nkhokwe-lined pits in other lakeside districts would generate important information that could inform the design of new pit-lining options in sandy soils. This information would provide product designers with a stronger understanding of how householders’ perceive and disseminate the attributes of desirable sanitation products.

Figure 3: Cost and estimated time-in-use of three pit linings in Mangochi and Nkhata Bay.

Existing sanitation suppliers are constrained by inadequate products and hardware-subsidy programs
Strong commonalities were found in the training, marketing practices and business models of sanitation suppliers across the three districts. Twelve of the 14
(85%) suppliers had not received any formal training in constructing latrines. The two formally trained suppliers had been trained by a local non-government organization and a training centre located in Blantyre city. All suppliers stated they did not engage in any formal marketing activities but rather waited for customers to approach them. ‘I let my hands speak on my behalf’ (Supplier, male, 33 years, Dowa). The majority of suppliers (10 of 14) stated they did not supply building materials for the construction of latrines. Households were responsible for the collection and payment of building materials prior to the supplier arriving on the construction site.

Existing suppliers reported that sanitation-related business represents a low proportion (10-15%) of their annual income and workload. Suppliers of brick-lined pit-latrines reported their main business activities were the construction of houses and community buildings. Suppliers of nkholwe pit linings reported farming and labouring as their main form of income generation. Suppliers of brick-lined latrines reported two main constraints to the growth of their sanitation-related business. The first was they were unable to provide latrine options that matched their customers’ preferences, needs and expectations of cost. ‘People are willing, they all come and ask me, but the price is too high and they don’t come back’ (Supplier, male, 45 years, Nkhata Bay). The application of sanitation marketing programs could potentially overcome the mismatch between existing supply and demand. Costs for latrines could potentially be reduced through identifying lower-cost materials or manufacturing approaches via human-centred, participatory, lead-user or emphatic design approaches (Steen et al. 2007). Reduced or delayed payment options via micro-finance options or alternative business models for suppliers could also address the price disincentive. These approaches could be developed through subsequent design and implementation of an integrated sanitation marketing program.

The second constraint for sanitation suppliers was the expectation of householders to receive a hardware subsidy to construct a latrine. Householders consistently reported the expectation that hardware subsidies for latrines would return to their village. The suppliers reported the householders’ expectation of free hardware created a disincentive to commit their own income towards constructing a latrine.
'Villagers keep coming to me and asking “when do I get my free saniplat?” No-one has informed them that this program is finished and they don’t believe me’ (Supplier, male, 56 years, Nkhata Bay). This finding aligns with the evaluation of a sanitation marketing pilot program in Cambodia where hardware subsidy programs were reported to constrain householder demand and market growth (Baker et al. 2011).

Existing supply is male dominated

Only male suppliers of latrines were identified in the three study sites. It was identified that women do not engage in digging latrines as the activity is similar to digging a grave. EHOs reported that cultural norms dictate that only men can dig a grave for an adult. Alongside these cultural considerations, the majority of female interviewees in Nkhata Bay and Dowa expressed an interest in constructing latrines, supplying latrine-related materials and marketing of latrines. ‘Don’t you forget about us, we can also be involved in supplying latrines. Why not? We can run our own business, so why not this one?’ (Female, 42 years, Dowa). This position was supported during the male discussion groups in Nkhata Bay and Dowa. ‘Women are usually responsible for building more than 70% of the home. I see no reason why they couldn’t construct a latrine’ (Male, 55 years, Nkhata Bay). Further investigations should clarify how women’s awareness in sanitation combined with their building and business capabilities could be harnessed in the development of the sanitation market.

Demand assessment

Key constraint to construct an unlined and nkhokwe-lined latrine is their poor durability

During the interviews and focus group discussions, three sub-themes were identified in relation to the poor durability of unlined and nkhokwe-lined latrines. They were; existing latrine options had failed them, fear of children using unlined latrines and inability to construct latrines during the rainy season.

Existing latrine options have failed them

In districts with sandy soils (Mangochi and Nkhata Bay), unlined and nkhokwe-lined latrines were observed to collapse in two ways; a) total collapse of the
internal pit or b) shifting of the slab. Households reported that groundwater intrusion during the wet season was the reason for the total collapse of the internal pit. Shifting of the slab was reported to occur when surface water ran into the latrine during the rainy season. Poor design of the latrines was an important factor in the collapse of the pit and/or shifting of the slab. Masons reported that shifting of the slab could be dramatically reduced through installation of a watertight roof. ‘The duration depends on how you prepare the roof. If the roof doesn’t leak then it can last a long time. If no plastic, then it can leak and the floor and wall will not last’ (Mason, 42 years, Nkhata Bay). An examination of the efficacy of existing roofing options may identify a cheap, simple solution that would align with the householders’ preference for longer-lasting latrines.

The questionnaire survey identified that 28% of households (62 of 221) did not own a latrine. In-depth interviews with householders without latrines identified the overwhelming majority (10 of 11) of households had previously owned a latrine. These households reported their previous latrine had collapsed in sandy soils or was destroyed by termites. Further probing with households identified a consistent theme of despondency about existing latrine options and their durability. ‘I just want to take a rest from always digging a pit. Maybe I’m just lazy but it takes a lot of time and I have to borrow tools each time. But if you wait too long you feel like something is lacking in you’ (Male, 35 years, Nkhata Bay). ‘We are tired of rebuilding, we just dig and it collapses time and time again during the rainy season’ (Female, 47, Mangochi). ‘The wood rots and then I have to find time to collect wood. The strong wood is becoming harder to find and I have to travel a long way to collect it’ (FGD, male, Dowa). Developing latrine options that overcome the collapse of pits, shifting of slabs or destruction by termites could act to re-ignite household demand for sanitation.

Existing unlined and nkhokwe-lined latrine options are failing to match the expectations and needs of their owners, which in turn, result in low willingness to rebuild the latrine. These findings are consistent with Whaley and Webster (2011) who found Zimbabwean households with temporary latrines were unwilling to rebuild a collapsed latrine. Underperforming products have a significantly reduced
likelihood of re-purchase by consumers (Oliver 2010). Figure 4 applies Jenkins and Scott's (2007) conceptual model to represent the ‘delay’ in a householder’s choice to re-construct an unlined or nkhokwe-lined pit latrine. Product innovation has the potential to break the negative feedback loop through developing sanitation options that prevent the latrine from collapsing.

Figure 4: Conceptual feedback loop of a household's decision-making process to not rebuild a temporary latrine.

Fear of existing latrine options
Another significant barrier to building an unlined or nkhokwe-lined pit latrine was the perceived risk they posed to young children. Householders told numerous anecdotal stories about children falling into collapsed pits. A number of parents and guardians stated they would prefer to have no latrine over a latrine that presented a risk to their children. Householders reported preventing children up to the age of 10 from using a basic latrine. ‘We don’t let our children go near the latrine. I always worry about them playing near the latrine and falling inside’ (Female, 56 years, Mangochi). This finding supports Devine’s (2009) assertion that ‘threat’ is a behavioural determinant of the use of latrines for children, and indeed adults. Habit building during childhood is essential in developing long-term attitudes and practices towards hygiene-related practices (Curtis et al. 2009). Challenging the fear of children using latrines, through product innovation and marketing, has the potential to support life-long habitual use of latrines.
Unable to re-build basic latrines during the rainy season

The rainy season presents the most significant risk of collapse for unlined and nkhokwe-lined pit latrines. During heavy rainfall, the soil becomes wet, resulting in pit walls becoming heavy and mobile. The heavy and mobile walls cause the pit to collapse, displace the slab and encourage rotting of wood foundations and slabs. Households reported that during the rainy season (December – March) they often revert to open defecation and do not rebuild their latrine until the dry season returns (April – May). ‘There is no alternative during the rainy season to go outside due to condition of soil and rainfall’ (FGD, female, Dowa).

Local health workers stated that diarrhoeal and cholera outbreaks occurred predominantly during the rainy season. Householders reported returning to the practice of open defecation during the rainy season after their latrines collapsed. The movement of rain over exposed human faeces is a potential pathway for faecal-oral contamination. The collapse of unlined or nkhokwe-lined pit latrines during the rainy season raises questions about their efficacy in reducing the risk of diarrhoeal disease and cholera outbreaks. If this concern is valid, this raises further questions on the public health impacts of sanitation programs that focus on the construction of unlined or nkhokwe-lined sanitation options.

Product attributes and social drivers are key motivators to construct a brick-lined pit latrine

Householders reported product attributes and social drivers were important motivators to construct a brick-lined pit latrine.

Product attributes
Formative market research can identify the product attributes that are most important to the target audience (Devine 2009). The questionnaire survey found cleanliness was the most commonly stated advantage of owning a latrine. In-depth interviews unpacked the term ‘cleanliness’ and found it related to an overall reduction in the effort to maintain and operate a latrine. The reduced operation and maintenance included the ability to wash the slab clean. ‘The inside must be cement to allow for easy and fast cleaning’ (Female, Mangochi, 45 years). The second component to reduced operation and maintenance was not rebuilding a
temporary latrine every year. ‘Building a latrine each year is so much work. We had to collect grass, wood and then dig the pit. And I had to cook for the men and collect water. It was hard work, but now we have a good latrine and I don’t have to worry about any of that’ (Female, 62 years, Nkhata Bay).

Social drivers
A strong and dominant motivation reported by householders to construct a brick-lined pit latrine was the internal and external perception of their surrounding community. The internal perception was related to their perceived standing amongst other members of their village. ‘I can be proud of my latrine. A good latrine shows you are a good member of the community’ (Male, 54 years, Mangochi). The second was inter-village i.e. to improve their standing when guests from other villages or districts came to visit their home. ‘People know you have a latrine, so when people come and visit, you can relax’ (Male, 49, Dowa).

A minority of householders (3 of 30) argued that spending money on a latrine was ineffectual in improving their perceived position within the community. They argued motorcycles, mobile phones or watches were more effective status symbols. These status symbols could be used or worn outside of the village (unlike a latrine which is immobile) and therefore have a wider impact on a householder’s social status.

Privacy
A consistent motivation for a brick-lined pit latrine was privacy. The theme of privacy was predominant in all interviews and discussions with female householders. Privacy was related to protecting themselves from being disturbed by men, children and animals when using the latrine. Male householders identified privacy as a key issue to protect the dignity of their wife and other female members of the household.

Householders’ over-estimate costs of improved latrines
This study supports Cairncross’s (2004) assertion that householders ‘may underestimate the benefits and overestimate the cost of sanitation’. Interviews and discussions with householders identified the high expectation of costs were
related to the expectation that cement must be used to construct their ‘ideal’ latrine. Householders had an expectation of between 50-100kg of cement would be required to build a cement slab. This amount of concrete is six times more than that required in low-cost slab designs (GRET & IDE Cambodia 2010). DeGabriele (2009) further questions the central focus of cement in latrine construction and states that international donors and government agencies are moving away from the mind-set that only cement can be used to produce an impermeable slab. The change in the Government’s mindset is displayed in Malawi’s National Sanitation Policy which defines ‘improved’ sanitation as requiring an ‘impermeable floor’ (GoM 2008). In support of this shift away from cement, the research observed local materials such as smeared and polished mud were found to seal latrine floors and slabs. The application of local materials and building practices in combination with product development and marketing strategies could overcome the misconceptions of the necessity, and amount of, cement required to construct permanent latrines.

Analysis found that householders’ expectation of high costs associated with brick-lined latrines was not justified. The results in Figure 5 were calculated from data collated in the structured survey (n = 159), using the formula:

\[
\text{Cost per year} = \frac{\text{Total cost of latrine (materials + labour)}}{\text{Estimated time-in-use}}
\]

Figure 5 illustrates that costs per year of brick-lined pit latrines were similar or less than the costs for unlined or nkhokwe-lined latrines. The costs of unlined or nkhokwe-lined latrines would be substantially higher as the formula does not account for the loss of income due to time spent re-building the latrines, cost of food for workers or inflation. This suggests that implementing sanitation marketing programs that support households to purchase brick-lined latrines would deliver long-term cost savings to householders. However, the high costs of existing brick-lined latrine options and the requirement for bulk repayment options would continue to act as a barrier to low-income households. Low-income households often have insecure and irregular access to cash and are unable to afford large capital expenditures. Future sanitation marketing programs must remain cognisant of the timing and access to income or finance for low-income
households. Sources of income and finance would include their occupation, finance from relatives/friends/neighbours, ceremonial money and awareness/willingness to use micro-finance institutions.

Figure 5: Annual cost per year of unlined, nkholke and brick-lined latrines over their time-in-use.

*Income, occupation and access to micro-finance institutions (MFIs)*

This study identified a significant association between overall household spending and latrine ownership. Household spending was regarded as a proxy measure of household income. Figure 6 shows households without latrines, with unlined or with nkholke-lined latrines reported lower levels of spending in the two weeks prior to the survey than households with brick-lined latrines. The level of reported spending is potentially biased through participant recall and influenced by the interviewer’s presence in the home. However, the consistent nature of the association suggests that households with a higher income are more likely to invest in brick-lined latrine options. The design of low-cost latrine options that are affordable for low-income households whilst meeting their preferences and needs will be essential to gain wide improvements in sanitation coverage across the study sites.
As income was associated with latrine ownership it was important to understand the sources of income. The occupation of the female and male household head impacted upon the consistency and level of income. The three main occupation groups were farmers, fishermen and small business people. Farming households stated their income was focused around prevailing climatic conditions. Access to income was highest after harvest. For maize crops, Malawi's largest crop, the harvest occurs from May to July. In comparison to farmers, fishing households reported a relatively consistent income throughout the year. Fishermen reported a decrease in their ability to catch fish and a corresponding drop in income during periods of high winds, from June to August. Small business people reported a relatively consistent income throughout the year. The majority of small businesses were run by women and involved trading local and imported goods at local markets. ‘I buy fish and then take these to the market, I then return with some soap and I hope to sell this at our village. Each time I make a little profit, not much, but it is enough to survive’ (Female discussion group, Nkhata Bay). ‘Women will travel together to the market. They will often carry goods to trade and then bring things back to sell or trade with others in the village. Some of them are very successful, they can make a strong profit if they know how to sell’ (Male discussion group, Dowa).
Access to finance offers an alternative source of income into a household. Awareness and access to micro-finance institutions (MFIs) was highly variable between the three study sites. Householders in Nkhata Bay expressed the highest awareness and use of MFIs (including Opportunity International Bank of Malawi and National Banking Service). In Nkhata Bay, it was reported that women were predominantly responsible for taking and servicing loans. ‘Most of the people getting loans are women and that is causing no problems in the home or families’ (Health Surveillance Assistant, 30 years, Nkhata Bay). In contrast, householders in Dowa had limited experience with MFIs. Experiences of village saving groups were mentioned but criticised for their high interest rates. ‘The local saving group is too expensive, they charge high interest rates, you have to pay 50% interest’ (FGD, women, Dowa). In Mangochi, very low awareness of MFIs was expressed; this was accompanied with no interest in accepting loans. ‘We don’t take loans from banks here, I would prefer to save’ (FGD, male, Mangochi). Future sanitation marketing programs would need to be tailored to account for the wide variability in awareness, access and acceptance to MFIs in rural districts.

CONCLUSION

Overall, the research indicates the three study sites offer fertile environments to apply sanitation marketing approaches to improve sanitation coverage. The research demonstrates that demand for latrines is currently not matched with the supply of affordable nor desirable sanitation products or services. The development of affordable latrine options that respond to the householders’ preferences and needs could act to re-stimulate demand. On the supply side, the development of locally-sustainable business models will be required to ensure sanitation suppliers are motivated and engaged to match the demand for affordable and desirable latrines.

Cultivating demand whilst matching it with adequate supply will require the design, testing and refinement of an integrated sanitation marketing program. A simple and rigorous monitoring system must accompany future sanitation marketing programs. The monitoring system would allow practitioners and policy-
makers to make evidence-based decisions to refine and adapt rural sanitation marketing approaches in Malawi.

REFERENCES


Jenkins, M.W. & Scott, B. 2007 Behavioural indicators of household decision-making and demand for sanitation and potential gains from social marketing in Ghana. *Social Science and Medicine, 64*, 2427-2442.


NSO (National Statistical Office) & ICF Macro 2011 *Malawi Demographic and Health Survey 2010*. NSO and ICF Macro, Zomba, Malawi, and Calverton, Maryland, USA.


WHO & UNICEF 2010. *Joint Monitoring Programme for Water Supply and Sanitation; Progress on Sanitation and Drinking-Water 2010 Update* (online). Available at:

Abstract

Market research is the foundation of the design, implementation, and evaluation of evidence-based sanitation marketing programmes. Limited financial resources combined with time constraints may result in some organizations neglecting this fundamental stage. This paper describes how UNICEF Malawi’s government partners were supported to implement market research over five days in Mangochi and Dowa districts, Malawi. The paper presents the six stages of the market research and provides the strengths and challenges of each stage. The market research provided government staff with an opportunity to dispel misperceptions by hearing, recording, and analysing qualitative and quantitative information about the existing sanitation market.

