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Mobile Phones and Financial Services in Developing Countries: *A Review of Concepts, Methods, Issues, Evidence and Future Research Directions*

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Table of Contents

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Abstract

Research concerning mobile phones and financial services in developing countries has undergone rapid growth in recent years. This paper seeks to improve understanding of this expanding research area and in so doing consider the potential for mobile phone applications for the delivery of financial services for the poor. The current state of knowledge is assessed by reviewing the content of 43 research articles drawn from both peer-reviewed academic journals and non-peer reviewed studies and other practitioner-orientated sources. A framework is developed that categorises and analyses the research according to a socio-technical spectrum, identifying levels of analysis and differentiating research activity according to a lifecycle model that incorporates financial needs, design and applications, adoption and adaptation, and impact.

Positive aspects of research to-date are identified, most noticeably the high level of practitioner involvement in research publication and the strong links that have been forged between the mobile phone industry and the research community. This, however, has also caused research to become too narrowly defined and largely a-theoretical. Hence, research weaknesses and gaps are also identified suggesting that issues relating to financial needs and the measurement of impacts have been comparatively neglected, whilst application design and adoption have received greater attention. Emphasis tends to be on devices and new ways to deliver services, but ignores the broader context of financial services for the poor and tends to be technology-led. In order to correct this imbalance in research, the paper identifies key research gaps relating to concepts, methodologies, issues addressed and evidence presented and provides pointers to future research directions.

A. Background and Rationale for the Review

A recent paper from the Consultative Group to Assist the Poor (CGAP) examines *"how banks can translate the potential of mobile phones into greater financial access for poor people"* (CGAP, 2008b:1). The paper builds upon a succession of reports from donor and industry sources that highlight the potential of mobile phone applications to address the financial needs of those currently unbanked or excluded from formal financial services in developing countries (CGAP, 2008a; 2008b; UNCTAD, 2007; World Bank, 2006). Belief in the potential of mobile phones to help meet the financial service needs of the poor has been driven by rapid expansion of networks into previously un-served regions and communities of developing countries during the last decade. The impact has been most noticeable in the least developed countries (LDCs) of sub-Saharan Africa and South Asia where existing fixed-line infrastructure was particularly weak and underdeveloped.[i] Mobile communications are now the fastest growing technology in the developing world and research has already demonstrated that use of mobile phones has had significant socio-economic impact in poor communities (Abraham, 2006; Jensen, 2007; Overa, 2006).

Because mobile phones are increasingly becoming part of the everyday lives of the poor, it is argued that they have potential to become a low cost accessible 'account' or delivery channel for financial information, services and transactions (Porteous, 2006) thus facilitating innovations including micro-payments (m-payments), electronic money (e-money), and a banking channel (m-banking). Existing initiatives (e.g., Globe Telecom's GCash in the Philippines; WIZZIT in South Africa; Safaricom's M-PESA in Kenya and the Grameen Village Phone Programme in Bangladesh) are already demonstrating the viability of such services in developing country environments. Research also suggests that the poor majority are in need of, and are increasingly demanding, a broader range of micro-financial services that could potentially be delivered via mobile phones or via mobile phone operators. These have been specified as low cost solutions that can underpin regular savings, facilitate payments, enable monetary transfers (particular of small denominations) and supply micro-credit (Claessens, et.al 2006). However, studies also caution that the financial needs of the poor are fungible,[ii] and embody a complex set of interactions across a broad portfolio of predominantly informal financial service settings (Ghate, 1992; Matin, Hulme & Rutherford, 2002). There is a primary requirement, therefore, to more fully understand the interrelationship between the suggested *potential* for mobile phone applications and the *reality* of the financial service preferences and behaviours that the poor majority exhibit.

This paper seeks to address this question by assessing the current state of knowledge concerning the potential of mobile phones as a delivery mechanism for financial services for the poor in developing countries. Thus, the overall aims are as follows:

1. Provide a literature review and analysis of research concerning mobile phones and finance (m-finance) in developing countries – with particular reference to those currently unbanked, underserved and excluded from formal financial systems.
2. Categorise and analyse conceptual approaches for understanding m-finance in developing countries.

3. Categorise and assess methodologies used to carry out research studies, and evaluate the evidence from those studies.
4. Identify key research trends and gaps relating to: a) concepts; b) methodologies; c) issues addressed and questions raised; d) evidence presented; and e) future research directions in the area.

This review is opportune given there is growing global interest in the role of mobile phone technologies in developing countries from donors, governments, regulators, and the banking and commercial sector. At present the field of research is disparate. A number of studies have been conducted some of which are academic, but with a greater preponderance of ground level surveys carried out for specific purposes by practitioners. Consequently, academic research and conceptual understanding of mobile phones in the development of financial services is lagging behind the rapid pace of change on the ground. This is recognised in a discussion paper by Donner (2007) who identifies lack of primary research and lack of conceptualisation of how mobile phones can interact with existing financial networks. He also identifies gaps in research related to social perspectives concerning trust, risk, social ties, cultural norms, and other links to measures of social, as well as financial capital. Interestingly, literature reviews of m-finance undertaken in the industrialised countries (Dahlberg et al., 2008; Shahrokhi, 2008) come to similar conclusions – reporting the dominance of consumer-driven perspectives and the application of business-driven models in preference to analysis of socio-cultural factors and comparison between mobile, traditional or other electronic payment services.

This paper will build upon previous analyses and take stock of accumulated evidence and experience by seeking to provide a more structured approach to analysing the literature and identifying trends and gaps in order to map out a research agenda for mobile phone applications and financial services in a development context.

B. Framing m-Finance Research

Classification of m-finance research needs to take account of financial service preferences and behaviours on the one hand, and the technological potential of mobile phones on the other. At the human end of the spectrum, we can take a functional view of financial services in developing countries such as suggested by Claessens et.al (2006). This distinguishes financial service requirements: a) the ability to access credit including micro-credit and social protection cash transfers; b) the ability to deliver credit (including remittances); c) the means and motivation for savings; d) the means to facilitate cash transfers and make payments. This classification is useful for differentiating a range of existing or potential needs for financial services, as well as identifying underlying social, economic and cultural factors that determine and shape needs for finance. The importance of carrying out effective needs assessment for financial services prior to adopting new innovations in delivery mechanisms is emphasised by Hulme & Mosley (1996), and it is noted by Matin, Hulme & Rutherford (2002) and Ghate (1992) that the poor tend to have little interaction with formal financial institutions and systems, and on the whole favour informal mechanisms.