Keywords: rural sanitation, demand, supply, market research, research methodology

Introduction

Sanitation marketing programmes are derived from the discipline of social marketing (Cairncross, 2004). Social marketing applies commercial marketing approaches to attain positive social outcomes (Kotler and Zaltman, 1971). A vital step in developing any commercial or social marketing programme is conducting market research (Kotler et al., 2008; WSP 2011). Market research can provide a rich illustration of the competitors, customers, suppliers, and regulatory environment that relate to a product, service or idea (Kotler et al., 2008). The research process reveals vital information about the needs and wants of potential
customers, how they seek information, and whom they trust to deliver that information (Dearing, 2008).

The Water and Sanitation Program’s, large-scale, rural sanitation programmes in India, Indonesia, and Tanzania engaged professional market research firms to conduct formative market research (Perez et al., 2012). Market research firms are experts in research design, implementation, and analysis and have access to trained survey teams. The key challenge of using market research firms is their demand on financial resources. Indeed, a lack of financial resources is the main reason cited by small businesses and not-for-profits for not using the services offered by professional market research firms or consultants (Kotler and Lee, 2008).

Small and large businesses have employed a range of low-cost market research strategies for many decades. Large companies have recognized the benefits of engaging their managers and staff in the collection and analysis of market data (Kotler et al., 2008). An example of this is when product managers temporarily move into the home of a family that matches the target audience of their product. This provides the product manager with a nuanced sense of the lifestyle, demands, and needs of their target audience. Small businesses have also developed low-cost approaches to market research including the use of systematic approaches to speak with customers/non-customers, networking with competitors, and cost sharing through linking with other firms to implement a survey (commonly called an omnibus survey) (Kotler and Lee, 2008).

For large and small-scale sanitation programmes, the national government has commonly been identified as a key partner of donor-funded sanitation programmes (Perez et al., 2012). Less often though have sanitation programmes engaged government partners in the collation and analysis of market research. Failure to embed government partners in the collation and analysis of market research may result in lower engagement and reduced understanding of a sanitation programme. Indeed, an evaluation of sanitation marketing programmes in Vietnam strongly recommended the need to improve engagement of
government partners to ensure the results of pilot projects were institutionalized into national sanitation strategies (Sijbesma et al., 2010).

Community-led total sanitation (CLTS) and sanitation marketing are the implementing mechanisms identified in Malawi’s Open Defecation Free by 2015 Strategy (MoIWD, 2011). Since 2008, CLTS programmes have been applied across all districts in Malawi. The rate of declared open defecation free villages in Malawi is 9.4 per cent (ODF Taskforce, 2013). In 2011, UNICEF Malawi recognized the potential for sanitation marketing approaches and tools to enhance the progress shown by CLTS. UNICEF Malawi commissioned the first phase of the sanitation marketing programme to conduct market research in three rural districts. The findings from the market research are presented in Cole et al. (2012).

This paper offers guidance for non-government and government organizations to conduct low-cost and rapid market research. The paper aims to:

- Describe the market research process conducted in partnership with government staff in rural Malawi; and
- Evaluate the strengths and challenges of each stage of the market research.

![Figure 1 Map of Malawi depicting location of Dowa and Mangochi districts](image)

**Study area**
Market research was conducted in partnership with two district councils: Dowa and Mangochi (Figure 1). Mangochi was chosen due to its proximity to the lakeshore. Lakeshore districts, with sandy soils, were reported to have high rates of open defecation due to collapsing pit latrines. The eastern part of Dowa was selected to represent a district with clay/loamy soils and with forests where people defecate openly in the bush.

Within each district, the market research was conducted in one traditional authority (TA) (the next administrative level within the district). Within each TA, one group of villages was selected using the following criteria: 1) they included more than three villages and/or a population greater than 1500 people (300 households); and 2) were not more than 90 minutes’ drive from the District Commissioner’s Office. Local government staff were asked to purposively select a group of villages that represented typical population density and occupations in the TA (Cole et al., 2012).

**Methods and findings**

This section describes the six stages undertaken during the market research. The strengths and challenges of each stage are identified. This will assist other practitioners to improve upon this research process in future programming.

**Stage 1: Literature review and partner selection**

Prior to designing the research programme all relevant literature and datasets were collated. Collated literature and datasets included the Joint Monitoring Programme (JMP), Malawi’s Demographic Health Survey (DHS), and reports prepared by non-government organizations. The literature review confirmed that existing sanitation-related information was inconsistent. For example, Malawi’s DHS (NSO/ICF Macro 2011) reported 50 per cent lower improved sanitation coverage compared with the JMP (WHO/UNICEF 2010). No literature was found that recorded the attitudes, perceptions or behaviours of households or sanitation suppliers in Dowa or Mangochi.
The next step was identifying a suitable government ministry. In Malawi, the lead ministry for sanitation is the Ministry of Irrigation and Water Development (MoIWD). Working in close partnership with MoIWD to improve rural sanitation coverage is the Ministry of Health (MoH). The MoH was identified as a suitable research partner due to their established network of staff from the national, the district, and the village levels. The MoH network of sanitation-related staff extends from the national (ministry staff), to district (environmental health officers), group village (health surveillance assistants), and village level (volunteer health workers).

In this case study, the implementing research partners were environmental health officers (EHOs) in Mangochi and Dowa. The EHOs had experience in the implementation of other approaches to sanitation programming including hardware-subsidy and CLTS programmes. Table 1 summarizes the strengths and challenges of the literature review and partner selection. As indicated in Table 1, an early challenge was the limited understanding of the approaches and tools used by sanitation marketing programmes. This knowledge gap was overcome by providing the research team and their managers with an overview of the principles of sanitation marketing and their application in Asian and African countries. Ongoing discussions during the process allowed partners to explore how market research findings could also be integrated into the design of existing CLTS programmes.

**Table 1 Strengths and challenges of literature review and partner selection**

<table>
<thead>
<tr>
<th><strong>Strengths</strong></th>
<th><strong>Literature review demonstrated the urgent need for market research to develop an appreciation of the behavioural determinants for sanitation-related behaviour.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ministry of Health partners had a proven track record in implementing CLTS programmes and were familiar with no subsidy policy for hardware for sanitation in Malawi.</td>
</tr>
<tr>
<td></td>
<td>EHOs were university-educated and had proven experience in</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

127
Stage 2: Setting the research objectives
As the literature review identified limited information about the sanitation market, broad research aims were developed to encompass the supply and demand of the existing sanitation market (see Box 1). Additional research objectives included the identification of suitable communication channels and the attitudes of local leaders to sanitation programmes.

Box 1 Aims of the market research conducted in rural Malawi

- To identify existing toilet options and householders’ perceptions towards each option
- To identify environmental, socio-economic, and cultural factors which prevent or motivate householders to own a toilet
- To discover existing suppliers of toilets and understand their current perceptions and practices towards their toilet-related business
- To identify existing communication channels used to promote new innovations and ideas at the village level
- To understand village and traditional leaders’ knowledge and attitudes towards existing sanitation policies and programmes

Stage 3: Methodology and survey tools
The same methodology and survey tools were used in both districts: Dowa and Mangochi. Mixed methods research was used to simultaneously collect quantitative and qualitative data (Creswell, 2007). The quantitative survey included: 1) coverage of existing toilet options; 2) building materials and costs; 3)
advantages and disadvantages of existing toilet options; 4) hand washing practices; and 5) socio-economic information. Three distinct interview guides were designed and pre-tested to gather the qualitative data. Interview guides were developed for: 1) households with a latrine; 2) households without a latrine; and 3) existing sanitation suppliers. The interview guides were derived from the questionnaires presented in Jenkins (2010: 52–84).

Table 2 identifies the strengths and challenges of the methodology and the survey tools. A key strength of applying mixed methods was the collection of traditional baseline data (toilet types and coverage) along with rich insights into the motivations and barriers of householders and suppliers in the sanitation market.

Table 2 **Strengths and challenges of methodology and survey tools**

<table>
<thead>
<tr>
<th><strong>Strengths</strong></th>
<th>Mixed methods allowed for collection of numerical and language-based data which captured rich insights into the sanitation market and offered a baseline for evaluating the impact of future interventions.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Challenges</strong></td>
<td>Survey tools were not translated into local languages which may have resulted in divergence in the questioning between surveyors/interviewers.</td>
</tr>
</tbody>
</table>

**Stage 4: Team training and data collection**

![Photo 1: Surveyor meets with a householder prior to requesting an interview](image)

The surveyors and interviewers were EHOs and their co-workers included assistant EHOs and health surveillance assistants.
The research team was trained for one day prior to data collection by the lead author. The training covered each question contained within the survey tools. Training also included research ethics (seeking informed, oral consent to participate) and questioning to tackle challenging and sensitive issues.

Each team identified a lead researcher. The lead researcher was responsible for introductions to the village chief, setting the time limits for each data collection phase, and collating all completed survey forms. After arriving at the village a central place was identified by the research team. The central place was commonly the village meeting place. This place was used by the research team to assemble at lunch and at the completion of the day.

Table 3 provides an overview of the three-day data collection process. The quantitative component applied a structured survey to 100 randomly selected households. Three surveyors moved across the group of villages in different directions (north, east, south or west). Guides who were local villagers supported the surveyors by providing directions and introducing the surveyors to the householders. Surveyors chose the ‘nth’ house located in their direction and politely requested the head of household to respond to 50 open-ended questions with coded responses. The survey required 20–30 minutes to complete, resulting in each surveyor interviewing 10–12 households per day.

| Table 3 Research tools, sampling regime, and staff requirements for data collection |
|---------------------------------|----------------|----------------|
| **Research methods** | Quantitative | Qualitative |
| Research methods | Structured survey | In-depth interviews (IDI) and focus group discussions (FGD) |
| Survey tools | 50 open-ended questions with coded responses | Questions guides with 7 main topics of discussion |
| Number of surveyors | 3 (+ 3 local guides) | 2 |
| Sampling | Random starting point followed by ‘nth’ household based on last | IDI, purposeful sampling for households with/without and |
The qualitative component included in-depth interviews followed by gender-segregated focus group discussions. Households were purposively selected to represent families without toilets, sharing, with basic toilets, and with improved toilets. Recruitment was conducted through requesting each participant to recommend another household that matched the required criteria. Health surveillance assistants also provided information to identify households that matched the selection criteria. The main topics discussed during the focus group discussions included: confirmation of existing sanitation options and their advantages/disadvantages; social motivations related to sanitation upgrades; female/male motivations to upgrade sanitation; and challenges of elderly-, female- and child-headed households to upgrade their sanitation.

Table 4 identifies the strengths and weaknesses of the team training and data collection stage. A noteworthy challenge was the consistent request by householders for a hardware subsidy to support the construction of their toilet. This finding suggests there was a widespread perception that government sanitation programmes are associated with hardware subsidies.

**Table 4 Strengths and weaknesses of research team training and data collection**

| Strengths | Surveyors and interviewers developed a rich appreciation of the existing market for sanitation. |
Surveyors and interviewers had strong interactive skills with the communities which enabled them to obtain rigorous, trustworthy, and in-depth data.

Local guides ensured the surveyors and interviewers remained safe and could return to the central collection point at the end of each day.

EHOs could interact with village chiefs to discuss the Government of Malawi’s new focus on demand-led sanitation programmes including CLTS and sanitation marketing.

<table>
<thead>
<tr>
<th>Challenges</th>
<th>Additional time was required to train the research team in both qualitative and quantitative research tools.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Some members of the research team were reluctant to probe households beyond their surface responses.</td>
</tr>
<tr>
<td></td>
<td>Difficult to organize lunch for a large research team in remote, rural villages.</td>
</tr>
<tr>
<td></td>
<td>Wet-weather gear should be included if research is conducted in the rainy season.</td>
</tr>
<tr>
<td></td>
<td>Surveyors and interviewers consistently reported being asked by respondents if they would receive a hardware subsidy if they were responded to the survey/interview.</td>
</tr>
</tbody>
</table>

Stage 5: Data analysis
The research team conducted the initial and rapid analysis of the qualitative and quantitative data. Initial analysis took place over one full day immediately after data collection. The research team members included all surveyors and interviewers, but did not include the local guides.

Quantitative data were entered into Excel. Means and proportions were calculated to provide a picture of the sanitation coverage, toilet types, and perceived advantages and disadvantages.

The qualitative data was analysed using the approach described in IDEO’s (2009) Human-Centred Design Toolkit. Researchers were encouraged to share specific stories heard during the data collection phase. The stories were used to identify themes and possible areas of opportunity.

The second half of the day of analysis was framed using Jenkins (2010), specifically Part 3, Tool 15, pp. 92–6. The team specifically addressed the research questions presented in Box 1. These included: current defecation practices; consumer knowledge and perceptions of existing technologies; motivations and constraints for householders/existing sanitation suppliers; and traditional tools and channels for communication. After addressing these questions, the team attempted to identify opportunities using the four P’s framework of product, price, place, and promotion.
Further detailed statistical analysis and identification of themes was conducted over a three-week period by the lead author (detailed findings are presented in Cole et al., 2012). The qualitative findings were analysed using the behavioural determinants identified in the SaniFOAM framework (Devine, 2009). Table 5 offers an overview of the three main resources/frameworks used during the analysis of the data and presents their strengths and challenges.

Strengths and challenges of the data analysis are summarized in Table 6. The main strength was that it allowed team members to challenge and explore their perceptions about the existing sanitation market. The key challenge was the short time allocated to the initial analysis. The short time resulted in the team being unable to adequately explore the opportunities using the framework of the four Ps.
– product, price, place, and promotion. Future programmes should allocate two to three days for data analysis and programme development.

Table 6 Strengths and challenges of data analysis

| Strengths | Provided a forum for surveyors and interviews to share first-hand stories and to dispel misconceptions about the existing sanitation market

Surveyors responsible for quantitative surveys also conducted ancillary discussions with the householders interviewed with the structured survey tool. These ancillary discussions offered additional insights about the barriers and motivations of latrine ownership.

Working through the analysis, government staff developed insights into the application of social marketing principles to their local sanitation market. |
| challenges | Initial analysis over one day was rushed.

Some team members became distracted by other work duties during the final day of analysis. |

Stage 6: Sharing information

The final stage of the market research involved a workshop that disseminated the market research findings to government, non-government, and private sector representatives. The aim of the workshop was to create a framework for a National
Rural Sanitation Marketing Program. The team leaders of the research in Dowa and Mangochi were present at the national workshop.

The market research findings were presented in three discrete phases: demand, supply, and regulatory environment. After the findings for each phase were presented, workshop participants were asked to identify the key findings that were ‘surprising’, ‘required further investigation’, and ‘relevant to the development of the national programme’. Workshop participants identified two main areas that required consideration in follow-up research: 1) remove potential gender bias of the research team by including more female researchers; and 2) introduce more emphasis on household financing and decision making.

After the presentation of findings, the workshop participants split into four teams. Each team was required to explore opportunities in one of the four Ps (price, product, place, and promotion). These areas of opportunity were compiled into the draft version of the National Rural Sanitation Marketing Program. This programme has been used as the framework for the development and implementation of UNICEF Malawi’s rural sanitation marketing programme since 2012.

During 2012 and 2013 a number of activities have commenced based on the evidence generated during the market research. This has included: 1) the use of participatory design approaches to identify a no-cement, locally available range of sanitation products; 2) creation of a marketing design brief to develop a promotional campaign to support the uptake of the new product range; and 3) the identification and recruitment of local business people to market and sell the new product range.

<table>
<thead>
<tr>
<th><strong>Strengths</strong></th>
<th>Use of numerical and language-based data assisted in conveying the story of the sanitation market.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Research team leaders could explain and justify the findings to their national and district counterparts.</td>
</tr>
<tr>
<td><strong>Challenges</strong></td>
<td>Some participants had limited experience with the concepts of sanitation marketing and struggled with the application of the</td>
</tr>
</tbody>
</table>
Conclusions

This case study demonstrates how engaging government staff in five days of market research can dramatically improve their understanding of the local sanitation market. Applying mixed methods provided a wide and rich data set. By capturing quantitative and qualitative data the research provided a baseline for monitoring changes in sanitation coverage, uptake of new technologies, and shifts in household attitudes and practices during future sanitation marketing programmes.

Established frameworks, including Jenkins (2010) and IDEO (2009) allowed for the rapid generation of initial findings. However, the allocation of additional time to the analysis of findings and programme development would dramatically improve the outcome of future research. The use of the four Ps (product, price, place, and promotion) as a framework for programme development was found to be effective, but adequate time must be provided for researchers and decision-makers to comprehend each category.

Conducting market research is only the first step towards developing effective sanitation programmes. Future investigations should explore how market research findings were integrated into the design of rural sanitation programmes in Malawi. Awareness and behavioural indicators derived from the market research must be tracked to assess how the research or its interpretation has resulted in developing successful sanitation marketing programmes and hence progressing the objectives of Malawi’s Open Defecation Free by 2015 Strategy.

References


CHAPTER 7  (PAPER FIVE)

EXPLORING THE METHODOLOGY OF PARTICIPATORY DESIGN TO CREATE APPROPRIATE SANITATION TECHNOLOGIES IN RURAL MALAWI

ABSTRACT

The methodologies of demand-led sanitation programmes (including community-led total sanitation [CLTS] and sanitation marketing) encourage participation of users in the design of appropriate sanitation facilities. There has been limited examination of the application of established methodologies in participatory design in the sanitation sector. This paper describes and reflects upon three case studies that applied established participatory design methodologies to create sanitation technologies in rural Malawi. Participants of the design sessions represented two groups: (i) researcher-designers (government staff); and (ii) users (local builders and householders). The methodology created a space to develop a common language between the two groups and allowed an exploration of tensions about the use of sanitation hardware subsidies. The design sessions created a number of innovations including corbelling structures, trapezium shaped bricks and reinforcement of wooden frame structures with sandbags. The paper critically reflects on the processes of participatory design in relation to power, ownership and continued participation.