At the other end of the spectrum the functionality of the technology can be addressed, defined according to the technical capabilities inherent in (what is) a networked communication device. These are summarised by CGAP (2008b) as twofold: first, the ability to enter, display, process, store and transmit data and information concerning finance – recognising that as a device for processing and communicating information the mobile phone is limited in terms of processing power and the user interface – compared with automated teller machines (ATMs) or computer terminals, for example. Secondly, the ability to store, convert and transfer monetary value and enable transactions or payments [iii] – recognising the particular functionality of the SIM card – which is essentially a smart card that is embedded within the communication device, with built in security features that make it particularly suited to m-payments and m-banking applications.[iv]

The framing of m-finance research, therefore, needs to incorporate both social and technical parameters. Heeks & Bailur (2006) concur with this approach for considering information and communication technology (ICT) in a development context, and suggest a categorisation of conceptual approaches according to whether they represent:

a) s*ocial systems* – which are concerned with underlying socio-economic and cultural factors such as those that impact upon the financial needs of the poor.
b) s*ocio-technical systems* – which are concerned with understanding the interrelationships between social systems and technologies which would include examining the organisational and institutional factors that intermediate between the technologies and users.
c) *technical systems* associated with understanding the design, development and adaptability of the technologies themselves.

A further issue of classification concerns the level of socio-economic analysis at which the research is carried out, and the extent to which research identifies interrelationships between levels of analysis. Walsham & Sahay (2005) suggest that this ranges from: a) the *micro level* – where the focus of research would be the owners or users of m-finance applications:[v] these may be individual owners or shared users – such as within poor households, micro-enterprises or communities; b) the *meso level* – where the focus would be on the intermediaries that deliver m-finance services such as micro-finance institutions, network providers, or other informal intermediaries; c) the *macro level* – where the focus would be on examining the role of institutions that deliver infrastructure, determine policy and set rules and regulations within which m-finance initiatives can be developed.

A final requirement for framing m-finance research is a temporal (or time dependent) aspect. Here the 'informatics lifecycle stage of applicability model' (Heeks, 2006) can be adapted to incorporate both technical and social parameters applicable to m-finance in a development context. This model presupposes four main phases of development for m-finance initiatives.

1. *The assessment of the financial needs of the poor.* Assessment of needs can be differentiated and includes needs for financial information, as well as for transactions. Needs can be defined at meso- and macro-levels (e.g., market or regulatory needs) as well as at the micro-level of the individual user or community. Studies that highlight and differentiate needs provide a broader

socio-economic or socio-cultural perspective within which m-finance initiatives can be evaluated.

2. *The design and development of applications for mobile phones to address the financial needs of the poor.* Lying behind the hardware interface of the mobile artefact are less conspicuous software designs, network architectures and operational models that underpin the applications that facilitate communication with financial service providers, exchange of information concerning finance or enable financial transactions. Studies that address design and development are likely to take greater account of the role of the technical artefact, which as recognised by Orlikowski & Iacono (2001) has often been neglected in studies of ICT applications for development.
3. *The analysis of processes of adoption of m-finance applications.* Processes of adoption and adaptation are the linking mechanisms between the functionality of the technology and the needs of the users. Agarwal & Prasad (1997) state that the advantage of any innovation as compared to another method is positively and directly related to its rate of adoption. Thus, the rate and pattern of adoption within poor communities, as well as patterns of adaptation and system performance, are likely to be good indicators of potential. Processes of adoption include organisational factors (such as stakeholder involvement or business models) and institutional factors (such as policy and regulation) that govern technologies and users.
4. *The assessment of impact of m-finance initiatives/interventions*. Impact assessment encapsulates studies that focus on identifying the anticipated or actual impacts of an (m-finance) initiative or intervention, on the social, economic and environmental factors which the intervention is designed to affect or may have inadvertently affected (Kirkpatrick, 2000). Impact assessment may be directed towards accountability (to funders of initiatives for example), improving project/organisational effectiveness or policy and regulatory development.

C. Methodology for the Literature Review

Because the initial developments within this research field have been heavily influenced by the activities of practitioners, this literature review incorporates both 'academic' sources (peer reviewed – journals, working papers, conference papers) and 'practitioner' sources (exclusively non-peer reviewed – consultant's reports, official reports, journal articles, conference papers and other occasional and published papers). A number of criteria were set for the identification, selection and classification of literature sources.

- First, it was decided that the review would be time limited – identifying research that has been reported in the literature since the year 2000 with a cut off point of Aug 2008. Given m-finance in developing countries is a new area of practice and research, this timeframe allowed for the identification of some influential early studies as well as the bulk of recent studies that have appeared in the past three to four years.
- Second, the scope of the review would need to cross academic boundaries. Articles were drawn from a spectrum of disciplines incorporating social impact assessment at one end to business models and technical system design

at the other. Thus, research from a broad range of disciplines is a feature of the topic area with articles drawn from development studies, economics, banking and finance, technology and innovation, management and information systems (M&IS) and information & communication technology for development (ICT4D) (see: Table 1).

- Third, the type of content surveyed was limited in terms of the extent to which the research article addressed m-finance as a defined research area in a developing country context. Only articles dealing with m-finance as a core issue – research studies assessing the application of mobile technologies to financial services in developing countries – were included in the review. Thus, search criteria cross referenced key words linked to: a) mobile technologies (*e.g., mobile networks, cell phones, mobile, mobile phones*) with b) those linked to finance (*e.g., financial services, finance, payments, remittances, banking, transfers*) and c) those linked with the developing country contexts (*e.g., developing countries, poor, unbanked*).

Table 1 summarises the sources of the 43 articles that were included in the review together with their date of publication.

Table 1. Summary of Literature Sources and Year of Publication

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**Total**
Agricultural Economics		1								1
Contemporary South Asia				1						1
Computer Fraud and Security								1		1
Computers and Security					1					1
Electronic Commerce Research and Applications									1	1
Information Technology for Development								1		1
Innovations: Technology, Governance, Globalization								2		2
International Journal of Information Management				1						1
Journal of Economic Studies								1		1
Managerial Finance									1	1
Small Enterprise Development					1					1
Technology in Society			1							1
Other peer reviewed articles				1			2		1	4
Peer reviewed articles (total)		**1**	**1**	**3**	**2**	**0**	**2**	**5**	**3**	**17**
Consultative Group to Assist the Poor (CGAP)							1		2	3
UK Department for International Development (DFID)							3	1		4
The World Bank							2			2
Vodaphone Research								2		2
United Nations Conference on Trade and Development (UNCTAD)								1		1
Swedish International Development Agency (SIDA)								1		1
Other non-peer reviewed articles				1	1	2		5	4	13
Non-peer reviewed articles (total)				**1**	**1**	**2**	**6**	**10**	**6**	**26**
Total articles reviewed		**1**	**1**	**4**	**3**	**2**	**8**	**15**	**9**	**43**

The spread of research articles suggests a peak of interest in m-finance for development from 2006. This is largely the result of donor, mobile and banking industry funded researchers and other independent consultants progressing research in the area as well as a smaller number of academic studies. Because the majority of the articles were non-peer reviewed, there was a need to separate out the more deeply researched studies from the anecdotal evidence and other literature based on opinion or policy prescriptions. It was useful, therefore, to identify articles where primary data had been collected, and to critically assess the findings of such studies in the light of the theoretical and methodological approaches adopted. The primary categorisation was whether studies had been compiled using: a) new data collected from primary sources; b) data collected from secondary sources; or c) where no primary or secondary data was presented (see: Table 2).

Methodological approaches were classified along qualitative—quantitative (Orlikowski & Baroudi, 1991). This distinguishes between: a) quantitative studies which tend to be more representative in terms of sampling, but possibly contribute less to theoretical understanding; b) qualitative studies which largely focus on analysis of individual case studies, which make no claims to the general population, but tend to provide more in-depth data concerning processes and contribute more to theory. Also added to this list (as suggested by Walsham and Sahay (2005)) were: c) mixed methods studies; and d) studies that were purely descriptive.

For analysis of the articles, the method adopted by the co-authors was as follows. In the primary phase of the review the 1st author identified, read and analysed 31 research articles drawn from sources located at the 'social system' end of the spectrum. The 2nd author identified, read and analysed a further 12 research articles focusing on the 'technical system' end of the spectrum.[vi] Both authors then came together to: a) agree a preliminary coding scheme which would form the basis for the analysis in the study, and b) to review and agree the individual coding for each article. 50% of the total sample of articles reviewed was read and cross-checked by both authors. The final sample of 43 research articles was agreed upon for inclusion in the review.

The following section explains further the approach taken to classification and coding of the articles and maps and reviews the literature according to the approach to framing m-finance research set out in Section B.

D. Mapping m-Finance Research: Issues and Evidence

As a first step, the overall distribution of the articles is gauged, establishing their positioning according to the temporal lifecycle model and the level of analysis employed. Additionally, it is indicated whether the evidence presented is based on analysis of primary or secondary data or where no data is evident (Table 2).

Table 2: Mapping of Articles Reviewed According to a Temporal Lifecycle Model and Level of Analysis

	Studies assessing **needs** or requirements	Studies concerned with **design** of systems and areas of **application**	Studies concerned with processes **of adoption and adaptation**	Studies concerned with assessing **impact**
Studies conducted at the **macro**-level (infrastructure, policy and regulation)		8 *9* 15 *28* 43 *13* 22 **26**	**24** *25* *27* *35* 40	*33*
Studies conducted at the **meso**-level (intermediaries, delivery mechanisms)		*3* 31 37 *10* 38 **19** **21** *32* **18,** 23	*2*	
Studies conducted at the **micro**-level (individual owners/ shared users)	**4**	*29* 16, 34 **36** 30 **11** **14**	**7**	**20** **39** *41* **1, 5** 6**, 12, 17, 42**

Bold: analysis of data collected from primary sources (17 articles)
Italic: analysis of data collected from secondary sources (13 articles)
Normal: no data collected or analysed (13 articles)
See Section G2 for reference to article number

The mapping exercise shows a coalescing of studies around system design and areas of application. A large segment of this group also overlaps into adoption, whilst a slightly lesser number overlap into considering needs, and 2 studies span needs, design and adoption. Only one study deals exclusively with adoption and one exclusively with assessing needs. Fewer studies are found at either end of the lifecycle, with only 5 studies identified that make use of primary data to assess impact of m-finance initiatives at the micro-level. The collection and analysis of (new) primary data is concentrated at the micro-level, whilst studies at the meso- and macro-levels analyse some primary data sources, but a greater number of secondary.

The following section discusses key issues in more detail according to the evidence presented in a selection of the studies – focusing principally on those reporting primary data.

D1. Identification of Needs

The review identified only one study (Batchelor, 2007) that directly addresses the assessment of the financial needs of the poor *a priori* to specifying m-finance solutions. Data from 650 households in Senegal demonstrates that informal financial

systems predominate even amongst the 12-15% of the sample that were banked or belonged to credit unions. Whilst 40% expressed confidence in any future m-payments system for sending or receiving remittances, only 2% had sent money locally via airtime credits. Overall, this study reinforces the view of Donner (2007) that identifies the greatest need amongst the poor is for cash-in/cash-out systems, and person to person transactions that can be *additive* – in this case substituting for existing informal practices. The study also identifies need amongst the poor to facilitate remittances of small value that become uneconomic when transaction costs are high. This is considered potentially *transformative* as it provides a completely new service that was previously unavailable in poor communities. From the other primary studies, only Hughes & Lonie (2007) make any significant analysis of the needs of prospective poor or unbanked clientele – in relation to M-PESA, a Kenyan m-banking initiative directed at previously unbanked clients. Other studies specify needs in a more general sense – such as through recognising the high demand for socially contextualised information concerning finance, emphasising that phones are primarily a tool that facilitate social interaction (Aminuzzaman, et.al 2003), whilst other studies highlight market needs (CGAP, 2006; Porteous, 2006) or policy needs (CGAP, 2008a&b) arguing for a proportionate regulatory response that gives space for innovation and permits m-banking initiatives for poor clients to scale up safely.

D2. Design Considerations

In terms of *technical design*, the need to take greater account of user perceptions and capabilities is emphasised by Hughes & Lonie (2007) and Vaughan (2007) in studies of M-PESA. The case history demonstrates that although technical issues were not paramount (M-PESA was based on the application of existing and proven technology) application development was constrained by the need to simplify the operability of the user interface. It was also apparent that many of the successful technical adaptations were the result of local agents mastering the systems and creating their own innovations in the way the system was used and operated. Similarly, Infodev (2006) note that SMART and GLOBE Telecommunication's m-banking initiatives in the Philippines were founded on existing SMS technology, using SIM-based menus over GSM networks, and as such presented no serious technical design constraints. In common with other studies, a study of 215 low income users of WIZZIT in South Africa (Ivatury & Pickens, 2006) found that factors concerning the utility and social context of the system were far more important in determining usage patterns than technical design considerations. Williams & Torma (2007) further articulate the complexity of organisational and institutional factors confronting application design in a comparative study of the three most well publicised m-banking initiatives that are extending their reach to poor users (M-PESA, WIZZIT and GLOBE).

In terms of *organisational design*, agent-based systems (and underlying business models) represent a strong theme in the literature. Knight-John (2005) provides a study of the specific incentives that led Grameen Phone in Bangladesh to innovate successfully in the way that it did. That is, to be able to rapidly expand an agent-based network of Village Phone Operators (VPOs) able to resell telecommunication and financial services to the poor. Organisational factors played a key role. Grameen Phone had first mover advantage, and was able to piggy-back on a large and powerful institution that already had strong links into poor communities – the Grameen Bank. This facilitated easy access to credit histories which in turn led to selection of the most credit worthy VPOs. New organisational forms (through the use of agents) are

not confined to cell phone banking, but can be used to extend other forms of branchless banking to under-served communities at a fraction of the cost of setting up a new branch (CGAP, 2006). This has raised key institutional design issues related to preventing the heightening of operational, liquidity and reputational risk within the initiative, or indeed, within the banking system as a whole. In this regard m-banking is seen to confer certain advantages over other delivery channels where pre-paid connections can overcome credit worthiness problems and transfer risk to the re-seller of banking services (Williams & Torma, 2007; Knight-John, 2005). M-banking systems developed in the Philippines (SMART and GLOBE) have been particularly successful in this respect including those initiatives aimed specifically at poor clients such as the 'text to payment' project developed by the Rural Bankers Association of the Philippines which allows micro-loan clients to pay their loan amortisations using GLOBE's G-Cash platform through SMS (Jimenez & Roman, 2005).