Key words | design, participation, rural, sanitation
INTRODUCTION

Top-down sanitation programmes that promote a specific technology based on the presumptions of ‘outside experts’ have been criticised for endorsing unsustainable, expensive and inappropriate technologies (Cairncross 2004; Jenkins and Sugden 2006). In response to these failings, a new era of demand-led sanitation programmes encourage greater participation of users to create, identify and select appropriate sanitation technologies (Cairncross 2004; Kar & Chambers 2008). Although comprehensive compilations of sanitation systems and technologies exist (e.g. Tilley et al. 2008), few studies critically examine the methodologies used to engage local users and suppliers in the design of appropriate sanitation technologies. This paper engages with that space by presenting and reflecting upon a participatory design methodology applied in rural Malawi.

Two common demand-led sanitation programmes are sanitation marketing and community-led total sanitation (CLTS) (Mara et al. 2010). Sanitation marketing programmes in Lesotho, Cambodia and Kenya applied human-centred design approaches (Blackett 1994; Baker et al. 2011). Human-centred design attempts to create sanitation products and services that match the needs, practices and preferences of users and suppliers of sanitation technologies. In Vietnam, Cambodia and Kenya sanitation marketing programmes have engaged international researchers-designers to conduct qualitative market research with users and suppliers (Sijbesma et al. 2010; Baker et al. 2011). The market research informed the researchers-designers to create iterative prototypes that were subjected to extensive user testing.

The CLTS methodology does not recommend inputs from external researchers-designers but suggests that local facilitators should ‘help in establishing linkages with local markets’ (Kar & Chambers 2008). The role of local
facilitators also includes: encouraging local innovation and production; identifying locally available products and materials; and training locals to manufacture sanitation technologies (Kar & Chambers 2008). Recently, a founder of the CLTS approach emphasised that the selection of technology is crucial to overcome second and third generation problems such as groundwater contamination and environmental pollution (Kar 2012).

**Participatory design practices**

This research applied a participatory design methodology described in Spinuzzi (2005) and IDEO (2009) to engage users and researchers-designers in the creation of appropriate sanitation technologies. Participatory design evolved through the US labor movement and Scandinavian codetermination laws during the 1970s. The approach was used to democratically engage workers in the design and integration of new technologies within their work processes (Nieusma 2004; Spinuzzi 2005). Participatory design is now an established methodology used across a wide breadth of development programmes (Nieusma 2004; Winschiers-Theophilus et al. 2012). Steen (2011) argues that participatory design is a specific approach of human-centred design that ‘attempts to give future users of a system a role in its design, implementation and evaluation’. Participatory design provides a space for users to express traditional, tacit and often invisible knowledge and skills used in their daily lives (Spinuzzi 2005).

Participatory design's methodological and philosophical position aligns to participatory action research (PAR) (Winschiers-Theophilus et al. 2012). Both approaches attempt to create a democratic space between researchers-designers and users and link research objectives with actionable goals (David 2002; Bozalek 2011). Criticisms of PAR methodology include the application of Western-
democratic practices in non-Western cultures (Campbell 2002) and the failure to include participation from marginalised groups (Bozalek 2011; Winschiers-Theophilus et al. 2012). These criticisms have encouraged commentators of participatory design to advocate that researchers have a duty to critically reflect on their research processes and outcomes (Steen 2011).

Existing sanitation technologies in rural Malawi

Evaluations of CLTS programmes and formative market research identified an urgent need for design improvements in existing sanitation technologies in rural Malawi (Phiri 2010; Cole et al. 2012). Research conducted in three rural districts found more than half of all sanitation facilities collapsed within 12 months of construction, resulting in users returning to open defecation or sharing a facility (Cole et al. 2012). Cole et al. (2012) also reported that sanitation suppliers were unengaged in the sector because of low demand for existing sanitation technologies.

The overall objective of this paper is to record, examine and critically reflect on the use of Spinuzzi’s (2005) and IDEO’s (2009) participatory design methodology to identify appropriate sanitation technologies. To achieve this objective the following specific aims are addressed:

- To describe the methodology used during the participatory design sessions.
- To evaluate the outcomes of the participatory design methodology between the three case studies.
- To explore the challenges of power, ownership and ongoing engagement in the application of participatory design methodology.

METHODS
**Country context**

Up to 49% of households in rural Malawi have an inadequate or absent sanitation facility (WHO & UNICEF 2010). The Malawian government has identified CLTS and sanitation marketing as the two leading mechanisms to achieve its objective of total sanitation coverage by 2015 (MoAIWD 2011). Since 2009, CLTS programmes have been applied extensively across rural communities (Maulit and Kang 2011). In contrast, few rural sanitation marketing programmes have been implemented (DeGabriele 2009).

**Programme context**

In 2011, UNICEF Malawi initiated a rural sanitation marketing programme with three district government partners. In partnership with staff members of the District Environmental Health Office (DEHO), the first author conducted formative market research (Cole *et al.* 2012). The research informed the development of an integrated marketing strategy that addressed the four Ps of ‘Price’, ‘Product’, ‘Promotion’ and ‘Place’. In 2012, the participatory design sessions were applied to address the ‘Product’ and ‘Price’ components of the integrated marketing strategy.

The development of the ‘Product’ and ‘Price’ components was based on a ground-up philosophy such that the primary source of information was derived from the collective knowledge and skills of local builders and villagers. It was intended that in each district, the designs would be collated and provided to the DEHO. The DEHO would identify designs that would be provided to the National-level Open Defecation Free (ODF) Taskforce. The ODF Taskforce is a co-ordinating body for organisations operating in the sanitation sector and includes representatives from the Ministry of Health, Ministry of Irrigation and Water Development, UNICEF and leading non-government organisations.
Participatory design approach

The participatory design sessions were derived from the methodologies presented in Spinuzzi (2005) and IDEO (2009).

The three-day design sessions consisted of four stages:

Stage 1: Initial exploration of work

Photo 1 | User describes the components of existing brick-lined pit latrines

Teams of five builders/masons, two village health workers/householders and one staff member of the DEHO were formed. Each team was asked to draw and label the existing sanitation technologies in their villages. The teams were then instructed to identify the advantages and disadvantages of each technology. Each team then presented their findings to the group (Photo 1).

Stage 2: Discovery processes
The discovery process asked each team to identify numerous potential design options. The design options were framed by a design challenge. A design challenge presents a challenge in human terms, in a broad manner that offers opportunities for discovery in areas of unexpected value but is ‘narrow enough to make the topic manageable’ (IDEO 2009). The design challenge used during the sessions was:

*Can we create a toilet that matches what the majority of villagers want, need and can afford using local materials?*

Teams visualised their designs through drawing and text (Photo 2). After two hours of brainstorming, each team was asked to identify three designs that they would like to prototype. The teams identified the materials required to create the prototypes and these were submitted to the DEHO staff for collection from local suppliers.

*Stage 3: Prototyping*
Day 2 was dedicated to the process of creating small and medium-sized prototypes. Local building materials were provided to allow each team to explore and create their design directions (Photo 3). Users were encouraged to share and discuss their ideas with people from outside their nominated team.

*Stage 4: Feedback*

The first half of day 3 allowed the design teams to estimate the material and labour costs of their prototypes.

During the final afternoon on day 3, teams presented their designs to 12–15 local villagers including both men and women. The villagers were invited to review the prototypes and provide feedback (Photo 4). The feedback sessions were intended to allow the design teams to hear critiques from potential users.
Study sites

Three study sites were chosen to represent areas located along the lakeshore of Malawi with both clay and sandy soil profiles. The sites were located in Salima, Mangochi and Nkhata Bay districts. The design sessions were conducted at the group village level. In Malawi, a group village commonly consists of three to four villages.

Group villages were purposefully selected using the following criteria: i) consisting of more than three villages or greater than 300 households; ii) not more than 90 minutes drive from a central market; iii) representative of a typical soil type within the district; iv) a suitable location to conduct building and construction of prototypes; and v) a group village leader or senior health worker with a proven record in supporting innovative social programmes.

Participant selection

The participatory design engaged with two groups, ‘researcher-designers’ and ‘users’. Researcher-designers included environmental health officers (EHO) and their support staff. The EHO and their support staff were engaged in formative market research prior to the design sessions (Cole et al. 2012). Users included builders, masons and householders. Users were purposefully selected from the group villages. Five builders/masons were invited to attend from each village (total of 20 representatives). The selection criteria were: i) proven reputation as a builder, carpenter or mason; ii) constructed a latrine in the last 12 months; and iii) a permanent resident of their village. Two representatives of households were invited from each village (up to eight representatives). Householder
representatives were individuals that had acted as natural leaders during previous CLTS events, village health workers or people with a proven interest in sanitation.

Data collection and analysis

The study applied a qualitative multiple-case study methodology (Baxter & Jack 2008). The first author conducted overt participant-observation at one design session held in each of the three study sites. Qualitative data was collected using triangulated sources that included the first author’s descriptive and reflective field notes, participants’ drawings and text, and recorded interviews with participants. The interviews were conducted during the design sessions with builders/masons, householders and government staff. The unstructured interviews were conducted through an interpreter speaking in Chichewa. The interpreter had five years experience and a university diploma in teaching. The local interpreter was trained for two days prior to conducting the design sessions. The training developed a rapport between the first author and interpreter and was used to clarify the methodology, interview process and terminology (Pitchforth & Teijlingen 2005; Squires 2009). The lead author and interpreter identified potential biases and addressed these through the process of ‘bracketing’ described by Ahern (1999). The interviews were recorded and replayed to inform the first author’s descriptive field notes. Key statements from the transcripts were transcribed.

Additional data was collated through photographs of prototypes and a report prepared by a structural engineer. The field notes, transcripts, photographs and reports were analysed using qualitative content analysis to identify and prioritise key themes and outcomes across the three case studies (Sandelowski 2010). The themes reported in this paper were selected for inclusion based on the interpretation of the first author.
Limitations

The design sessions were conducted in 3 of the 28 districts of Malawi. In each district, three traditional authorities were identified of which three group villages participated in the design sessions. Up to 35 participants attended each workshop, with a total of 104 participants attending the three sessions. The findings from the three case studies must be interpreted in the context of their geographical scope. The designs identified are specific to their place of origin. It is likely that design sessions held in different geographical locations and with different participants would result in design ideas reflecting the different needs, resources and challenges of different locations and social contexts.

Participant observation brings both advantages and challenges to the rigour of a study. Advantages include the ability of the researcher ‘to be open, discovery oriented and inductive and less reliant on preconceptions’ (Boyd 2009). Criticisms of participant-observation include the risk of selective memory, encoding and attention, which bias the focus and recording of information by the participant observer. These criticisms were addressed in this study by recording notes during and immediately after each design session, through reflective bracketing (Ahern 1999) and through re-listening to interviews to elaborate the first author’s field notes.

The selection of participants is a central determinant of the outcomes of participatory action research (David 2002). This study identified participants through identifying selection criteria with district-level government staff. Local health workers and village leaders applied the criteria to select the participants. It is possible that participants were selected based on their position within the community or through personal connections with village health workers or village...
leaders. This may have biased the selection against the inclusion of users from marginalised and lower income groups.

RESULTS AND DISCUSSION

Confirming language and knowledge between users and researcher-designers

An important goal of participatory design is the creation of a common language between users and researcher-designers (Spinuzzi 2005; Steen 2011). The initial exploration of work (Stage 1) provided a strong platform for users and researcher-designers to develop a common vocabulary for sanitation-related terminology: ‘We can learn from the language of the builders. It helps us to speak with their words’ (researcher-designer, Nkhata Bay).

The three main types of sanitation technology identified during the design sessions were categorised as unlined, nkhokwe (woven wooden-, reed- or bamboo-frame that is cylindrical in shape) and brick-lined with cement mortar pit latrines. The advantages and disadvantages of existing sanitation technologies aligned with the findings of market research previously conducted by the researcher-designers (described in Cole et al. 2012). The Stage 1 process offered a significant benefit of allowing the two parties to speak confidently and openly about the challenges presented by existing sanitation technologies.

Divergence of attitudes towards hardware subsidy programmes

A significant challenge arose during the discovery process where some users (builders and householders) insisted on the inclusion of cement as a building material for latrine construction. Researcher-designers (government staff) argued that including cement in the latrine design would make it unaffordable for the
majority of households. The users argued that government should provide the cement through a subsidy programme. This created debate amongst the group on the role of government in the provision of hardware subsidies in sanitation programmes. Two main themes emerged from the users’ perception of cement. The first was that cement is an essential component of a strong and modern latrine, and the second was that subsidy programmes for cement can be successful if managed appropriately.

*Cement is progress, why would we want to use wood? Wood is a primitive way for latrines. Cement is a part of progress* (user, Nkhata Bay).

*The other (cement) subsidy programmes were not well managed, we can manage them better. The fertiliser subsidy is working, why can’t we do the same for cement?* (user, Nkhata Bay)

Malawi has a long history in the provision of subsidised cement through government and non-government sanitation programmes (DeGabriele 2009). It is therefore unsurprising that users assumed a hardware subsidy would be provided in future sanitation programmes. To counter this assumption, the researcher-designers stated that subsidies were no longer promoted by national government policy (as described in the Open Defecation Free by 2015 Strategy [MoAIWD 2011]). Researcher-designers also presented their personal experiences of subsidised programmes that had failed under various forms of management.

*You build 10 toilets with a subsidy then go away. You come back in five years and still only 10 toilets have been built in that village. People are waiting for the subsidy to come back. I’ve seen this too many times* (researcher-designer, Mangochi).
The dichotomy of views toward the inclusion of cement as a building material created a tension between users and researcher-designers. Participatory design scholars recognise that overcoming disagreement in design objectives is an important process that must be mediated (Nieusma 2004). To overcome this tension, the first author recommended that the group recognise the important characteristics of cement while creating designs that reduce or eliminate its use.

*I have heard that you like the cement slab because it is strong and durable, they like it because the children can use it and are not scared and because termites cannot eat it and it is easy to clean...but now I want to ask you, can we keep these five things, these five characteristics, but push the price down to allow households the capacity to buy a latrine on their own?* (first author, Nkhata Bay)

The instruction not to include cement in the building materials encouraged the design teams to explore latrine designs that did not rely on a cement slab. The instruction resulted in design teams exploring numerous design options that replicated the attributes of a cement slab (that is, strength, water- and termite-resistance) while keeping material costs affordable. The resulting design options included metal frames, wrapping of logs with plastic, widening of the roof structure accompanied with surface water diversion channels and self-supporting brick domes. Users and researcher-designers identified the self-supporting brick dome as a potentially viable design that offered the same attributes of a cement slab at a significantly reduced cost (as discussed further below).

**Consistent design themes identified for clay soils**
The design sessions in Mangochi and Nkhata Bay identified a consistent design direction for environments with clay soils. The design overlaid burnt bricks to form a self-supporting brick dome to create the floor and slab of the pit latrine (Figure 1). Corbelling is an established building practice for pit latrines. It overlaps one brick over another to reduce the diameter of the pit (Government of Zimbabwe n.d.). Existing designs (such as the Blair VIP latrine) apply corbelling to reduce the size of the cement slab. In contrast, the design that emanated from the design sessions in both Mangochi and Nkhata Bay used corbelled bricks to form the slab (Photo 5). Users stated that the benefits of brick corbelling were that it eliminated the need for: a) wood which is commonly attacked by termites resulting in an unstable floor; and b) cement which is unavailable in local markets and is prohibitively expensive for the majority of households. All participants identified burnt bricks as widely available in clay soil environments. The construction of burnt bricks requires the collection of local clay, a wooden frame to shape the brick and wood and other plant-based fuels to fire the bricks.
The identification of the corbelled design provided evidence of the participatory methodology drawing out the tacit knowledge of users. Users reported the corbelled design was inspired from building technologies observed both within and beyond their local villages:

*I saw this approach in Nhkota Kota. It is used there but I hadn’t used it before to build a latrine. I just thought we could try it and then other people in my group said ‘yes, that is a good idea’ (user, Nkhata Bay).*

*This approach is very common in the areas around the lakeshore in Mangochi. We have been using this approach for many years* (user, Mangochi).
Lead users created innovative designs

The Mangochi and Salima design sessions were conducted in areas that had previously been exposed to sanitation programmes. In Mangochi, sanitation suppliers from one group village had been exposed to innovative sanitation technologies through a Swiss-funded subsidy-based programme (Photo 6).

In Salima, a CLTS programme had been conducted two years prior to the design session. The CLTS programme had encouraged sanitation suppliers to develop innovative sanitation designs. Using the terminology of human-centred design, these suppliers were recognised as lead-users. The lead-users identified the challenges of existing sanitation designs and offered immediate solutions. One solution combined the widely used nkhokwe but wrapped the frame in plastic and then reinforced it with sandbags (Photo 7). The sandbags were constructed by cutting and re-sewing locally available maize bags. This innovative design shows how engaging villagers who have been exposed to CLTS triggering events brings lead-users to the design team who are able to use their previous experiences to enhance the participatory design outcomes.
Responding to criticism

The feedback sessions were intended to allow design teams to ‘present solutions with a neutral tone, highlighting both pros and cons of a solution’ (IDEO 2009: 80). During the feedback sessions users found it difficult to engage in an open and honest exchange of ideas, criticisms and feedback. The ability to ‘design on the fly’ is a challenging task and the majority of users found the feedback process both challenging and confronting. The researcher-designers recorded the villagers’ feedback so that it could be fed into future iterations of the prototypes. The feedback sessions did create tension between the users and researcher-designers. Users were reluctant to respond to criticisms while researcher-designers embraced the feedback. Future design sessions could overcome this tension by providing additional time (up to one week) for villagers to provide feedback to the design team. This would allow the design team to hear the feedback in an informal setting without being pressured by time.

Reflections on power, ownership and participation

Recognising the inherent power of the researcher-designer and the ability to exert that power is an important reflective element of participatory design (Steen 2011).
During the design sessions, the first author instructed the design teams to minimise the amount of cement used in the designs. This decision was taken to increase the affordability and accessibility of the designs. This decision challenged a number of users who were unwilling to move away from the concept of the government providing a hardware subsidy for cement. It is clear that the inherent power of the first author (as a foreign researcher) played a part in directing the boundaries of the participatory design process. While it could be argued the use of this inherent power may contradict the principles of a genuine participatory process, it is important to recognise the necessity for establishing specific design criteria and boundaries when applying participatory approaches.

The question of ownership of the designs is a vexed question that was not discussed during the design sessions. It could be argued the intellectual property of the designs should retain with the original designer or design team. Indeed, in Western cultures new ideas are regarded as the property of individuals or corporations. However this sits in contrast to numerous African cultures where ideas and knowledge ‘are “owned” by ancestors or the land’ (Winschiers-Theophilus et al. 2012). The issue of ownership is further complicated as some designs, including the brick corbelled design, were created at multiple design sessions. It could also be argued that the potential value of a new design to improve public health outweighed the rights of the individual’s intellectual property. The issue of ownership deserves further attention in follow-up sessions with the users.

Participatory design is an iterative process that requires continual participation, actual use of prototypes and sustained reflection (Spinuzzi 2005; Brereton and Burr 2008). The methodology described in this paper offers only a preliminary glimpse into the potential tacit knowledge of villagers and builders to
design appropriate sanitation technologies. The programme has been designed to continue engagement with the users through returning to discuss, redesign and test the revisions and iterations suggested by the National ODF Taskforce and the structural engineer’s report. It is hoped that continuing the prototyping process will allow users to ‘critically reflect on the implication of the research results for their own work’ (Spinuzzi 2005).

CONCLUSIONS

Be prepared to discuss and debate the issue of hardware subsidies with users

The research found that encouraging an open discussion on the role of hardware subsidies provided a forum for dialogue between the users and researcher-designers. Although not all members of the two groups reached consensus, the process created a space for dialogue. The dialogue should aim ‘not to convince each other of the rightness of one’s opinion or to merge individual pre-factored ideas, but rather aims to jointly create something new by talking’ (Winschiers-Theophilus et al. 2012: 168).

Develop specific design criteria in a small team that are familiar with the findings of the formative market research

Clear and specific design criteria, framed in human terms, are an essential ingredient of successful and productive design processes (IDEO 2009). This research developed the design criteria in a small team that was engaged in the collation and analysis of the formative market research. Developing the criteria in small, well-informed teams ensured the design sessions were suited to the specific environmental, socio-economic and market conditions of the three study sites.
Identify and engage with lead users and innovators in the local sanitation sector

Engagement with leading thinkers and innovators is an established approach in the field of human-centred design (Steen 2011). Members of the design team that had been previously exposed to CLTS programmes were found to drive the innovation process within their team and the wider group.

Participatory design methodology can be integrated into CLTS and sanitation marketing programmes

The participatory design methodology aligns with the philosophical and methodological approach applied in both CLTS and sanitation marketing programmes. At the philosophical level, the use of participatory approaches in designing sanitation technologies naturally aligns to the historical development of CLTS from participatory rural appraisal and participatory action research. At the methodological level, participatory design sessions allow the community to innovate and produce local sanitation products and services (Kar & Chambers 2008).

The sessions also align with the development of an integrated sanitation marketing programme. Sanitation marketing programmes have evolved from the discipline of social marketing. Key characteristics of social marketing are its consumer orientation and the exchange process (Donovan 2011). By engaging users in the design process, the participatory sessions increase the likelihood the final product will align with both the needs and preferences of the end-user/consumer. The participatory sessions also establish relationships with
existing sanitation suppliers and may encourage them to exchange a broader range of sanitation products and services.

The case studies do not suggest that participatory design is a ‘silver bullet’ in identifying sanitation products and services for sanitation marketing programmes. Indeed sanitation products and services designed without participatory methodologies have demonstrated rapid uptake in Vietnam (Sijbesma et al. 2010). For these case studies, the use of participatory design was chosen after extensive market research and supply chain analysis (described in Cole et al. 2012). The formative research identified the majority of rural consumers had limited access to cash and water, combined with poor transport infrastructure and limited distribution channels for pre-fabricated sanitation products (such as plastic- and cement-slabs and ceramic pans). In the future, however, market conditions may change and the introduction of a range of pre-fabricated sanitation products may become favourable. This may require engaging local shop owners to provide distribution and sales points for the pre-fabricated products. Widening the availability, price-range and attributes of sanitation products may increase the size of the target audience and hence the coverage of improved sanitation across rural Malawi.

Technical review is vital prior to the commercial release of new sanitation technology

The structural engineer report provided vital input into the iterative development of the original prototypes. The report provided recommendations on the safety and durability of the designs and offered suggestions for locally managed trials to test improvements and certain aspects of the designs. Failure to include this stage could result in unsafe designs being released into the market.
The engineer’s report will be used to test and refine the designs at Mzuzu University’s SMART Centre. Testing will include mortar strength rating, load testing and standardisation of designs. Throughout the second half of 2013 the new round of designs will be presented to the design teams in two group villages in each district. The new designs will be presented with drawings and images that identify any changes or additions to the original design. This will allow users and researcher-designers to understand the strengths and limitations of their original designs and offer an opportunity for them to provide ongoing feedback and input into the design process.

**Need to provide focus on hand washing facilities**

The design sessions missed the opportunity to engage participants on the design of hand washing facilities. Future sessions should include hand washing facilities as an essential component of the latrine design.

Overall, the participatory design methodology was engaging and highly productive. Users and researcher-designers displayed high levels of engagement throughout the three-day design sessions. The participatory design methodology, supported with ongoing technical feedback, offers a potential mechanism to create safe, affordable and desirable sanitation technologies that match a range of local conditions.

**REFERENCES**


Phiri, S. 2010 *TA Mkanda CLTS Research Summary*. Engineers without Borders Canada.

Sandelowski, M. 2010 What’s in a Name? Qualitative Description Revisited.  
*Research in Nursing & Health* 33, 77–84.


WHO & UNICEF 2010 *Progress on sanitation and drinking-water 2010 update* (online), Joint Monitoring Programme for Water Supply and Sanitation. Available from  
CHAPTER 8  
(PAPER SIX)

MODELLING POTENTIAL BUSINESS MODELS IN A RURAL SANITATION MARKET, MALAWI

ABSTRACT

Sanitation marketing programs face challenging market conditions in Malawi and other east African countries. The aim of the study was to ascertain whether the delivery of suitable sanitation products could be the basis of a profitable business for local village entrepreneurs. This study utilises formative market research, satellite imagery, business model development and cash-flow analysis to model the potential business case for rural sanitation in one district in Malawi. Two business models are modelled; (i) 'the builder': a business operated by one person that only provides construction services and (ii) 'the retailer': a business that provides a complete package of building materials and sub-contracted labour that is operated by a person with an existing retail business. The modelled results show that potentially either model could be a profitable venture, within the assumptions employed, for enterprising residents with the required skills to market and deliver the product. Financial assistance may be required to fund initial equipment, training and marketing costs. A range of regulatory approaches (including supplier accreditation, market protection and subsidies) may also be required to expand the market and revenue potential of the business. The choice of model may vary from village to village due to differential skill bases, existing businesses and market reach.

INTRODUCTION

Rural sanitation programmes across the globe have recognised the potential of applying market-based approaches to improve sanitation coverage. Sanitation marketing programs attempt to generate demand, encourage supply and create an enabling regulatory environment for sanitation products and services (Cairncross
Kotler & Armstrong (2011) argue that creating a vibrant market for a product must create value for customers and capture value from customers in return. This study examines these criteria by investigating the profit generation of two potential business models in a rural sanitation market in Malawi.

Rural sanitation marketing programs in south-east Asia, particularly Cambodia (Baker et al. 2011) and Vietnam (McGrath 2009; Sijbesma et al. 2010), have demonstrated the capacity for rural sanitation markets to support profitable business models. Baker et al. (2011) propose that innovative latrine products and services can generate profitable business models that attract and retain entrepreneurs. Alternatively, there is limited evidence that demonstrates a profitable or scalable business model for rural sanitation in eastern Africa (Robinson 2011).

An important commonality between sanitation markets in south-east Asia and east Africa is the historic use of government and non-government organisation-led subsidy programs that offer subsidised sanitation products and/or services. Poorly targeted and widespread subsidy programs are proposed to negatively impact upon demand as households prefer to wait for the return of a subsidy rather than spend their own income on the purchase of a new latrine (Baker et al. 2011; Cole et al. 2012). Eastern African rural sanitation markets in Malawi, Kenya and Tanzania also display important distinctions to markets in south-east Asia (IFC & WSP 2013; Cole et al. 2012; PriceWaterhouseCoopers 2012). The first distinction is the high relative cost of cement compared to household incomes in east Africa (Cole et al. 2012; IFC & WSP 2013). Rural eastern Africa has poor road infrastructure, which makes moving fragile and heavy products difficult and expensive. In response to these challenges, sanitation programs in east Africa have designed and marketed latrine options that are durable, affordable and desirable, but eliminate or significantly reduce the use of cement. Examples of these innovations include; plastic slabs in Kenya (IFC & WSP 2013), brick-dome, corbelled flooring in Malawi (Cole et al. 2014) and the combination of corbelling with small-sized cement slabs in Zimbabwe (Government of Zimbabwe, 2008). This study applies the product
design guidelines for the brick-dome corbelling with reduced cement slabs in one district in Malawi.

The objective of the study is to examine the viability of two business models to provide an innovative latrine product in one district in rural Malawi. This required the following analyses to be conducted:

- Calculate the potential market size of a rural sanitation market
- Identify suitable business models that align to existing business practices in Malawi’s rural market
- Model the cash-flow of suitable business models in a rural sanitation market

SITE SELECTION

This study is based on the market conditions representative of the central region of Malawi in areas with clay soils (Figure 1). The district chosen was Dowa, Traditional Authority Chiwere and Group Village Bimphi.

Figure 1: Dowa district indicated by arrow (top left map displays map of Malawi with neighbouring countries

METHODS
Sanitation products

The products used in this model are suitable only for clay soils. In clay soils, the promotion of pit linings has not been recommended as the inherent stability of the clay soils renders them redundant (Cole et al. 2012). In-depth interviews with households reported that existing flooring options were either prohibitively expensive (cement slab) or regularly collapsed (wood and mud flooring). The wooden flooring was prone to collapse due to termite damage or rotting due to water absorption (Cole et al. 2012). Formative market research found that 54% of households with latrines had a wooden slab.

To overcome the challenges associated with high costs of imported materials (including cement) whilst offering a durable flooring solution participatory design sessions were conducted in three districts in Malawi (as reported in Cole et al. 2014b). A consistent design theme that emanated during the participatory design sessions was to overlay bricks to form a self-supporting dome (corbelling). The brick corbelling creates the floor and slab of the pit latrine (Cole et al. 2014b). Corbelling is an established building practice for pit latrines to reduce the diameter of the pit and therefore the amount of cement required to create a cement floor (such as the Blair Toilet) (Government of Zimbabwe 2008).

The product used in this study is a combination of corbelled flooring and a reduced-size cement slab. The designs was derived from the participatory design sessions described in Cole et al. (2014b) and from reviewing the methodology and building materials described in the construction manuals of the Blair Latrine (Government of Zimbabwe 2008) and Easy Latrine (GRET & IDE Cambodia 2010).

The flooring and slab structure used in this study is constructed using the following key steps: (i) dig a 1m diameter circular pit to a depth of 2.5m, (ii) Increase the size of the diameter to 1.5m to form a step in the pit at 1.5m in depth, (iii) place a layer of fired-bricks on the step and place next layer of bricks on top of layer with 1.5 cm overlay, (iv) continue overlaying each additional layer of brick to form a self-supporting dome, (v) cast a 70cm x 70cm cement slab (GRET & IDE
Cambodia 2010) (vi) place the cement slab on top of the corbelled flooring. The final product is a 2.5m unlined pit with brick-dome flooring and cement slab.

*Estimating the potential market size and distribution*

An overview of the market was compiled from the national census, health and demographic surveys and formative market research (Cole et al. 2012; National Statistical Office & ICF Macro 2011). The formative market research applied mixed methods to investigate the dynamic relationship between demand and supply for sanitation in three rural districts including Dowa. In Dowa, the market research was conducted by surveying 60 households, accompanied with 10 in-depth interviews with households and 4 with existing sanitation suppliers in group village Bimphi (as reported in Cole et al. (2012).

Household demand for the brick-dome flooring and cement slab latrine was estimated from data collated during the formative market research (Cole et al. 2012). The analysis identified the average willingness-to-pay for an improved floor and slab was USD 34 (range USD 2 – 200). Fifteen of the 60 households (25% of sample) reported a willingness-to-pay for an improved floor and slab to be equal or greater than USD 29 (MWK 11,500).

The level of existing competition in the sanitation market was predicted from the market research presented in Cole et al. (2012). The market research found existing suppliers of latrines offered a limited and expensive range of products that failed to meet their customers’ preferences, needs and expectations of costs. Existing sanitation suppliers did not conduct any marketing activities for latrine construction services. Cole et al. (2012) also found that sanitation suppliers did not regard the supply of existing latrine technologies as an area of growth for their business.

The distribution of the potential market was analysed using satellite imagery. The central point of the market was chosen to be Group Village Bimphi. This is the same site used to collect formative market research as reported in Cole et al. (2012) and Cole et al. (2014a). Detailed satellite images were used to identify five
zones from a central point every one kilometre. The criteria for identifying a house were iron or thatch roofing greater than four metres in length. Households were counted by placing a location point on each roof identified on the satellite image. The co-ordinates for each household were recorded in a summary table and total number of households was calculated in each zone.

*Business model generation*

The business models modelled in this study were designed during a workshop conducted at Mzuzu University, Malawi on 7-9 November 2012. Workshop participants included representatives from Malawi’s water and health ministries (13 participants), non-government organisations (13 participants), private sector representatives (7 participants) and academia (4 participants). The business models were generated by multi-stakeholder teams using the Business Model Canvas (www.businessmodelgeneration.com/canvas 2014). The workshop participants identified two business models;

- **Business Model A - ‘the builder’**

Business Model A would be managed and operated by an existing builder or mason. The mason or builder would be responsible for marketing, sales, construction and customer relations. Business Model A exclusively provides installation services and has no involvement in the purchase or delivery of building materials. The purchase and delivery of materials is the responsibility of the household.

- **Business Model B - ‘the retailer’**

Business Model B would be managed and operated by an existing retailer. The business model is a vertical networked business model and requires a minimum of two parties: (i) a retailer and (ii) mason or builder (Lappauf 2011). The retailer is responsible for marketing, sales and visiting new customers. The retailer organizes all building materials and delivery to the household. The retailer sub-contracts the
construction to a mason or builder. After construction, the retailer is responsible for quality assurance and customer relations (Table 1).

Table 1: Roles of operation under Business Model A 'the builder' and B 'the retailer'

<table>
<thead>
<tr>
<th>Role</th>
<th>Business Model A 'the builder'</th>
<th>Business Model B 'the retailer'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marketing of product and services</td>
<td>Builder</td>
<td>Retailer</td>
</tr>
<tr>
<td>Meeting new customers</td>
<td>Builder</td>
<td>Retailer</td>
</tr>
<tr>
<td>Digging pit</td>
<td>Household</td>
<td>Household</td>
</tr>
<tr>
<td>Purchase and delivery of building materials to household</td>
<td>Household</td>
<td>Retailer</td>
</tr>
<tr>
<td>Construction of flooring and slab</td>
<td>Builder</td>
<td>Sub-contracted mason or builder</td>
</tr>
<tr>
<td>Quality assurance</td>
<td>Builder</td>
<td>Retailer</td>
</tr>
</tbody>
</table>

Cash-flow analysis and assumptions

The financial inputs for the cash-flow analysis included a marketing plan, sales, operations, capital costs, and operating costs. The model identified monthly costs and revenue for Year 1. Costs and revenue were summarized for Years 2 and 3. Table 2 presents the assumptions and known variables of each financial input. Known variables were confirmed through interviews with local builders and retailers operating in Dowa.