D3. Adoption Patterns

The overall level and pace of adoption of m-finance services in developing countries is relatively low and confined to more affluent users. Brown et.al (2003) demonstrate this in a study of adoption of cell phone banking in South Africa using a sample of respondents located in urban areas. This target group may have been expected to be early adopters. Whilst 91% of the 162 respondents owned a cell phone, only 6% had used cell phone banking, but 35% indicated an intention to use it. At the time of the study, the use of cell phone banking was found to be very low in comparison with other channels including ATMs, mainline telephone and Internet banking. This may be expected in a relatively developed urban environment, and indeed the slowness in take up of m-banking has also been a feature of the industrialised countries due to the advantages conferred by alternative and pre-existing delivery channels, although it is noticeable that higher levels of m-banking success have been experienced in transitional economies such as Estonia and Turkey (UNCTAD, 2007). New initiatives in South Africa such as WIZZIT have since provided more innovative agent-based services, and Ivatury & Pickens (2006) report a greater level of uptake amongst low-income users.

Issues of policy and regulation are alluded to as significant constraints on m-finance adoption in a range of studies and reports (CGAP, 2008a&b; CGAP, 2006). The backdrop to the regulatory issues concerns the convergence of two previously separate and distinct regulatory regimes – that of banking and telecommunications – and the blurring of the distinction between services that are *bank-led* (a licensed financial institution or bank delivers an m-banking service to bank customers through a retail agent) and *non-bank led* (customers exchange cash for e-money stored in a virtual e-money account on the server of an organisation that is not a bank – such as a mobile network operator). These studies further suggest that whilst rigid regulatory regimes present a constraint, those which are adaptive and flexible facilitate innovation. This is demonstrated by Coetzee et.al (2003) in relation to a mobile banking initiative in Kenya which was initially set up using a vehicle service and VHF communications networks, but which subsequently migrated to GSM networks. The service caters for previously un-served rural communities, and survival and growth of the service was only guaranteed after the Kenyan government introduced special dispensations within the regulatory regime.

D4. Assessment of Impact

The survey turned up only five impact studies that collected data at the micro-level. This was unsurprising given that many such initiatives are at their pilot or early stage of implementation. The Grameen VPO programme in Bangladesh (Aminuzzaman, et.al, 2003; Bayes, 2001) is one programme that has created identifiable impacts. Two significant findings can be mentioned. First, both owners and users of Grameen VPO services are found to be amongst the comparatively better off strata of society. Only 4% of users were illiterate, compared with a 60% national illiteracy rate; users were predominantly men, and traders were overrepresented compared with farmers. Second, social calls predominated amongst users but these calls were strongly linked to arranging financial transactions or discussing financial matters (such as remittances or purchases). This underlines the importance of mobile phones as a communication device that is able to transmit information concerning finance and commerce, as well as a potential channel for financial exchange. On a slightly different track, Walia & Goodman (2007) assessed the impact of airtime transfer services in Egypt surveying 700 users and 300 non-users of the service. This highlights one of many novel adaptations of mobile phones as electronic money. However, the study finds that balance transfer is not used as a money substitute, but is used by low income users as a means to manage airtime and make mobile use more affordable. It also has an important social function – tending to reinforce family and friendship networks. Ivatury and Pickens (2006) touch on assessing impact and report that those on low incomes are making use of cell phone banking (via WIZZIT), but not the poorest, and predominantly those with higher levels of education and technological sophistication. The perception of the initiative from non-users classified as poor was found to be similar as towards other formal banking channels – of distrust and belief it is not for them.

E. Conceptual Approaches and Methodological Issues in m-Finance Research

This section categorises and analyses conceptual and methodological approaches taken in the studies, providing the basis upon which gaps in methodology and conceptual approach are identified in Section F. Table 3 positions each study according to the initial categorisation framed in Section B.

Table 3. Mapping of Articles Surveyed According to Conceptual and Methodological Approach Taken

	Approaches inspired by social theories	Approaches inspired by socio-technical theories (inc business models)	Approaches inspired by technical theories	No defined theoretical approach evident
Quantitative	33	**11**, 29, 30, 41		
Mixed methods	**1, 4, 17**	**7**		**5, 20**
Qualitative	2, **39, 42**	31, 38	34	3, 32
Descriptive: No defined methodological approach evident	6, **24**, 40	8, 9, 16, **26**, 37	13, 22, 28	10, **12, 14**, 15, **18, 19, 21**, 23, 25, 27, 35, **36,** 43

Bold: Studies analysing primary data (17 articles)
See Section G2 for reference to article number

E1. Conceptual Approaches

The broad initial categorisation from 'social to technical' and 'no theory' provided a valuable initial understanding and representation of the diversity of conceptual approaches identified, indicating a spread across all three categories. It confirmed that 17 of the studies made no recourse to theory or definable conceptual ideas and identified only 4 studies inspired by technical concepts. A more detailed picture of the conceptual approaches used to research m-finance in developing countries can be gained from Table 4. Here the key research approaches have been grouped according to the categorisation of issues addressed through the lifecycle model. 26 research articles are identified together with key references to their antecedents – previous research cited in the article upon which the conceptual approach was based. The conceptual approaches are also differentiated according to a schema adapted from Heeks and Bailur (2006) which creates a hierarchy moving from 'shallower' conceptualisation to 'deeper' theoretically-based approaches – as follows:

A. *Theoretically-based approaches*: which make clear use of an identifiable theory that can be applied or tested.
B. *Framework-based approaches*: that make use of a framework for analysis that is derived from a body of theoretical work.
C. *Model-based approaches*: models that are applied, but without reference to a deeper body of knowledge.
D. *Concept-based approaches*: that make use of a defined concept such as 'information poverty', but which is not theoretically grounded.
E. *Category based approaches*: that make use of a prescribed set of factors to carry out analysis.