Table 2: Known variables and assumptions of financial inputs

<table>
<thead>
<tr>
<th>Role</th>
<th>Business Model A 'the builder'</th>
<th>Business Model B 'the retailer'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marketing plan</td>
<td>Builders have existing reputation in the community to provide construction services (as described in Cole et al. 2012). Marketing would include posters in suitable locations and word-of-mouth to existing clients. The model also</td>
<td>Retailers do not currently offer sanitation related products and would require a promotional launch and product demonstration would be required to raise awareness to potential customers.</td>
</tr>
</tbody>
</table>
allows for a demonstration product to be constructed in a location that provides high exposure to the market (e.g. within a market-place, church or health centre).

Assumption – it is assumed the builder would pay for the demonstration latrine.

| Sales | More than 25% of the market within a 5km zone are willing to pay MWK 5,500 (USD 14) for the construction services (as collated during market research presented in Cole et al. 2012). | Up to 25% of the market that currently own a mud-wood floored latrine, within a 5km zone of GVG Bimphi, are willing to pay MWK 11,500 (USD 29) for materials and the construction services (as collated during market research presented in Cole et al. 2012).

Assumption - Builder follows up on sales inquiries by travelling to each household. The distance travelled would not exceed 5km from their home. The retailer converts 2 in every 3 potential customers into a sale.

Assumption - Retailer follows up on sales inquiries by travelling to each household. The distance travelled would not exceed 5km from their retail outlet. The retailer converts 2 in every 3 potential customers into a sale.

| Operations | Builder utilize their home to store their building tools (trowel, measuring tape and spirit level). They would employ a junior (apprentice) builder to assist them with construction. | Retailer has an existing shop in a local trading centre. The shop has sufficient space to store building materials.

Sub-contracting builders provide their own building tools (trowel, measuring tape and spirit levels).

In Year 1, the retailer has two teams of sub-contractors (consisting of one senior and one junior builder each). In Year 2, they are four teams and Year 3 six teams.

<p>| Capital costs | Bicycle is required to travel to customer’s home. Mobile phone is used to reach customers. Both | Bicycle is required to travel to customer’s home. Mobile phone is used to reach customers. Office equipment |</p>
<table>
<thead>
<tr>
<th>Training costs</th>
<th>Mzuzu University provide 5-day training programs on low-cost latrine construction. Estimated cost for travel, accommodation and course fees is MWK 25,000.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assumption</strong></td>
<td>The builder would pay to attend the training course provided by Mzuzu University.</td>
</tr>
<tr>
<td></td>
<td><strong>Assumption</strong> – In year 1 the retailer would pay for two sub-contracting senior builders to attend the training course. In year 2 &amp; 3 the trained builders would be paid by the retailer to train the two additional head builders. The cost of training would be half the price of the Mzuzu University training package due to reduce overheads, travel time and no accommodation.</td>
</tr>
</tbody>
</table>
RESULTS AND DISCUSSION

This section presents the key findings of the market and business model assessment. The discussion includes the viability of attracting business people to engage in the sanitation market, and hence, the design of rural sanitation marketing programs.

*Market size is adequate*

Analysis of the satellite imagery identified 7,468 households within a five kilometre zone of the central point, Group Village Bimphi (Figure 2). Table 3 shows more than 1,000 households are potential customers based on existing sanitation coverage (Cole et al. 2012) and assuming one-quarter of the market has sufficient disposable income to purchase the sanitation product as calculated in Table 3.

*Figure 2: Household identified in 5 km zone of T.A. Chiwere, Dowa district*

<table>
<thead>
<tr>
<th>Table 3: Potential market size in 5 kilometre zone of T.A. Chiwere, Dowa district</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of households in 5km zone (estimated from satellite imagery)</td>
</tr>
<tr>
<td>Proportion of population with unlined latrines (Cole et al. 2012)</td>
</tr>
<tr>
<td>Market size based on latrine ownership</td>
</tr>
<tr>
<td>Households with willingness-to-pay of ($ value)(sourced from data collated during market research reported in Cole et al. 2012)</td>
</tr>
</tbody>
</table>
Production is a limiting factor for market growth

Table 4 shows that seven sanitation teams are required to cover a potential market of 1,010 households in a five kilometer zone from Group Village Bimphi within a three-year timeframe. This assumes that 25% of households decide to purchase the new latrine. Identifying, recruiting and training building teams would require investment by an external funding source (for example, a non-government organisation or government program).

Table 4: Estimate number of building teams required to satisfy potential market demand in a three-year timeframe

<table>
<thead>
<tr>
<th>Year</th>
<th>Latrines per week per team</th>
<th>Number of dry months suitable for latrine construction</th>
<th>Total latrines constructed per year per team</th>
<th>Number of teams required to reach potential market</th>
<th>Annual target to satisfy potential market</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>6</td>
<td>48</td>
<td>7</td>
<td>337</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>6</td>
<td>48</td>
<td>7</td>
<td>337</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>6</td>
<td>48</td>
<td>7</td>
<td>337</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1010</td>
</tr>
</tbody>
</table>

Both business models are profitable within two-years but offer differences in start-up capital requirements and cash-flow

The financial result summary (presented in Table 5) demonstrates important differences between the two business models including; (i) The ‘builder’ business model requires lower sales to break-even and requires less cash outlay to remain cash positive over ‘the retailer’ business model, (ii) Over the three year projection, ‘the retailer’ business model offers significantly higher cash returns (more than ten times) than offered by ‘the builder’ business model. In summary, ‘the retailer’ presents a higher risk business proposition than ‘the builder’ as it requires greater
capital outlay and higher break-even point but this is matched with greater profitability over the three-year projection.

Table 5: Financial summary table for Business Model A and B*  

<table>
<thead>
<tr>
<th></th>
<th>Business Model A ‘the builder’</th>
<th>Business Model B ‘the retailer’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash surplus at end of Year 1</td>
<td>MWK 32,950 (USD 82)</td>
<td>MWK 9,898 (USD 25)</td>
</tr>
<tr>
<td>Cash surplus at end of Year 2</td>
<td>MWK 20,100 (USD 50)</td>
<td>MWK 294,844 (USD 737)</td>
</tr>
<tr>
<td>Cash surplus at end of Year 3</td>
<td>MWK 73,150 (USD 183)</td>
<td>MWK 753,838 (USD 1885)</td>
</tr>
<tr>
<td>Time to attain positive cash flow</td>
<td>24 months</td>
<td>10 months</td>
</tr>
<tr>
<td>Break even point (number of latrine sales to cover fixed costs)</td>
<td>44 latrines</td>
<td>68 latrines</td>
</tr>
<tr>
<td>Cash outlay to maintain positive cash flow</td>
<td>MWK 108,850 (USD 272)</td>
<td>MWK 147,550 (USD 369)</td>
</tr>
</tbody>
</table>

*1 USD was equivalent to 400 Malawian Kwacha (MWK)

An important limiting factor to establish any small business is access to capital. In Malawi, access to finance in rural areas is particularly challenging and is predominantly provided by informal networks or micro-finance institutions (Cole et al. 2012). The financial model found that ‘the builder’ requires lower start-up capital (USD 272) than ‘the retailer’ (USD 369). The lower cash barrier to entry may increase the likelihood of ‘the builder’ business model attracting existing builders to the sanitation market. ‘The builder’ business model also provides an income to the owner through direct payment of their services from the households. In contrast, the higher cash barrier may limit the number of existing retailers that would engage in ‘the retailer’ business model. Overcoming the challenge of start-up capital for both business models may require the introduction of financial products that offer attract rates to potential business owners.

The financial model is based on a market size for 25% of households that currently own a mud and wood floored latrine. This market represents a very small proportion of the total market for sanitation. An inclusion of a targeted subsidy could potentially increase the market size for the new latrine. Although previous hardware subsidy programs have been criticized, these programs commonly
offered expensive and over-engineered sanitation products (Cairncross 2004; Jenkins & Sugden 2006). The use of low-cost, locally available designs matched with targeted subsidy programs may present a new line of investigation to create cost-effective sanitation programs that offer access to all households.

Sanitation marketing programs produce stronger outcomes when local government agencies are engaged, aware and supportive of their crucial regulatory and enforcement role in the provision of safe and hygienic sanitation products and services (Cairncross 2004). These financial models assume a steady demand and that market share is not diluted by the entry of new competitors into the sanitation market over a three-year period. In reality, this assumption could only be achieved through a government regulator controlling the number of sanitation suppliers that enter the market. The regulatory agency could also accredit new suppliers through validating their training and competencies. The accreditation of suppliers would offer customers with greater confidence in the quality of their new latrine. Sanitation marketing programs must remain aware to the crucial role the regulatory environment can offer to nurture and grow sanitation markets.

A key consideration is also the relative cost-benefit of assisting suppliers to meet demand in relation to the cost of treating diseases associated with unhygienic or absent sanitation facilities. While regulatory agencies would want to ensure accreditation of suppliers, the supply level should be sufficient to satisfy consumer demand for safe and effective sanitation when it arises. Therefore the demand and supply levels should be monitored to ensure that householders are able to access sanitation products when they demand them. While this may impact on the longevity of this particular business model, the resulting health benefits are likely to instigate further business opportunities for builders and retailers. Further research including cost-benefit analysis of funding assistance for effective sanitation products and business models as a form of disease prevention compared to curative medical treatment would be an appropriate extension of this study.
CONCLUSION

All market interventions require careful planning that includes risk assessment and mitigation strategies. However, often planning fails to capture the unpredictable nature of market growth and development. This study demonstrates how financial modelling can test assumptions and provide a foundation of evidence to design, trial and iterate business models that attempt to grow the rural sanitation market. As with all modelling the results are based on numerous assumptions that require field validation, testing and iteration. Two important assumptions that require validation are the abilities and motivations of the business owners and the response of householders to the product.

REFERENCES


Cole, B., Pinfold, J., Ho, G. and Anda, M. 2014b Examining the methodology of participatory design to create appropriate sanitation technologies in rural Malawi. Journal of Water, Sanitation and Hygiene for Development 4(1), 51 - 61

IFC (International Finance Corporation), WSP (Water and Sanitation Program) and MoPHS (Ministry of Public Health and Sanitation) 2012 Selling Sanitation: Presentation of formative market research, IFC, Nairobi.


CHAPTER 9  (PAPER SEVEN)

EXPLORING THE UTILITY OF DIFFUSION THEORY TO EVALUATE SOCIAL MARKETING APPROACHES TO IMPROVE URBAN SANITATION IN MALAWI

ABSTRACT

This study examines diffusion theory as an explanatory framework for the adoption of an ecological toilet by innovative customers in an urban setting in Malawi. The study was conducted during a social marketing program that attempted to improve the coverage of an ecological toilet. 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 innovators who purchased the ecological toilet. The study found that innovators were relatively wealthy and made purchasing decisions in groups. Innovators reported a relative advantage of the innovation was the provision of a sanitation micro-loan that provided capital to purchase the product as well as surplus capital which could be used to invest in an income generating activity. A self-selecting opinion leader was highly influential in the take-up of the innovation by other innovators. The study provides evidence that specific components of Rogers’ (2003) diffusion theory offer a useful theoretical framework to evaluate social marketing approaches to urban sanitation in Malawi. Organisations that attempt to improve urban sanitation coverage in developing countries may improve their efficacy and cost-effectiveness by utilising diffusion theory as the theoretical framework to design, implement and evaluate their programs.
Keywords: 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 (UNICEF & WHO 2012). Access to a safe and hygienic toilet, combined with clean drinking water and hand washing with soap, could prevent more than two 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 (Katukiza et al. 2010; Thye et al. 2011). The most common de-centralised 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 (commonly named as 'Skyloos') allow for recycling of nutrients, prevent groundwater contamination and offer a potential source of revenue to users through selling composted manure. Despite these potential benefits, evaluations of ecological sanitation programs 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 (SUSANA 2010; Roma et al. 2013).

Attempting to surmount these challenges has led sanitation managers to apply social marketing approaches to design, implement and evaluate rural and urban sanitation programs 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). 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 programs 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 program 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 programs 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 programs?

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 initial design of social marketing programs.

**Characteristics of innovators**
Diffusion researchers categorise individuals into adopter categories (Smith & Findeis 2012). An individual is categorised based on the timing of their 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 that they have higher social status (income, level of living, possession of wealth) and they are less risk adverse than later adopters (Rogers 2003). This categorisation led to the creation of the first research question.

Research Question 1: *Are innovators of the sanitation innovation relatively wealthy and do they display 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 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 programs 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 innovators 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 innovators of the sanitation innovation?

**Attributes of an innovation**

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

- 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 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 innovators report all five attributes described by Rogers (2003) (relative advantage, compatibility, simplicity, observability and trialability) as positive reasons for purchasing the sanitation innovation?

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 1200mm. The low-lying valleys (‘dambos’) are subject to seasonal flooding and remain waterlogged throughout most of the year.
This study was conducted in three city wards: Zolozolo upper, Zolozolo lower and Chipitula.

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

The innovation – Skyloo and sanitation micro-loans

The ecological sanitation facility, named Skyloo, is a urine diverting, dehydrating toilet. The facility is constructed above ground and has two vaults (Figure 1).

The in-use vault collects human excreta for up to 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 compost offers a source of nutrients and wetting agents that can act as a social conditioner and promote

Figure 3: Schematic view of Skyloo (taken from Stenstrom et al. 2011)
agricultural crop growth (Langergraber & Muellegger 2005). The compost from the storage vault is emptied every 6-12 months depending on the level of use.

The SPA program used a competitive tender process to recruit one business to act as the local sanitation business (LSB). The LSB was responsible for marketing, sales and construction of Skyloos. A National financial institution provided the administrative services for the sanitation micro-loans. The total loan available ranged from MKW 80,000 – 120,000 (USD 260 – 400). The monthly repayments were based on an interest rate of 30% per annum. 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 surplus capital provided by the loan ranged from MKW 60,000 – 100,000 (USD 200 – 330).

**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.

**Qualitative investigation**

The dominant component of the study was a descriptive qualitative investigation. This took place over a three-month period during the first twelve months of the implementation of the SPA Program. The descriptive study applied open-ended, in-depth interviews. Purposive sampling was used to identify customers that had been in the first 25 households to purchase a Skyloo during the first twelve months of the SPA program.

Only households that purchased a Skyloo via a microfinance loan facilitated through the SPA program were recruited as ‘innovators’ and interviewed as part of the study. As indicated in the data provided by the financial institution that provided the microfinance loan, many other households applied, but were denied a loan to purchase a Skyloo. In effect, these households were ‘innovators 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 only to recruit interviewees who were granted a loan reduced the sample size of the study. It also passed up the opportunity to generate a body of knowledge on those ‘innovators 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 was provided through the sanitation micro-loan program. The micro-loan program manager provided the de-identified data of 385 loan applicants. The de-identified data was analysed using IBM® SPSS® v.21 to compare means between loan applicants that were accepted and declined by the micro-loan program manager.

**Data analysis**

The characteristics of innovators (Research Question 1) was 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 & Lundham 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 & Lundham 2004). Relevant meaning units were categorised into groups. Groups were then clustered into Rogers’ (2003) five attributes of an innovation that increase the rate of diffusion using QSR NVivo© v.10 (see Table 1) (Elo & Kyngas 2008).

Table 1: Example of grouping for relative advantage category based on Rogers’ (2003) attributes of innovations that improve diffusion

<table>
<thead>
<tr>
<th>Category</th>
<th>Grouping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative Advantage</td>
<td>Micro-loan reduces risk of spending capital on non-income generating household item</td>
</tr>
<tr>
<td></td>
<td>Small amount of land required to construct</td>
</tr>
<tr>
<td></td>
<td>Save money on fertiliser</td>
</tr>
<tr>
<td></td>
<td>Permanent solution that doesn’t require annual</td>
</tr>
</tbody>
</table>
Ethics

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 three months of purchasing and constructing their Skyloo.
The second methodological challenge in this study was the language barrier. Six of the 14 interviews were conducted in Chichewa and interpreted 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 two 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).

RESULTS AND DISCUSSION

Research Question 1: Are innovators of the sanitation innovation relatively wealthy and do they display risk-taking behaviours?

Rogers (2003) identified relatively high incomes and venturesomeness as two important characteristics of the first segment of adopters; the innovators. Innovators of 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).

Risk taking

Innovators demonstrated some willingness to accept risk. All innovators stated they had used their own money to purchase the materials to construct their Skyloo. This occurred prior to receiving money from the sanitation micro-loan. Innovators 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)

Innovators did however report using risk reduction strategies prior to accepting the innovation. One important risk reduction strategy, taken up by all innovators, was the identification of a plan to ensure the generation of income from the surplus capital provided from the sanitation micro-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 innovators) was the creation of small groups of innovators prior to purchasing their Skyloo. The groups reduced an individual’s exposure to risk in two ways: The first was through sharing information about the innovation, 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 was 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 when ever someone is lacking materials the other side can assist (H6, male).

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. 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 clique to share information within their close social network. This finding suggests sanitation programs introducing an innovative toilet may improve adoption through shifting their focus away from targeting individuals toward developing strategies that encourage individuals to form groups.

Diffusion studies conducted in low-income communities in sub-Saharan Africa have reported that all adopter categories, including innovators, require reduced risk and financial security prior to accepting an innovation (Smith & Findeis, 2012). These findings highlight that sanitation program managers should endeavour to identify mechanisms that support potential innovators to attain their required level of financial security. In doing so the likelihood of adopting a sanitation innovation may be improved.

Research Question 2: What is the role of interpersonal information sources (opinion leaders and change agents) on the decision-making process of innovators of the sanitation innovation?

Opinion leaders

The majority of innovators (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 innovators 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 innovators 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).*

Innovators perceived the opinion leader to satisfy all four of Dearing (2009)’s 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 allowing
opinion leaders to naturally evolve, rather than through nomination by the community, can enhance the diffusion process (Dearing 2009).

*Change Agents*

All innovators reported a change agent was another vital source of regular and sustained information about purchasing the Skyloo. The change agent was employed by the local sanitation business as a marketing and sales manager. Innovators reported the change agent worked in close association with the opinion leader (describe above as H7, male). The relationship between the change agent and 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 local sanitation business to supervise the construction of new Skyloos.

Research Question 3: Do innovators report all five attributes described by Rogers (2003) (relative advantage, compatibility, simplicity, observability and trialability) as positive reasons for purchasing the sanitation innovation?

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 innovators confirmed they would not have purchased the Skyloo if their application for a sanitation micro-loan had not been approved. Innovators stated 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 innovator:

*Sometimes to keep money here is difficult because you can keep money for this, but something can come and you have to spend all the money...So keeping money little by little is difficult, but paying little by little is easy* (H5, male.).

Innovators 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.

Innovators reported a further relative advantage offered by the sanitation micro-loan was the provision of surplus capital. Innovators stated that the surplus capital would be invested into 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 innovators was that it established their relationship with a respected National financial institution. The innovators 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 customers, 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 innovators. 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:
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 innovators reported 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 customer described the Skyloo as offering a life-time solution:

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 innovators reported observing a Skyloo prior to purchase. As discussed above, the majority of innovators 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 innovators 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 may be a useful strategy for future social marketing approaches to sanitation in urban settings.

**Simplicity**

Over half the innovators (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 smells, the removal of waste from the storage vaults and making repairs. Two innovators captured the concerns about the complexity of the Skyloo:

*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 innovators trialled using the toilet nor emptying the storage vault after six months of use.

This finding reveals the innovators will be the first people in their social network to trial the simplicity of the use and maintenance of the Skyloo. The innovator’s experiences will influence and inform the decision making process of later adopters. Evaluations of ecological sanitation programs have identified that
inadequate training on the operation and maintenance of the innovation resulted in low user satisfaction (Cole et al. 2009; SUSANA 2012). Providing simple and practical training sessions on the use and maintenance of the ecological sanitation system to innovators would allow them to assess all five of Rogers’ (2003) attributes of an innovation. The training sessions may also improve the likelihood of correct use and maintenance, which would improve the innovators’ satisfaction. Improved satisfaction of the innovators could potentially improve the long-term diffusion of the 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 offers evidence that specific components of diffusion theory (innovators’ characteristics, interpersonal information sources and product attributes) provide a useful theoretical context to design, implement and evaluate urban sanitation programmes in Malawi. The study demonstrates how customers were relatively wealthy and formed groups to reduce their exposure to risk. A local opinion leader naturally evolved during the intervention and was identified as a key source of verbal and visual information by innovators. These findings suggest that allowing opinion leaders to self-select may offer a cost-effective alternative to conducting exhaustive searches to identify ‘ideal’ opinion leaders. The self-selection process made by opinion leaders may improve the long-term outcome of programs that attempt to diffuse innovative sanitation options into urban settings.
The provision of a sanitation micro-loan that offered surplus capital was identified as an important relative advantage of the innovation. New funding approaches for sanitation deserve further exploration as they may present an innovative mechanism for improving coverage of traditional and ecological sanitation facilities across urban sanitation markets in sub-Saharan Africa.

A useful accompaniment to this study would be to return to the study area when customers have longer experience with the use and maintenance of the Skyloo. 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. (2011) 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 long term diffusion of the Skyloo innovation.

REFERENCES


Jenkins, M.W. & Scott, B. 2007 Behavioural indicators of household decision-making and demand for sanitation and potential gains from social marketing in Ghana. *Social Science and Medicine 64*, 2427-2442.


Mzuzu City Assembly 2008 *Mzuzu city profile 2008*. Mzuzu, Malawi.


CHAPTER 10

CONCLUSION

The motivation underpinning this thesis was to contribute new evidence and knowledge towards tackling the global sanitation crisis. The seven papers contained within were guided by the research objective of investigating how market-based approaches may impact sanitation coverage in rural and urban settings in Malawi. This concluding chapter will present the key findings of the research and demonstrate how they respond to the research questions. The chapter also provides a higher level of analysis and identifies themes that address the overall research objective. The practical, methodological and theoretical implications of the themes are discussed. Recommendations for future research needs are presented in the final component of the chapter.

Research Question 1: What are the practices, motivations and barriers of sanitation suppliers?

The impact of subsidies to grow or diminish the supply component of a market has been widely debated and disputed across various and numerous industries (Chang 2008). This thesis provides evidence that supports the argument that subsidy programs in the sanitation market have an adverse impact on the motivation of suppliers. Evidence presented in the formative market research (Paper Three) and the participatory design methodology (Paper Five) shows that suppliers did not regard sanitation as a profitable or expanding market. This perception was based on the supplier’s experiences with customers rejecting their product and service offerings due to the expectation of receiving a government subsidy to construct their toilet. The adverse impact of subsidy programs on market penetration has also been reported for latrine coverage in Vietnam (Rheinlander 2010) and non-polluting cook stoves in India (Shrimali et al. 2011). This finding suggests that market-based approaches to sanitation in Malawi will face great obstacles unless hardware subsidy programs are eradicated and the community accepts their cessation.
This thesis identifies a second key barrier for sanitation suppliers as the failure of existing products to match the needs and expectations of customers. A central tenet of a market-based approach is that businesses capture value from customers and are incentivised to continue to create value for customers (Kotler & Armstrong 2011). The participatory design sessions (Paper Five) identified three innovative designs that may support a business model that offers a financial incentive to sanitation suppliers. Paper Six confirmed this potential by modelling a positive cash flow for a business model that offered an innovative latrine design (corbelled, brick flooring). The development and testing of innovative designs presents a potential avenue to create financially sustainable business models for sanitation suppliers in rural settings in Malawi.

Research Question 2: What are the constraints and motivations of consumers to select, construct and purchase a toilet?

The research identified wealth as a key factor that impacted a consumer’s ability to select, construct and purchase a toilet. This finding aligns with evaluations of sanitation programs in Vietnam (McGrath 2009; Sijbesma et al. 2010), Tanzania (Robinson 2011) and Zimbabwe (Whaley & Webster 2011). The formative research (Paper Three) identified a clear association between household latrine type and household wealth. The urban case-study (Paper Seven) found the wealthiest households self-selected to engage in the market-based sanitation program. These findings suggest the market-based approach to sanitation in Malawi must pay attention to the needs and preferences of low-income households. Failure to do this may result in market-based programs creating a widening gap of latrine ownership between upper and low-income households.

Motivations of consumers to purchase a latrine were found to be consistent between rural and urban households. Two key motivations were improved social status and a desire to own an affordable, durable and easy to clean latrine. These motivations align with the findings of formative and evaluative studies of rural sanitation programs in Benin (Jenkins & Curtis 2005; Scott et al. 2011) and Cambodia (Baker et al., 2011). The identification of these motivators suggests that future social marketing approaches should focus on social drivers in their
promotional campaigns. The promotional campaigns must, however, be accompanied with the provision of a range of products that are affordable, long lasting and easy to clean.

*Research Question 3: How do technological, environmental, socio-economic and cultural factors impact upon the appropriate design of sanitation products and services?*

A consistent finding that arose from the formative rural market research (Paper Three), participatory design methodology (Paper Five) and the urban case-study (Paper Seven) was the prevailing influence of local environmental conditions on identifying appropriate sanitation designs. In rural settings, the soil type (sand or clay), presence of termites in the soil and availability of stones as building materials dictated existing latrine designs. In the urban setting, the high groundwater levels accompanied with regular flooding offered a clear incentive for households to recognise the benefit of above-ground sanitation designs. This finding demonstrates the importance of sanitation designs that respond to local environmental conditions.

The research demonstrated that existing technologies for latrines have stymied latrine coverage and market growth in rural Malawi. The formative market research (Paper Three) found that the predominant design for a durable latrine in rural areas was a cement-based product. Cement is both expensive and difficult to obtain across rural Malawi. The participatory design sessions (Paper Five) demonstrated that local knowledge and building materials offer potential technological solutions that do not require cement in the design. For example, the corbelled, brick design applies proven engineering principles to form a durable, water- and termite-resistant flooring in clay soils. The testing and refinement of the corbelled, brick design followed up with a scale-up strategy may offer a new technological solution that matches the needs and preferences of consumers in rural Malawi.

**Higher-level themes**
This concluding chapter will now shift to discuss the research objective and identify the higher-level themes that emanate from the research. The higher-level themes are presented under three categories; practical, methodological and theoretical.

**Practical**

Formative market research is a vital component of commercial and social marketing programs (Kotler & Armstrong 2011; Devine & Kullman 2012). This thesis demonstrates the ability of formative market research to inform the development of iterative lines of research and program development within the sanitation sector. For example, this thesis utilised the market research findings to identify the participatory design methodology, which in turn led to the creation of the business model analysis. These findings support previous studies that have demonstrated the importance of formative market research to carefully target programs to ensure products align with the needs and preferences of customers (Devine & Kullman 2012).

A key criticism of sanitation programs that offer hardware subsidies is their provision of expensive and over-engineered products (Cairncross 2004). This thesis (Paper Five) contributes early evidence to support the assertion that safe and desirable latrine products can be manufactured with limited or no cement. The removal of cement from latrine construction reduces the cost of construction in rural Malawi. The non-cement designs were created during participatory design sessions. The findings from this thesis suggest that wider use of participatory design methodologies across a broader range of environmental, socio-economic and cultural conditions may identify locally-inspired sanitation designs that match the needs and preferences of customers in different environments.

**Methodological**

Paper Two presents a theoretical argument for the selection of a pragmatic paradigm accompanied with mixed methods to investigate market-based approaches to sanitation programs. The investigative papers (three to seven)
provide evidence that demonstrate the practical application of mixed methods to address research questions related to investigating market-based approaches to sanitation. The quantitative findings provide depth and breadth to the analysis that are augmented with deeper probing via qualitative investigative tools. This body of research offers a foundation for greater exploration of mixed methodologies to evaluate market-based approaches to sanitation.

The research supports the findings of previous studies on the rewards of applying participatory approaches in program design and implementation (IDEO 2009; Steen 2011; Wishchiers-Theophilus et al. 2012). Paper Four demonstrates how partnering with government staff generates rich and triangulated market research findings. Paper Five presents three innovative, low-cost sanitation designs that were generated during participatory design sessions with builders, villagers and government staff. In addition to the specific practical outcomes of both papers, participatory approaches enabled knowledge sharing between users, builders and government staff and provided a space to explore divergent views toward Government subsidy programs. These outcomes support the claim that participatory approaches encourage innovation and challenge traditional positions between donors and recipients of foreign aid (Bozalek 2011).

**Theoretical**

The research provides evidence that supports the utility of three components of Rogers’ (2003) diffusion theory to examine market-based approaches to sanitation in urban settings. The three components are; attributes of adopters, characteristics of the innovation, and the role of change agents. Paper Seven confirmed Jenkins and Scott (2007)’s assertion that diffusion theory is a suitable theoretical lens to examine market-based approaches to sanitation. Paper Seven also found that the application of diffusion theory offers a conceptual lens to examine the findings of evaluative research in an urban setting. Utilising a suitable theoretical framework supports the translation of findings to other studies (Evans et al. 2011) and leads to the creation of models to describe the process of social change (Rogers 2003). This research provides evidence that supports the use of diffusion theory as a
relevant and supportive theoretical framework to design, implement and evaluate market-based approaches to sanitation.

**Future research**

This research has identified the benefits of formative market research to create targeted programs to offer sanitation products that match the needs and preferences of customers (Paper Three). It has also identified potential products via participatory design approaches (Paper Five) and conducted an examination of business models (Paper Six) and theoretical frameworks (Paper Seven). The sum of this work has highlighted a range of areas in which future research could be undertaken.

Firstly, a potential next stage in the research process would examine how the market responds to the new product offerings and their associated business models and promotional campaigns. Future research could also include process and outcome evaluations of market-based sanitation programs that identify, recruit and train sanitation entrepreneurs to offer new products and services in rural Malawi. The evaluations could follow numerous lines of investigation framed using Rogers’ (2003) diffusion theory. Three potential lines of inquiry are; i) What are the psychological and demographic attributes of innovative suppliers and early adopting customers? ii) What are the attributes of new products/services that encourage/discourage diffusion and iii) What communication channels/change agents support the diffusion of products? Rigorous evaluations will offer policy-makers an evidence-base to support, adapt or reject the use of market-based approaches to sanitation in Malawi.

A second area for future research is in relation to the sustainability of the sanitation business model. A business person or organisation must generate a profit that sustains their activity and motivates their continued actions and continued role in the market. Evaluations of business models of other health improving technologies, such as clean-burning brick stoves, have faced significant challenges to develop profitable distribution and sales systems in rural markets (Shrimali et al. 2011). Future research in the sanitation sector must examine the
ability of sanitation products and services to offer a sustainable financial model for entrepreneurs in rural and urban settings. Challenges observed in south-east Asian market-based approaches to sanitation include; (a) wide sales penetration but limited reach to customers beyond middle and upper income earners and (b) copy-catting of products eroding the market size of legitimate suppliers (Baker et al. 2011). Overcoming unviable business models requires further exploration. Possible solutions include; (a) bundling sanitation products with other product offerings, (b) accreditation of sanitation suppliers to specific geographic regions or (c) supporting accredited suppliers with regular work contracts through the construction of toilets in government buildings including schools, hospitals and child-care centres. The close examination of proposed and spontaneous business models that evolve in sanitation markets will offer deep insights into the viability of market-based approaches across Malawi.

The third area of future research is related to product design. The participatory design sessions (Paper Five) identified three design directions for sanitation products using local building materials. Future research would conduct rigorous and documented technical testing on these and other potential designs, accompanied by local testing with builders and villagers. Indeed a key principle of participatory design is the ongoing dialogue and testing between users (builders and householders) with researchers-designers (government staff) (Wischiers-Theophilus et al. 2012). The testing process must include descriptions of preparatory site inspections (soil type, surface water flow, slope of land), structural load testing under natural conditions (rainfall, termites and soil movement). The rigorous testing process should attempt to create an accreditation process that is approved by relevant government authorities or private organisations that regulate or engage in the sanitation market.

A fourth area for future research is the exploration of how small-scale, qualitative investigations could provide adequate information to develop an evidence base for a market-based approach to sanitation. Conducting formative research using mixed methods is expensive, time consuming and requires high levels of expertise within the research team. An alternative approach would be to conduct small-scale qualitative studies (as described in Jenkins 2010) and then validate the findings.
against national-scale mixed methods research. If proven to be valid, the qualitative studies could offer a rapid and affordable tool to develop targeted, market-based approaches to sanitation in countries with developing economies.

A fifth area of future research relates to community-led total sanitation (CLTS). CLTS programs do not endorse the use of a prescriptive methodology to conduct formative market research (Kar & Chambers 2008). The CLTS methodology recommends conducting ‘pre-triggering’ activities to identify the program policy environment, current conditions and practices, physical conditions and social/cultural conditions. This thesis provides evidence that supports the inclusion of rigorous and systematic formative market research into the CLTS methodology. The market research presented in Paper Three identified that household demand for latrine ownership was very high, however this demand was unsatisfied by existing latrine products. Evidence from this thesis suggests that understanding existing market conditions prior to commencing a CLTS program would support the creation of locally responsive CLTS programs. By incorporating formative market research into a CLTS program, resources and time could be allocated to engage the community in additional participatory approaches (such as participatory design methodologies) to address the key challenges that prevent latrine ownership.

A final area of future research relates to the use of diffusion theory to sanitation programming. Successfully introducing a new sanitation product or service to a community requires the diffusion of the product or service across a social network over time. A key argument for the application of market-based approaches to sanitation is that they hold the potential to expand sanitation coverage without ongoing, external funding. For sanitation coverage to expand without external funding the product/services must diffuse across a wide cross-section of the community and across geographical boundaries. This current research found diffusion theory to be an effective theoretical framework to explore and evaluate market-based approaches to sanitation. The field of diffusion theory is rapidly expanding and diversifying (Peres et al. 2010, Donovan 2012). Future research should explore how new theoretical approaches to diffusion theory could be applied to market-based approaches in sanitation.
Final Remarks

The United Nation’s aspiration to dramatically improve sanitation coverage in countries with developing economies is unlikely to be met by 2015 (WHO & UNICEF 2014). The global community’s failure to improve sanitation coverage demonstrates the urgent need for new approaches to be applied, tested and adopted. This thesis contributes to the growing body of research on market-based approaches to sanitation. The evidence contained in this thesis demonstrates the strength of applying an established theoretical framework (diffusion theory), new tools (formative market research) and innovative approaches (participatory design) to understand and nurture sanitation markets in rural and urban Malawi. Ongoing research into the role of market-based approaches to sanitation is urgently required to support the global community’s commitment to achieve universal access to safe and hygienic sanitation.