Table 4. Mapping Conceptual Approaches to m-Finance Research in Developing Countries

Research Issue	**Conceptual Approaches Identified**	**Classification of conceptual approach**	**Antecedents cited**	**Article** (see Section G2)
Financial Needs	Information poverty	Concept	None	1
	Framework to assess mobile payments: built on theories of (i) consumer choice and demand; (ii) network externalities; (iii) switching costs; (iv) complementary goods; (v) information technology value; and (vi) adoption and diffusion	Framework	Bakos & Kemerer (1992)	2
	Additive-transformational m-payments model: assessing market needs	Model	None	4, 8
	Additive-transformational m-payments model: assessing regulatory needs	Model	None	9
Design and Applications	Additive-transformational m-payment model: four stages of market development	Model	None	28
	m-Payment/-banking business models: bank vs operator-centric	Model	None	13
	Theory of asymmetrical information and cultural perspectives on collective action	Theory	Putnam (1993)	1
	Transaction costs and new institutionalism	Theory	Williamson, 1985	24
	Bottom of the pyramid economics: theory of marginal customer	Theory	Prahalad (2006)	24
	Framework for assessing electronic payments	Framework	None	38
	Phases of mobile payment transaction: security requirements for electronic payment systems	Model	Spinellis et al. 1999	22, 34
	Theory of information added values	Theory	Kuhlen, 1996	29
	Six antecedents of m-payment adoption: current payment relationships, payment scenarios, suitability, ubiquity, regulatory and security concerns, and market segmentation.	Category	Lee & Benbasat (2004); Liao, et.al (2005)	31
	CAM design framework: architecture of mobiles for rural developing world	Framework	None	26
	Payments space	Concept	None	40

Adoption	Diffusion of innovations theory: the decomposed theory of planned behaviour	Framework	Rogers, 1983; Taylor & Todd, 1995; Agarwal & Prasad, 1997; Tan & Teo, 2000	7, 11
	Technology acceptance model; subjective security; task-technology fit	Framework	Davis et al., 1989	30
	Pull and push mechanisms	Model	None	16
	Access frontier	Model	Porteous (2005)	41
Impact	Additive-transformational m-payment model	Model	None	4, 41
	Ripple-effect technology	Concept	None	1
	Financial deepening, connectivity and economic growth	Theory	Claessens et.al (2002); Levine (1997)	33
	Banking market model: banking ladder	Model	None	37
	Social capital: theories of networks and social ties	Theory	Putnam (1993); Woolcock (1998)	17, 39, 42
	Trust: theory of reasoned action	Theory	Mayer, et.al (1995)	6

Studies that draw upon deeper *theoretically-based approaches* tend to be located in the field of economics, and are quite varied depending upon the level of analysis employed. At the micro-level, Au and Kauffman (2008) draw on theories of (i) consumer choice and demand; (ii) network externalities; (iii) switching costs; (iv) complementary goods; (v) information technology value; and (vi) adoption and diffusion, creating a multi-stranded approach for researching m-finance, focusing on testing hypotheses linked to processes of transition from pre-existing transaction networks to adoption and use of m-finance. Studies in this area draw upon contrasting theoretical ideas: on the one hand inspired by the 'new institutionalism' of Williamson (1989) or on the other by the 'bottom of the pyramid' economics of Prahalad (2006). For example, Knight-John et.al (2005) uses the theory of the marginal customer – one who gets excluded from market transactions under a given market setting or a particular configuration of supply and demand conditions. Here the advent of pre-paid market options and airtime transfer of small denominations are seen as proof that market innovations can be inclusive of the poor. In contrast to the above, Shamin (2007) draws upon macro-economic theories of financial deepening demonstrating that e-finance technologies (including m-banking) enhance economic growth because they lower processing costs for providers, and search and switching costs for users, whilst also increasing the availability of finance for low income borrowers. Also at the micro-level, Aminuzzaman et.al (2003); Donner & Tellez (2008) and Benamati & Server (2007) draw upon an economically-inspired understanding of social capital to show how trust in financial relationships is impacted upon by the advent of mobile phones, and how underlying cultural and social norms condition adoption and usage patterns.

Recourse to deep theory, however, is at its early stage of development and only isolated examples of research are identifiable. Much more prevalent is shallow theory which takes the form of *framework- or model-based approaches* (17 out of 26 articles) that have been applied to researching applications, design and adoption, in the main through approaches borrowed from information systems (IS) and innovation research and applied to m-finance. They include the technology acceptance model (TAM) (Davis et al., 1989); diffusion of innovation (Rogers, 1983); and the decomposed theory of planned behaviour (Taylor & Todd, 1995). The TAM has been used particularly to provide conceptual underpinning for studies of m-finance adoption such as Brown, et.al (2003) who define and test a range of factors (e.g., relative advantage, compatibility, complexity and trialability) in relation to a study of early adopters undertaken in South Africa.

Emerging *model-based approaches* are drawn from banking and finance research, and they have been applied principally to understand design and adoption (Choi, et.al, 2007; DFID, 2006; Kadhlwal & Anwar, 2007; Porteous, 2007; Tsiakis & Sthephanides, 2004), but also to specify and analyse needs (Batchelor & Scott, 2007; CGAP 2006; 2008a) and consider impacts (Williams & Torma, 2007). In general, such models have been applied in a rather ad-hoc manner, with a sense of critical mass only really being generated around m-payment models in relation to system security, where Spinellis et al (1999) have given conceptual direction to a number of studies, whilst also drawing upon developed country experience. Whilst conceptual parameters for system security have been developed, they have yet to be applied to research on real m-payment systems in developing countries.

Other models have been tailored specifically for m-finance research in a development context. Most prominent is the 'additive-transformational m-payment model' which has been used as a practitioner tool, as well as an underlying concept in academic research on m-payment systems, focusing on needs for remittances of small value (Batchelor et al, 2007), application design (Porteous, 2006), and classifying impact (CGAP, 2008a&b). The importance of developing effective business-models is emphasised in most industry-led studies – unsurprising given that all m-finance initiatives are essentially market-led and market-facing. The relative merits of bank-led or non-bank-led models for branchless banking are examined as are models of risk associated with the creation of new forms of agency in bank-customer relationships (CGAP, 2006). Other models suggest linear patterns of adoption, for example Porteous (2006) proposes an e-banking model that moves from pioneering, to breakout (replication), consolidation and maturity, with transition from one phase to the next requiring careful balancing of innovation and regulation of banking services. Alternatively, Williams & Torma (2007) model banking opportunities for the un-banked as a banking ladder that represents increasing take up of banking opportunities – moving from informal to formal systems. The ladder suggests a relationship between uptake of banking services and increasing levels of income, but questions whether willingness to pay (for m-banking services) is a result of price insensitivity given the attraction of security and convenience, or a reflection of the exploitation of market power and the extraction of economic rents by the service providers.

At the technical end of the spectrum, an interesting model has been developed by Parikh and Lazowska (2006) which suggests an m-finance architecture suited to rural applications. The proposed system which is being tested in an India micro-finance institution (MFI) purports to be user-friendly in design and documentation, tied to paper forms, localised and can be used offline. The authors argue that it is applicable to processing micro-finance loans, facilitating rural supply chains, and can form the starting point for future research in design of mobile applications for MFIs.[vii] Other *concept-based approaches* are used to explore the transformational impact of m-finance and include the ripple-effect of technologies and information poverty (Aminuzzaman et al., 2003) conceptualising impacts of m-finance in terms of empowerment of individuals economically and socially. The authors advise the need to explore the effect of such empowerment especially with regard to gender roles. Other *category-based approaches* (e.g., Saji & Agarwal, 2006), whilst useful, lack any identifiable conceptual basis.