REFERENCES


Jenkins, M.W. & Scott, B. 2007 Behavioural indicators of household decision-making and demand for sanitation and potential gains from social marketing in Ghana. *Social Science and Medicine, 64*, 2427-2442.


Moyo D. 2009 *Dead Aid: Why aid is not working and how there is a better way for Africa.* Farrar, Straus & Giroux, New York.


APPENDIX I – TITLE PAGE OF PEER-REVIEWED PUBLICATIONS

PAPER THREE

Investigating the dynamic interactions between supply and demand for rural sanitation, Malawi
Ben Cole, John Pinfield, Goen Ho and Martin Anda

ABSTRACT
Formative market research is the first step in developing evidence-based sanitation marketing programs. In Malawi, the design, implementation and evaluation of rural sanitation marketing programs has been limited. This study applied a mixed methodological approach to examine the dynamic interactions between the supply and demand of sanitation in three rural districts. The supply assessment identified an extremely limited range of latrine options. Sanitation suppliers reported very low household demand for their existing latrine options. An additional constraint reported by suppliers was households’ perception of a hardware subsidy for latrine construction. The demand assessment found a key constraint to constructing an unreinforced latrine was the short time-in-use (11–13 months). Householders expressed dequeueing at having to consistently rebuild collapsed, unlined pit latrines. For brick-lined latrines, a key barrier was affordability combined with an over-estimation of construction costs. Key motivations to construct brick-lined latrines included product attributes and social drivers. Wide variation in access to income and use of micro-finance organizations were recorded within and across the study sites. Formative market research is an iterative process from which new lines of investigation arise. This study provides information that will provide a foundation for the ongoing research, design, implementation and monitoring of rural sanitation marketing programs in Malawi.

Key words | constraints, financing, motivators, sanitation, social marketing

INTRODUCTION
Top-down, supply-led approaches to sanitation programs have generated sustained improvements in sanitation coverage in countries with developing economies (Cairncross 2004; Jenkins & Sugden 2006). In response, a growing consensus has developed amongst donor agencies, development organizations and governments to engage the local community to generate demand for sanitation (IWA 2008; Murray & Ray 2010). Two common approaches to support community engagement and generate demand for sanitation are; community-led total sanitation (CLTS) (Chambers 2009) and sanitation marketing (Cairncross 2004; Jenkins 2010).

In comparison to other sub-Saharan countries, Malawi has a relatively low rate of open defecation in rural districts with approximately 1 in 10 households (11%) open defecating (NSO & ICF Macro 2009; WHO & UNICEF 2010). In rural districts, basic sanitation has been reported to range from 32 to 82%, while improved sanitation ranges from 7 to 57% (NSO & ICF Macro 2009; WHO & UNICEF 2010). The Government of Malawi (GoM 2008) has recognized that more progress is required to overcome the disparities in sanitation coverage across rural districts. Malawi’s National Sanitation Policy (GoM 2008) and the recent National Open Defecation Free Strategy by 2015 (MoAIRD 2012) identify CLTS and sanitation marketing as the key approaches to improve rural sanitation coverage. A national program for CLTS has been implemented in 12 rural districts (Maulidi & Kang 2011). In contrast, there have been fewer attempts at sanitation marketing in rural districts and there is a lack of cohesion and capacity in rural sanitation marketing programs in Malawi (DeGabriele 2009).
Engaging government partners to conduct research on the sanitation market: a case-study from rural Malawi

BEN COLE, JOSEPH LWESYA, STERNER MSAMILA and STEVIE SUKALI

Market research is the foundation of the design, implementation, and evaluation of evidence-based sanitation marketing programmes. Limited financial resources combined with time constraints may result in some organizations neglecting this fundamental stage. This paper describes how UNICEF Malawi's government partners were supported to implement market research over five days in Mangochi and Dowa districts, Malawi. The paper presents the six stages of the market research and provides the strengths and challenges of each stage. The market research provided government staff with an opportunity to dispel misperceptions by hearing, recording, and analysing qualitative and quantitative information about the existing sanitation market.

Keywords: rural sanitation, demand, supply, market research, research methodology

Sanitation marketing programmes are derived from the discipline of social marketing (Cairncross, 2004). Social marketing applies commercial marketing approaches to attain positive social outcomes (Kotler and Zaltman, 1971). A vital step in developing any commercial or social marketing programme is conducting market research (Kotler et al., 2008: WSP 2011). Market research can provide a rich illustration of the competitors, customers, suppliers, and regulatory environment that relate to a product, service or idea (Kotler et al., 2008). The research process reveals vital information about the needs and wants of potential customers, how they seek information, and whom they trust to deliver that information (Dearing, 2008).

The Water and Sanitation Program's, large-scale, rural sanitation programmes in India, Indonesia, and Tanzania engaged professional market research firms to conduct formative market research (Perez et al., 2012). Market research firms are experts in research design, implementation, and analysis and have access to trained survey teams. The key challenge of using market research firms is the demand on financial resources. Indeed, a lack of financial resources is the main reason cited by small businesses and not-for-profits for not using the services offered by professional market research firms or consultants (Kotler and Lee, 2008).

Ben Cole (ben_cole_h20@mac.com) is an environmental health consultant at Murdoch University, Perth, Australia. Joseph Lwesya (lwesya@gmail.com) and Sterner Msamila (stmsamila@yahoo.com) are environmental health officers at the Ministry of Health, Malawi. Stevie Sukali (ssukali@unicef.org) is a member of the WASH support staff, UNICEF Malawi, Lilongwe, Malawi.

http://dx.doi.org/10.3362/1756-3488.2014.018, ISSN: 0262-8104 (print) 1756-3488 (online)

Waterlines Vol. 33 No. 2 April 2014
Exploring the methodology of participatory design to create appropriate sanitation technologies in rural Malawi

Ben Cole, John Pinfold, Goen Ho and Martin Anda

ABSTRACT

The methodologies of demand-led sanitation programmes (including community-led total sanitation (CLTS) and sanitation marketing) encourage participation of users in the design of appropriate sanitation facilities. There has been limited examination of the application of established methodologies in participatory design in the sanitation sector. This paper describes and reflects upon three case studies that applied established participatory design methodologies to create sanitation technologies in rural Malawi. Participants of the design sessions represented two groups: (i) researcher-designers (government staff); and (ii) users local builders and householders. The methodology created a space to develop a common language between the two groups and allowed an exploration of tensions about the use of sanitation hardware subsidies. The design sessions created a number of innovations including corbeling structures, trelliswork shaped bricks and reinforcement of wooden frame structures with sandbags. The paper critically reflects on the processes of participatory design in relation to power, ownership and continued participation.

Key words: design, participation, rural, sanitation

INTRODUCTION

Top-down sanitation programmes that promote a specific technology based on the presumptions of ‘outside experts’ have been criticised for endorsing unsustainable, expensive and inappropriate technologies (Calmercross 2004; Jerihs & Sugden 2005). In response to these failings, a new era of demand-led sanitation programmes encourage greater participation of users to create, identify and select appropriate sanitation technologies (Calmercross 2004; Kar & Chambers 2006). Although comprehensive compilations of sanitation systems and technologies exist (e.g. Tilley et al. 2008), few studies critically examine the methodologies used to engage local users and suppliers in the design of appropriate sanitation technologies. This paper engages with that space by presenting and reflecting upon a participatory design methodology applied in rural Malawi.

Two common demand-led sanitation programmes are sanitation marketing and community-led total sanitation (CLTS) (March et al. 2010). Sanitation marketing programmes in Lesotho, Cambodia and Kenya applied human-centred design approaches (Blackett 1994; Baker et al. 2001). Human-centred design attempts to create sanitation products and services that match the needs, practices and preferences of users and suppliers of sanitation technologies. In Vietnam, Cambodia and Kenya sanitation marketing programmes have engaged international researchers-designers to conduct qualitative market research with users and suppliers (Sibesma et al. 2005; Baker et al. 2008). The market research informed the researchers-designers to create iterative prototypes that were subjected to extensive user testing.

The CLTS methodology does not recommend inputs from external researchers-designers but suggests that local facilitators should “help in establishing linkages with local markets” (Kar & Chambers 2008). The role of local facilitators also includes: encouraging local innovation and production; identifying locally available products and materials; and training locals to manufacture sanitation technologies (Kar & Chambers 2008). Recently, a founder
Exploring the utility of diffusion theory to evaluate social marketing approaches to improve urban sanitation in Malawi

B. Cole, J. DeGabriele, H. Goen and M. Anda

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 microfinance 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 trustability 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 utilizing diffusion theory as the theoretical framework to design, implement and evaluate their programmes.

Keywords | diffusion, ecological sanitation, innovator, social marketing
APPENDIX II – PAPERS SUBMITTED BUT NOT YET APPROVED

PAPER ONE

Waterlines
Applying a social marketing framework to identify common lessons from rural sanitation marketing programs

---Manuscript Draft---

**Manuscript Number:**

**Full Title:** Applying a social marketing framework to identify common lessons from rural sanitation marketing programs

**Short Title:** Exploring common lessons from rural sanitation marketing programs

**Article Type:** In-depth article

**Keywords:** rural; sanitation marketing; social marketing; evaluation

**Corresponding Author:** Ben Cole
Murdock University
Perth, AUSTRALIA

**Corresponding Author Secondary Information:**

**Corresponding Author's Institution:** Murdoch University

**First Author:** Ben Cole

**First Author Secondary Information:**

**Order of Authors:** Ben Cole
Goon Ho
Martin Anda

**Order of Authors Secondary Information:**

**Manuscript Region of Origin:** Other

**Abstract:** Rural sanitation marketing programs have been implemented across the globe. Collations of their experiences are sparse and fail to assess their impact using the frameworks presented by social marketing approaches. This review examines the utility of applying the six Ps framework (product, price, place, promotion, policy and partnerships) to identify commonalities in the experiences of rural sanitation marketing programs in south-east Asia and Africa. The review demonstrates the six Ps framework is an effective tool to dissect and understand the commonalities between rural sanitation marketing programs.
APPENDIX III – SURVEY TOOLS (CHAPTER 5)

Appendix A

Households that currently have their own latrine

1. Latrine Construction History

- Can you describe your current latrine?
- What is the pit, slab, mould, walls and roof constructed of? – Use handout to walk through with the respondent
- Cost/collection of materials for each component of the latrine – (cash or in-kind)? – Use handout
- Costs of labour (cash or in-kind) for each component of the latrine? – Use handout
- Number of days required for each component of the latrine? – Use handout
- Is this your first latrine?
- If no, ask about history of previous latrines, whether they are still in use or whether the current one is a replacement; if so, what happened to the other one?

2. Latrine facilities

- In your opinion, what are the most important qualities in a latrine?
- Can you describe the main types of latrines that you are aware of?
- Are these all available in this area?
- Of these types, which is your favourite and why?
- Which is your least favourite and why?
- Why did you choose your particular latrine?
- From where and whom did you get the idea for constructing this latrine?
- If you could make any improvements to your latrine, what would they be?

3. Motivations

- Who was involved in making the decision about constructing your latrine?
- Who influenced the decision? In what way?
- In the end, what were the main reasons you constructed a latrine? Why is this important to you?
- In your experiences what are the real advantages of owning a latrine?
- What about negative experiences, have you found any disadvantages or problems associated with your latrine?

4. Construction Process

- Once you decided to construct a latrine was it easy or difficult? What factors made it easy?
• What factors made it difficult? [ground, financing, finding someone to build]
• Thinking of the specific difficulties you experienced, what ways did you find to overcome them?
• Did you receive any help when building your latrine? [family, friends, NGOs, local government]
• If yes, what kind of help? [advice, financing]
• How long did the process take, from deciding to build to completing the construction?
• What were the things determining this length of time? [saving money, finding mason, materials, deciding style]
• Why did you decide whether to construct yourself/get a mason (or outside support)?
• What are the advantages of doing it yourself?
• What are the disadvantages of doing it yourself?
• What are the advantages of employing someone? What are the disadvantages of employing someone?

5. Hiring someone to construct latrine

• If latrine was constructed by someone outside the household: How did you find someone and choose who to construct your latrine?
• Was their service good or bad? Please explain in what way.
• What about the construction materials, where did you get these from and how easy was it to get them?
• Did you have any access to credit to help you pay for the latrine construction?
• If no, if someone needed credit to help install a latrine could they get it? Where?

6. Latrine Use and Maintenance

• Are there any household members who do not use this latrine?
• If certain family members do not use latrine:
  – Where do they defecate? Why?
  – How does this make them feel? How does this make you feel?
• At what age do children start to use the latrine? Why?
• Where do the children defecate before they are old enough to use the latrine? What happens to the feces?
• Are there times when some people don’t use the latrine? [night-time, when working in the fields, elderly]
• Who is responsible for keeping the latrine clean?
• How is the latrine cleaned and how often? [cleaning implements, cleaning products]
• Is keeping the latrine clean easy or difficult? What makes cleaning easy? What makes cleaning hard?
• Has the latrine ever filled? What happens when it is full?

Households that do not have their own latrine
1. Awareness of Home Sanitation and Latrine Technologies

- What types of latrines are you aware of?
- Of these which types have you tried?
- Where did you try them? Of those latrines you have tried, which is your favorite? Why? *Probe for as many reasons as possible.*
- Of those latrines you have tried, which is your least favorite? Why? *Probe for multiple reasons.*

2. Intention to Install Home Sanitation

- Have you ever constructed a household latrine? Why? *For those who said no, probe beyond financial constraints, illustrating how these might be mitigated (e.g., saving).*
- If yes: When did you first consider/attempt installing a latrine? What made you consider installing a latrine? *Probe for multiple reasons.* What prevented you from taking your plan forward up until now? *Probe for multiple reasons.*
- If yes: What type of latrine did you construct?
- If you were to build a latrine now what type would you build? Why?
- What particular features would it have?
- Why are these features important to you?
- How long do you think this type of latrine would take to build? Cost in materials? Cash? In-kind? *– Use diagram of pit latrine*
- Would you consider a latrine without these features? Why? Under what circumstances?
- Thinking about the types of latrines you know, are there any problems with any of these that would inhibit you from installing them?
- Can you think of ways to overcome any of these to enable your plan to come to life? [*

3. Hiring someone to construct a latrine

- Do you know someone who can construct latrines?
- What type of latrines can they construct?
- Would you consider using them to construct a latrine? Why?
- How much would the person charge you to construct the latrine?
- Who would provide the materials to construct the latrine? How much do you think they would cost?

4. Current Defecation Practice (Now thinking about this household in particular)

- Where do members of this household defecate? Why? *Probe for reasons beyond cash constraints.*
- Do all household members use the same defecation place? Why? *[elderly, children, in-laws]*
- What are the main benefits you experience from this defecation place?
- What do you dislike about your current place of defecation? *Probe for
multiple reasons
Supplier interview guidance

1. **Business description:**
   - Type of artisan: (e.g., mason (general), latrine (only), digger)?
   - Part-time or full-time mason/artisan/digger?
   - Other occupation(s) and source(s) of income, if not full time?

2. **Provide a brief biographical sketch of the service provider and his business history, including:**
   - Monthly and annual income
   - Number of and type of employees
   - Assets (tools) and other capital owned
   - Use of credit or loans
   - Interaction or engagement with local government
   - Probe and ask for details on all aspects of his/her overall business operations, revenues, profits, services provided, construction methods and materials used, role of latrine service in overall business activities, etc. *(Be sensitive to people’s reluctance to divulge financial information)*

3. **Qualifications and experience:**
   - Formal training (e.g., at vocational training institute): When trained
   - Where and by whom
   - Number of years working?
   - Number of latrines built in total (approximately)?
   - Number of latrines built in the last 12 months?
   - Where have you built latrines?
   - What towns/villages have you worked in?

4. **Latrine types and features built and breakdown of costs for each – use handout**
   - How do you pay for these purchases?
   - What is your relationship with materials providers?
   - How do the materials get from the provider to the construction site?

5. **For each type of latrine built briefly describe main features – use handout**
   - Note any variation from typical latrine type and find out whose idea it was mason or client.
   - Determine reason for the variation, and any extra cost charged or required for such a variation

6. **What features/styles do clients prefer? Why? Who in the household asks for these? By component:**
   - Pit shape and depth preference, why?
   - Slab floor, materials, and size, why?
   - Seat/drop-hole size, features, why?
   - Superstructure dimensions, number of cabins, materials, features, aspects
   - Finishes, e.g., tile, paint, surface finishing/coating, why? Other features?
7. What is the typical profile of latrine customers and where are most of the customers located?

8. Where do you get your construction materials, such as concrete, steel, and sand?

9. Problems encountered with latrine construction, such as:
   - Soil problems, homeowners with limited space, water table problems?

10. Your perceptions/observations (discuss by type of latrine):
    - Reasons, advantages, benefits for building different types of latrines.
    - Barriers, problems, or difficulties people face in building latrines

11. Sales
    - Is business seasonal in some way, and if so, why? How do you manage this?
    - Do you have more business than you can handle, or would you like to expand your business? If so, what ideas/plans for expansion?
    - Types of clients and customers
    - How many more customers/latrines could you handle/construct each month?
    - Have you ever considered expanding your business by hiring helpers to work with you? Is the work seasonal? How? (income, climate)
    - Are there ways to generate work outside of the traditional season?
    - Would you like to have more latrine construction clients? Which types of latrines would you prefer to build and why?