E2. Methodological Issues

Overall, the sample of 43 articles contains 17 peer reviewed research studies and 26 non-peer reviewed (see Table 1). 24 studies (6 of which were peer reviewed) were purely descriptive accounts in which no approach to methodology was discernable. However, the absence of defined methods of enquiry did not necessarily detract from the insightfulness of the reported cases which were often informed by experienced practitioners or by those closely involved with m-finance initiatives or application contexts. Often, as in the case of Hughes & Lonie (2007) and Vaughan (2007) the methodological approach, although not made transparent, was indicative of *action research* which can be a particularly appropriate method for investigating new phenomena.[viii]

17 articles analysed primary data. As indicated in Table 3, a number of these (8) were descriptive accounts; these were made by practitioners closely involved with the initiatives themselves. When viewed in the context of the research area as a whole, only a small number of studies extract new primary data on the basis of a prescribed methodology. These are analysed in Table 5 using a range of evaluative criteria concerning research design, data, sampling and validity.

The number of studies employing a rigorous approach to methodology for the collection and analysis of primary data are a small proportion of the reviewed articles as a whole, and geographical coverage is biased towards Africa and South and East Asia. Another feature of the research area is that all the surveys are snapshots and as yet there is no availability of time series data or 'before and after' studies concerning adoption or impact – with the exception of Porteous (2007) who has begun to create a data set for South Africa that makes it possible to track m-banking adoption patterns and impacts over time.

Only one study (Cheong, et.al, 2005) employs a purely quantitative approach. Most make use of mixed method approaches (Porteous, 2007; Walia & Goodman, 2007; Batchelor & Scott, 2007; Ivatury & Pickens, 2006; Brown, et.al, 2003; Aminuzzaman, et.al, 2003; Bayes, 2001) that use questionnaire survey techniques to extract individual or household level data from samples of a few hundred respondents within a geographical spread confined to a particular district or region. Varying levels of reliability and validity testing have been built into most of the surveys, with the findings of some based on quasi-experimental design creating control groups of non-users and well as users of m-finance services. Most studies lack triangulation either through use of multiple research methods to cross check data, or by comparing data from differing groups of stakeholders. The representativeness of the findings is open to question in a number of the studies – with relatively small samples and lack of stratification and coverage. The level of analysis is predominantly micro – carried out amongst users, rather than providers of services.

Detailed qualitative research is thin on the ground. Case studies drawing on primary evidence are provided by Donner & Tellez (2007) and Morawczynski & Miscione (2008). These provide valuable insights, but are representative of exploratory or work in progress, and overall, there is a noticeable lack of in-depth qualitative case studies that could provide a basis for theorising.

Another issue linked to methodology concerns gauging the impartiality of the studies that are non-peer reviewed. Many of the key studies have been funded by industry research bodies and the affiliation of the authors is often to agencies or to consultant organisations that are partially funded by the mobile industry. The orientation towards industry needs is reflected in the use of business and market survey techniques in many of the reports concerned. A number of studies, however, were carried out by external consultants that were independently funded by donors, and these seem to provide more scope for impartiality, a greater focus on social research indicators, and a greater degree of critical analysis.

Table 5. Analysis of Methodological Approaches for Articles Based on the Collection of Primary Data

Criteria	**Source of data:**	**Type of data:** (quantitative/ qualitative/ mixed)	**Data-gathering methods:** (interview/ observation/ survey/ focus group)	**How representative:** (sample size and coverage)	**Reliability and validity:** use of control groups (users v non-users)	**Reliability and validity:** triangulation of methods or sources	**Timing:** Longitudinal (or repeat study) or cross-sectional	**Level of analysis:** macro/ meso/ micro (individual/ household/community)	**Country focus**
Study									
1. Aminuzzaman et.al (2003)	Primary	Mixed	-Questionnaire survey -Key informant interviews	-350 respondents -20 locations	Yes – 50 non users surveyed	Yes – 158 users, 85 operators, 55 key informants, 75 distant beneficiaries	Cross-sectional	Micro/meso – phone operators and users surveyed	Bangladesh
4. Batchelor & Scott (2007)	Primary	Mixed	-Questionnaire survey	-650 households from urban/semi-rural and rural areas	No – but gender an independent variable	Yes – some comparisons with national household survey data	Cross sectional	Micro	Senegal
5. Bayes (2001)	Primary	Mixed	-Questionnaire survey -Key informant interviews	-50 owners from 50 different locations around Dhaka -400 users drawn randomly	No	Yes – owners and users, and focus groups	Cross-sectional	Micro/meso – phone operators and users surveyed	Bangladesh
7. Brown, et.al (2003)	Primary	Mixed	-Questionnaire survey	-162 respondents: urban only (the majority young, educated and employed)	No – 91% owned cell phone	No	Cross-sectional	Micro	South Africa
11. Cheong, et.al (2004)	Primary	Quantitative	-Online questionnaire survey	-1034 respondents	No	No	Cross-sectional	Micro - users only	Korea
17. Walia & Goodman (2005)	Primary	Mixed	-Questionnaire survey -Focus group interviews	-1000 respondents -nationally representative	Yes – 700 user and 300 non-users	Yes	Cross-sectional	Micro	Egypt

20. Ivatury & Pickens (2006)	Primary	Mixed	-Telephone interview	-515 respondents	Yes – 215 low income users 300 low income non-users	Yes – some comparisons with national survey of financial service needs	Cross-sectional	Micro	South Africa
39. Donner & Tellez (2008)	Primary	Qualitative	-On-site Interviews	-20 micro-enterprises -Single location - Bangalore	No	No	Cross-sectional	Micro	India
41. Porteous (2007)	Primary	Quantitative	-Questionnaire survey	-4800 respondents -FinScope data (nationally representative)	Yes – 215 WIZZIT customers 300 non-customers	No	Longitudinal – comparable data for 2004 and 2006.	Micro	South Africa
42. Morawczynski & Miscione (2008)	Primary	Qualitative	-Participant observation -Semi-structure interviews	-Non-representative - single retail location	N/A	No	Cross-sectional	Micro	Kenya

F. Research Gaps and Future Research Directions

This final section identifies key research trends and gaps relating to the issues and evidence and the theoretical and methodological approaches followed in the reviewed studies. Finally, some pointers will be outlined for future research directions.

F1. Gaps in Issues and Evidence

As indicated through the application of the lifecycle model, research effort has been expended on studying application design and to a lesser extent adoption, rather than identifying needs or assessing *ex ante* or *ex post* impact.[ix] The lack of evidence concerning *ex post* impact is unsurprising given the relatively small number and the short time of operation of m-finance initiatives. The lack of focus on needs and *ex ante* assessment, however, is a more significant research gap. There is an indication, with some exceptions, that knowledge and understanding of the financial needs of poor communities have not been sufficiently linked to existing m-finance research or to the development and implementation of initiatives. This may be due to the fact that most, if not all, m-finance initiatives are commercially driven by the mobile phone industry as a value added service that is primarily designed to expand market share and generate revenue. Consequently research has been informed by business models that emphasise market development rather than social models that may put greater emphasise on community needs assessment. This orientation is followed by the current actors in the field of research, whose primary focus is system functionality and business value, focusing on technical and organisational aspects, rather than on the disruptive or ripple-effects the initiatives may have. Thus, emphasis tends to be on devices and new ways to deliver services – this is important, but ignores the broader context of financial services for the poor and tends to be technology-led.

There is a strong emphasis on specifying and assessing the shape of formal m-banking initiatives, but lack of studies analysing how mobile phones are interrelating with the pre-existing informal financial practices that the poor favour. This would fall into line with the observations of Donner & Tellez (2007) who recognise the need to specify mobile applications within contexts that define finance for the poor according to the social shape of existing networks of communication and transaction. In line with this view, a number of studies do seek to paint with a broader brush, considering the potential of m-finance alongside other access technologies and other approaches to 'branchless banking' (CGAP, 2008a; CGAP, 2006; Cracknell, 2004). This research indicates that extension of banking services via agents has been particularly successful in larger developing countries – Brazil, India and the Philippines – such as through the use of post offices, local merchants, lottery dealers and other retail agents.[x] These studies are useful in that they place m-finance initiatives within a broader context of banking for the poor, and allow judgements to be made about competing technologies and organisational forms. The value of scoping the issues and analysis more broadly can also be illustrated in the area of remittances, where m-payment systems are considered to offer greatest potential. A number of studies highlight the considerable functional potential of m-payments systems for handling transfers of small value. However, remittances are less well framed as a socio-cultural phenomena and it is not clear how well the functionality of m-finance systems can be adapted to remittance channels that are largely informal, and rooted in deeper culturally-driven systems of interaction based on trust and social bonding.

It is also evident that research linking technical solutions to the requirements of (what are termed) 'unbanked' users in developing countries is largely absent from the review. In particular, little research was identified arising from within developing countries: not only a lack of studies related to the development of appropriate user interfaces, but also those which seek to understand user environments. There are also gaps in relation to geographical focus. Studies tend to focus on, and draw examples from, existing m-finance initiatives located in Africa and South and East Asia. For this reason, the geographical gaps in the literature (particularly apparent for Latin America, China and SE Asia) are also significant. These may reflect: a) the absence of formal initiatives; b) the fact that such initiatives have remained undocumented or not widely disseminated; c) the bias of this review towards journals and reports published in the English language.

F2. Gaps in Conceptual Approach

M-finance research in developing countries in relation to design, applications and adoption has been fairly well conceptualised, drawing more strongly on innovation and IS research approaches, which provide a good grounding to facilitate and develop future research. Conversely, work on specifying and researching needs and impact has taken on a more a-conceptual approach, and consequently appears not to be following a well defined and thought out research trajectory. To date, no defined frameworks or proven theories have been specified, neither for understanding impacts nor assessing the financial needs of the poor and unbanked in relation to the potential adoption of m-finance applications and technologies. This review suggests that one reason for this may be that the complexity of influencing factors makes it challenging for practitioner-researchers to conceptualise or assess financial needs, applications, adoption or impact within a single model or concept-based approach. The prevalence of concept and model-based approaches over theory and (theoretically-inspired) framework-based approaches in the review gives weight to this view.

It is evident that academic researchers (who may put greater emphasis on researching financial needs, social impact and disruptive effects) are playing catch up. In this respect there is an opportunity to redress the imbalance evident in the research to date. This can be illustrated by contrasting the research effort in m-finance with approaches taken in the broader research area of micro-financial services and finance for the poor more generally where conceptualisation and research practice have been more strongly influenced by wider sociological and critical perspectives (Matin, Hulme & Rutherford, 2002; Zohir & Matin, 2004). Here, the emphasis has been to use detailed data gathering in poor communities to deepen understanding of the way in which the poor use financial services. These studies, and others from differing country contexts, can do much to inform m-finance research, suggesting approaches that seek to understand ICT application within a broader context of livelihoods (see, for example: Duncombe, 2006; Molla & Al-Jaghoub, 2007; Parkinson & Ramirez, 2006).

Greater emphasis on researching social and cultural contexts may also serve to highlight informal mechanisms to a greater extent and identify the potential disruptive effects of m-finance initiatives. Such negative impacts may arise because mobile phones are primarily a demand (market) driven innovation, so their use is likely to be distributed unevenly according to a range of non-dependent variables. This represents

another significant gap in conceptualisation (and methodology). The factors that are likely to be significant include gender, empowerment, social inclusion or exclusion and the manner in which use of mobile phones (for m-finance or otherwise) impacts upon social structure and cultural norms. This is a nascent research area, but an important one given the increasing level of mobile penetration in poor communities. A range of studies concerning mobile phones in development (m-development) have started to address these issues using a range of sociological perspectives. For example, Ureta (2008) draws upon theories of social and spatial mobility to analyse mobile adoption and use in low-income households in Chile; Molony (2007), Overa (2006) and Goodman (2005) link impact of mobile phones to differing conceptions of social capital; whilst Donner (2007) and Jagun, et.al (2007) make use of theories of information networks and information asymmetry to conceptualise the utility of mobile phones for micro-entrepreneurs. These studies display a higher degree of conceptualisation relating to the cultural and social determinants of mobile phone use and impact; avenues of theorising which are largely absent from m-finance research as yet.

F3. Gaps in Methodological Approach

The most apparent gap in the use of methods was the lack of in-depth qualitative studies analysing primary data – in contrast to the loosely-positivist mixed-method approaches which tend to dominate the area of study. Lack of depth of qualitative data may explain lack of conceptualisation as such studies have played an important role in other avenues of research concerning the application of ICTs to development (Walsham & Sahay, 2005). As indicated earlier, action research was evident in the review, particularly in the descriptive studies but with lack of overt reference to methodology.