12. Payment terms – e.g. cash, swap for labour or resources

13. Marketing strategies—how do you find work:
    - How do clients learn about your services?
    - Do you advertise in any way?
    - Do you ever go house-to-house to solicit new customers?
    - How do customers contact you?
    - Do you receive support from the district assembly, local government, ward, and parish?

14. What would help you improve your work as a latrine mason?
What constraints or difficulties do service providers face in their work building latrines?

15. What ideas do you have about how to improve or expand your latrine building services?
    - How can you lower the cost to customers so more of them can afford to build a latrine? How would building more latrines than you now do affect you and change the way you organize your work now?
    - How could you continue to build latrines during those times that people do not have the money to pay for them?
We are gathering information about people's knowledge and experience with latrines. We do not plan to build any latrines or provide subsidy but we want to help latrine sellers to provide better and less expensive latrines in your area. Are you able to answer a few questions for us? It will take about 20 minutes.

1 QUESTIONNAIRE IDENTIFICATION

(This information should be filled out before meeting with the respondent)

<table>
<thead>
<tr>
<th>No</th>
<th>Question</th>
<th>Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Number of interview</td>
<td></td>
</tr>
<tr>
<td>1.2</td>
<td>T.A. name</td>
<td></td>
</tr>
<tr>
<td>1.3</td>
<td>Village name</td>
<td></td>
</tr>
<tr>
<td>1.4</td>
<td>Date of Interview</td>
<td>dd ___ mm __, 2011</td>
</tr>
<tr>
<td>1.5</td>
<td>Interviewer name</td>
<td></td>
</tr>
</tbody>
</table>

2 RELATIONSHIP TO HEAD OF HOUSE

<table>
<thead>
<tr>
<th>No</th>
<th>Question</th>
<th>Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>What is the relationship between you and the head of this house?</td>
<td>Self.................. 0 &lt;br&gt; Spouse............ 1 &lt;br&gt; Son/Daughter.... 2 &lt;br&gt; Other.................... 3</td>
</tr>
<tr>
<td>2.2</td>
<td>What is the respondent's sex?</td>
<td>Male................. 0 &lt;br&gt; Female.................. 1</td>
</tr>
</tbody>
</table>
| 2.3| What is the sex of the head of house?         | Male................. 0 <br> Female.................. 1 <br> [Enter sex even if the respondent is the head of household]
### 3  HOUSEHOLD WITH LATRINE

<table>
<thead>
<tr>
<th>No</th>
<th>Question</th>
<th>Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1</td>
<td>Do you currently own a latrine?</td>
<td>No………………………… 0  Go to question 5.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yes…………………… 1  Go to question 3.2</td>
</tr>
<tr>
<td>3.2</td>
<td>How many months ago did you construct your latrine?</td>
<td>___________________months</td>
</tr>
<tr>
<td>3.3</td>
<td>In total, how many months do you expect your current latrine to be in</td>
<td>___________________months</td>
</tr>
<tr>
<td></td>
<td>use?</td>
<td></td>
</tr>
<tr>
<td>3.4</td>
<td>What kind of below ground structure does your latrine have?</td>
<td>Unlined pit…………………………. 0</td>
</tr>
<tr>
<td></td>
<td>[Determine by direct observation if possible]</td>
<td>Lined pit – sticks/bamboo………………. 1</td>
</tr>
<tr>
<td></td>
<td>[Check one]</td>
<td>Lined pit – bricks………………. 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lined pit – cement rings ……………. 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other …………………………………………………. 4</td>
</tr>
<tr>
<td>3.5</td>
<td>Who dug your pit?</td>
<td>Male family member,…………………… 0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Female family member,……………… 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Neighbour or tenant,………………. 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Someone outside of household ……… 3</td>
</tr>
<tr>
<td>3.6</td>
<td>How many days did it take to dig your pit?</td>
<td>___________________days</td>
</tr>
<tr>
<td>3.7</td>
<td>Did you provide payment in cash or in-kind payment (maize, livestock,</td>
<td>No….. 0</td>
</tr>
<tr>
<td></td>
<td>return of labour) for someone to dig your pit?</td>
<td>Yes….. 1 If yes, how much did you pay ?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>___________________ K or in-kind</td>
</tr>
<tr>
<td>3.8</td>
<td>Did you provide payment in cash or in-kind payment (maize, livestock,</td>
<td>No….. 0</td>
</tr>
<tr>
<td></td>
<td>return of labour) for someone to line your pit? (for example with a</td>
<td>Yes….. 1 If yes, how much did you pay ?</td>
</tr>
<tr>
<td>3.9</td>
<td><strong>What kind of slab does your latrine have?</strong></td>
<td><strong>Wooden slab only</strong></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>----</td>
</tr>
<tr>
<td></td>
<td><strong>[Determine by direct observation if possible]</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>[Check one]</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.10</td>
<td><strong>Who collected the materials for your slab?</strong></td>
<td><strong>Male family member</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.11</td>
<td><strong>Did you provide payment in cash or in-kind payment (maize, livestock, return of labour) for someone to construct your slab?</strong></td>
<td><strong>No</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.12</td>
<td><strong>What kind of shelter walls does your latrine have?</strong></td>
<td><strong>Reeds</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>[Determine by direct observation if possible]</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>[Check one. If more than one wall material is used, choose material that covers the largest area]</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.13</td>
<td><strong>Who collected the materials for your shelter walls?</strong></td>
<td><strong>Male family member</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.14</td>
<td><strong>Did you provide payment in cash or in-kind payment (maize, livestock, return of labour) for someone to construct your shelter walls?</strong></td>
<td><strong>No</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 3.15 What kind of shelter roof does your latrine have?

* Determine by direct observation if possible *

<table>
<thead>
<tr>
<th>Option</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron sheet</td>
<td>0</td>
</tr>
<tr>
<td>Reeds</td>
<td>1</td>
</tr>
<tr>
<td>Fibrous cement</td>
<td>2</td>
</tr>
<tr>
<td>Plastic sheet</td>
<td>3</td>
</tr>
<tr>
<td>Salvaged material</td>
<td>4</td>
</tr>
<tr>
<td>No roof</td>
<td>5</td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

### 3.16 Who collected the materials for your shelter roof?

<table>
<thead>
<tr>
<th>Option</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male family member</td>
<td>0</td>
</tr>
<tr>
<td>Female family member</td>
<td>1</td>
</tr>
<tr>
<td>Neighbour or tenant</td>
<td>2</td>
</tr>
<tr>
<td>Someone outside of house</td>
<td>3</td>
</tr>
</tbody>
</table>

### 3.17 Did you provide payment in cash or in-kind payment (maize, livestock, return of labour) for someone to construct your shelter roof?

- No... □ 0
- Yes... □ 1 If yes, how much did you pay?

### 4 ADVANTAGES AND DISADVANTAGES

<table>
<thead>
<tr>
<th>No</th>
<th>Question</th>
<th>Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1</td>
<td><strong>What are the advantages of owning a latrine?</strong> <em>(do not prompt, let respondent discuss the advantages—mark down as 1, 2 and 3)</em></td>
<td>Improved cleanliness□ 0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Improved health□ 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>More privacy□ 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>More comfortable□ 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Convenience / save time□ 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Improved safety□ 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Improved status / prestige□ 6</td>
</tr>
<tr>
<td>Question</td>
<td>Options</td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>---------</td>
<td></td>
</tr>
<tr>
<td>Respect</td>
<td>□ 7</td>
<td></td>
</tr>
<tr>
<td>Guests can use it</td>
<td>□ 8</td>
<td></td>
</tr>
<tr>
<td>No advantages</td>
<td>□ 9</td>
<td></td>
</tr>
<tr>
<td>Don’t know</td>
<td>□ 10</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4.2</th>
<th><strong>What are the disadvantages of owning a latrine?</strong> <em>(do not prompt, let respondent discuss the disadvantages)</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Bad smell</td>
</tr>
<tr>
<td>1</td>
<td>Attracts flies</td>
</tr>
<tr>
<td>2</td>
<td>Cost to maintain it</td>
</tr>
<tr>
<td>3</td>
<td>Work to maintain it</td>
</tr>
<tr>
<td>4</td>
<td>Other people come to use it</td>
</tr>
<tr>
<td>5</td>
<td>Affects groundwater quality</td>
</tr>
<tr>
<td>6</td>
<td>Overflows</td>
</tr>
<tr>
<td>7</td>
<td>Pit collapses</td>
</tr>
<tr>
<td>8</td>
<td>No disadvantages</td>
</tr>
<tr>
<td>9</td>
<td>Don’t know</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4.3</th>
<th><strong>Would you like to make any improvements to your latrine?</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No</td>
</tr>
<tr>
<td>1</td>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4.4</th>
<th><strong>What is the first, second and third improvement you would make to your latrine?</strong> <em>(do not prompt, let respondent discuss their improvements – mark down as 1, 2 and 3)</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Install cement slab</td>
</tr>
<tr>
<td>1</td>
<td>Stop pit collapsing</td>
</tr>
<tr>
<td>2</td>
<td>Build brick walls</td>
</tr>
<tr>
<td>3</td>
<td>Install iron roof</td>
</tr>
<tr>
<td>4</td>
<td>Install vent pipe</td>
</tr>
<tr>
<td>5</td>
<td>Build a second pit</td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4.5</th>
<th><strong>How much would you be willing to pay or in-kind payments (maize, livestock, return of labour) to make these improvements?</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>_____________ ___________ K or in-kind</td>
</tr>
</tbody>
</table>

**Go to 7.1 – Handwashing**
### 5. HOUSEHOLDS WITHOUT LATRINE

<table>
<thead>
<tr>
<th>No</th>
<th>Question</th>
<th>Coding</th>
</tr>
</thead>
</table>
| 5.1| Have you ever thought about or discussed building a latrine for your family? | No................................. 0  Go to question 6.1  
Yes............................. 1  Go to question 5.2 |
| 5.2| What kind of below ground structure would your latrine have?              | Unlined pit.......................... 0  
Lined pit – sticks/bamboo......... 1  
Lined pit – bricks.................. 2  
Lined pit – cement rings.......... 3  
Other ........................................ 4 |
| 5.3| How long do you think this would take you to build?                       | ___________________________ days                                    |
| 5.4| Would you provide payment in cash or in-kind payment (maize, livestock, return of labour) for someone to dig your pit? | No..... 0  
Yes.... 1  If yes, how much would you pay ?  
______________________________K or in-kind |
| 5.5| Would you provide payment in cash or in-kind payment (maize, livestock, return of labour) for someone to line your pit? (for example with a stick/bamboo frame or bricks)? | No..... 0  
Yes.... 1  If yes, how much would you pay ?  
______________________________K or in-kind |
| 5.6| What kind of slab would your latrine have?                                | Wooden slab.......................... 0  
Concrete slab on wooden supporting poles................................. 1  
Concrete floor with concrete slab........................................... 2  
Concrete floor with ceramic pan............................................. 3  
Other ................................................................. |
<p>|    | How long do you think this would take                                    |                                                                              |</p>
<table>
<thead>
<tr>
<th>No</th>
<th>Question</th>
<th>Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.7</td>
<td>If you hired someone from outside the family to build the slab how much do you think it would cost?</td>
<td></td>
</tr>
<tr>
<td>5.8</td>
<td>What kind of shelter walls would your latrine have?</td>
<td>Reeds: 0  Plastic sheet: 1  Salvaged material: 2  Unburnt brick: 3  Burnt brick: 4  Iron sheet: 5  Wood: 6  No walls: 7  Other:</td>
</tr>
<tr>
<td>5.9</td>
<td>How long do you think this would take you to build?</td>
<td></td>
</tr>
<tr>
<td>5.10</td>
<td>If you hired someone from outside the family to build the shelter walls how much do you think it would cost?</td>
<td></td>
</tr>
<tr>
<td>5.11</td>
<td>What kind of shelter roof would your latrine have?</td>
<td>Iron sheet: 0  Reeds: 1  Fibrous cement: 2  Plastic sheet: 3  Salvaged material: 4  No roof: 5  Other:</td>
</tr>
<tr>
<td>5.12</td>
<td>How long do you think this would take you to build?</td>
<td></td>
</tr>
<tr>
<td>5.13</td>
<td>If you hired someone from outside the family to build the roof how much do you think it would cost?</td>
<td></td>
</tr>
</tbody>
</table>

6 ADVANTAGES AND DISADVANTAGES
### 6.1 What are the advantages of owning a latrine? (do not prompt, let respondent discuss the advantages)

<table>
<thead>
<tr>
<th>Advantage</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved cleanliness</td>
<td>0</td>
</tr>
<tr>
<td>Improved health</td>
<td>1</td>
</tr>
<tr>
<td>More privacy</td>
<td>2</td>
</tr>
<tr>
<td>More comfortable</td>
<td>3</td>
</tr>
<tr>
<td>Convenience / save time</td>
<td>4</td>
</tr>
<tr>
<td>Improved safety</td>
<td>5</td>
</tr>
<tr>
<td>Improved status / prestige</td>
<td>6</td>
</tr>
<tr>
<td>Respect</td>
<td>7</td>
</tr>
<tr>
<td>Guests can use it</td>
<td>8</td>
</tr>
<tr>
<td>No advantages</td>
<td>9</td>
</tr>
<tr>
<td>Don’t know</td>
<td>10</td>
</tr>
</tbody>
</table>

### 6.2 What are the disadvantages of owning a latrine? (do not prompt, let respondent discuss the disadvantages)

<table>
<thead>
<tr>
<th>Disadvantage</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bad smell</td>
<td>0</td>
</tr>
<tr>
<td>Attracts flies</td>
<td>1</td>
</tr>
<tr>
<td>Cost to maintain it</td>
<td>2</td>
</tr>
<tr>
<td>Work to maintain it</td>
<td>3</td>
</tr>
<tr>
<td>Other people come to use it</td>
<td>4</td>
</tr>
<tr>
<td>Affects groundwater quality</td>
<td>5</td>
</tr>
<tr>
<td>Overflows</td>
<td>6</td>
</tr>
<tr>
<td>Pit collapses</td>
<td>7</td>
</tr>
<tr>
<td>No disadvantages</td>
<td>8</td>
</tr>
<tr>
<td>Don’t know</td>
<td>9</td>
</tr>
</tbody>
</table>

### 6.3 What is the barriers that prevent you from constructing a latrine? (do not prompt, let the respondent identify the top 3 response)

<table>
<thead>
<tr>
<th>Barrier</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not physically capable of building</td>
<td>0</td>
</tr>
<tr>
<td>No cash to pay someone to build</td>
<td>1</td>
</tr>
<tr>
<td>No access to correct tools</td>
<td>2</td>
</tr>
<tr>
<td>The pit always collapses</td>
<td>3</td>
</tr>
<tr>
<td>No time available to build</td>
<td>4</td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

### 7. HANDWASHING – All households must answer

<table>
<thead>
<tr>
<th>No</th>
<th>Question</th>
<th>Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.1</td>
<td>Do you have a handwashing station in</td>
<td>No...........0</td>
</tr>
<tr>
<td>7.1</td>
<td><strong>Do you have a handwashing station in your compound?</strong></td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No………………[ 0 ]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes……………[ 1 ]</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>7.2</th>
<th><strong>Where is your nearest water source for washing your hands from your usual place of defecation?</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 – 5m………………………………[ 0 ]</td>
</tr>
<tr>
<td></td>
<td>&lt; 5m………………………………[ 1 ]</td>
</tr>
<tr>
<td></td>
<td>5 – 10m…………………………[ 2 ]</td>
</tr>
<tr>
<td></td>
<td>10 – 20m………………………[ 3 ]</td>
</tr>
<tr>
<td></td>
<td>&gt; 20m……………………………[ 4 ]</td>
</tr>
</tbody>
</table>
### 8. SOCIOECONOMIC – All households must answer

<table>
<thead>
<tr>
<th>No</th>
<th>Question</th>
<th>Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.1</td>
<td><strong>What is the age of the head of household?</strong></td>
<td>_______ years</td>
</tr>
<tr>
<td>8.2</td>
<td><strong>How many adults slept in this house last night?</strong></td>
<td>_______ number of adults</td>
</tr>
<tr>
<td>8.3</td>
<td><strong>How many girls (under the age of 18) slept in this house last night?</strong></td>
<td>_______ number of girls</td>
</tr>
<tr>
<td>8.4</td>
<td><strong>How many boys (under the age of 18) slept in this house last night?</strong></td>
<td>_______ number of boys</td>
</tr>
</tbody>
</table>
| 8.5| **What level of education did the head of household attend?**           | None 0  
Some primary 1  
Full primary 2  
Some secondary 3  
Full secondary 4  
Higher 5 |
| 8.6| **During the last two weeks, how much did you or a member of your household spend on the following items?** | Food K  
Health care K  
Education K  
Housing K  
Clothing K  
Ceremonies/gifts K  
Agricultural inputs K  
Productive assets K  
Consumer goods K |

*Read expense categories. Fill in amount spent on each item. The following categories should be explained to the respondent*

- **Agricultural inputs** includes consumable seeds, fertilizers, and pesticides
- **Productive Assets** includes durable tools and equipment used to earn money (e.g., pump, bicycle, sewing machine, etc.)
- **Consumer goods** includes durable items that do not earn money (e.g., cook stove, TV, mobile phone, furniture, water filter, etc.)
| 8.7 | **During which months during the last 12 months did you have to buy food?** | _______________________________name of months |