Most studies investigating m-finance in a poverty context used a mixed-method approach. The best examples of these make use of multi-method approaches and multiple sources of data and a quasi-experimental research design that compares users and non-users of m-finance initiatives. Most studies, however, exhibit gaps in methodology which raise questions of reliability and validity of the findings. Three main issues stand out. The first relates to whether the results of surveys are representative (in terms of the wider population, but also the extent to which they address the potential for m-finance initiatives to meet the financial needs of the poor). Studies making use of control groups of non-users seek to provide a deeper level of analysis in this respect, but the size of the non-user samples tends to be small. Comparable socio-economic contexts are suggested for the control groups, but not specified in detail. Other methodological problems encountered include instances where data is collected using differing methods (e.g., telephone interviews for users and face-to-face for non-users). The second is the issue of causality – the extent to which the utility or wider social impact of m-finance initiatives can be attributed (i.e., how to disentangle the effects of the mobile phone from other contributory factors). This is a key constraint for studies that seek to measure broader socio-economic impact. This is also addressed in some of the studies through use of comparisons with non-user groups. However, such counterfactual assessment is of limited value unless it can be demonstrated that the user group and the control group are directly comparable in terms of a wide range of non-dependent variables. There were only a small number of cases (e.g., Aminuzzaman, et.al, 2003; Ivatury & Pickens, 2006)

where these issues had begun to be addressed. A related issue is the problem of endogeneity – or reverse causality – the problem of establishing the direction of cause and effect – or what Donner & Tellez (2007) conceptualise as the *bi-directionality of influence*. Does, for example, the use of m-payments lead to a reduction in poverty, or is it a reduction in poverty that leads to (or facilitates) the use of an m-payment service? A third issue concerns the extent that lessons learned can be transferred from one context to another. Because most studies are exploratory, their geographical and locational scope is limited – often to urban or peri-urban areas – or focusing on groups that are culturally distinct. As yet, due to the small number of studies, there is little indication of how findings may differ when the studies are replicated in different cultural, locational or country contexts.

With regard to levels of assessment, the literature review as a whole threw up a great deal of policy discussion and analysis at the macro-level dealing with infrastructure and regulatory issues, as well as from a meso-level perspective dealing with the development of applications and the role of financial and mobile phone intermediaries and delivery mechanisms. The evidence base at the micro-level upon which much of this discussion rests is relatively small and geographically biased. There is also a lack of studies that effectively link and inter-relate levels of analysis – particularly those that focus on needs and impact. Another methodological problem at the micro-level concerns how to model and measure the extent of mobile phone ownership and use within poor communities. In this respect, the level of access – and the way in which individuals or households can relate to mobile phones – will be a major determinant of m-finance potential. Here, the interrelationships between the intermediary and the user are crucial, and as James & Versteeg (2007) point out there is currently very little known about these interrelationships and about actual levels and patterns of mobile usage in poor communities.

F4. Conclusions and Pointers for Future Research

This review indicates a rapid expansion of research into mobile phones and finance applied to developing countries, and as yet there has been no systematic attempt to review how this research has progressed both conceptually and methodologically. This paper is intended to fill that gap. It is hoped that the studies reported here are representative of the field of research, and the interpretation of those studies by the authors accurately reflects the research conducted.[xi]

Overall, the reviewed studies indicate

- A high level of practitioner involvement and the high level of positive interaction between the donor community and the mobile phone industry. This has set in motion a research agenda that seeks to seriously address the potential of new technologies to serve the needs of poor communities via m-finance.
- Specific attempts to develop theoretical models, and create a deeper understanding of m-finance applications, most noticeable in the area of application development and technology adoption.
- A small number of primary research studies that have developed rigorous methodologies for data collection and analysis, and where those approaches and lessons learned have been documented and shared.

On the other hand the reviewed studies also indicate:

- That the research area has become too overtly 'technology-led' and driven by a mobile industry-donor nexus which (and in the absence of a strong evidence base) has tended to over-'hype' the potential of m-finance applications for poor users.
- There has been lack of focus on assessing financial needs *a priori* to specifying m-finance solutions, and by and large importance has not been attached to analysing the relationships between the technical and systemic aspects of m-finance services and the behaviours and preferences of poor users.
- In this respect there has been lack of focus on methodologies that emphasise user involvement such as participatory methods and action research, or where these approaches have been used they remain undocumented. For example, Participatory Learning and Action (Hulme, 2000; Mayoux & Chambers, 2005) are recognised methods of pro-poor needs and impact assessment and have been applied widely for researching micro-financial services and finance for the poor. In the small number of impact studies carried out research has not been linked – conceptually or methodologically – with mainstream knowledge and research concerning impact assessment of financial services and assessment of pro-poor development interventions more generally.
- The research area overall is unbalanced in terms of methodological approach, with use of surveys and quasi-experimental techniques outweighing qualitative approaches – which could be used to build in-depth case studies that can form the basis for theorising. With a few notable exceptions, the research reviewed tends to lack depth of evidence and analysis. Issues of validity of findings and attribution of causality have yet to be addressed sufficiently.
- Overall, there is lack of geographical diversity, with the state of current knowledge based upon a relatively narrow evidence base. There is also lack of published research being conducted by developing country institutions and researchers.

In terms of pointers to future research, the following should be considered.

Practical approaches to research design are likely to be conditioned by financial, time-related and other constraints. More complex approaches that aim for higher levels of reliability through statistical measurement necessarily involve larger samples, longitudinal surveys, control groups and carefully constructed research designs. This type of approach – aimed at proving impact or causality – will only be followed if sufficient resources are made available to conduct the research – likely to be funded either through donor or industry sources if the research area is considered strategically important. Independent research is more likely to be progressed on the basis of simpler research designs requiring less resource. Thus, research is more likely to follow current trends in terms of providing timely information that can contribute to improving impact, enhancing programmes and contributing to policy.

In order that such research can constitute a reliable source of data and evidence it is important that research methods are enhanced. This can be achieved by building on the current quantitative and mixed-method approaches (which are essentially quasi-experimental) to improve their reliability through use of larger and more carefully constructed samples, and repeat studies, but also through use of extensive and clearer statements of the methodology which will aid the transferability lessons learned.

Outside the confines of current research, there is also an urgent need to broaden out the research methods used. This should involve the construction of more detailed qualitative case studies (possibly within a mixed-method approach) with more effective use of triangulation of research methods and sources of data. More detailed qualitative data may help map the complexity of causal chains of impact, with greater emphasis placed on understanding and theorising the micro-processes that cause the poor user to interact with a mobile device or to make use of a service delivered via mobile networks.

In this respect, greater emphasis needs to be put on integrating m-finance research into more mainstream research themes at the micro level. Donner (2007) suggests theorising around social capital and broader socio-cultural domains concerning both formal and informal information systems and contexts. Linking m-finance research to notions of social capital is a route whereby theoretical issues could be investigated, for example: a) the changing patterns of communications that underpin social capital resources related to finance (e.g., trust, security, risk aversion); b) the impact of new information sources concerning finance (e.g., client-based information that can be used by service providers); and finally c) how transactions and monetary payment or exchange can be facilitated, and how 'transformational' mechanisms interrelate with the existing semi-formal and informal financial networks that are widespread in poor communities.

A second theme not yet addressed concerns linking m-finance research to mainstream research approaches concerning finance for the poor. Mainstream research has been strongly influenced by multidisciplinary approaches combining social, cultural and economic perspectives. It has produced a detailed understanding of the financial service behaviours and preferences of poor clients and users (Matin, Hulme & Rutherford, 2002; Zohir & Matin, 2004). Applied to m-finance, this approach would involve specifying the detailed money management needs of poor households and communities in relation to a fluctuating mix of lifecycle, emergency needs and investment opportunities as well as gauging the personal and organisational preferences of the users of (m-finance) services as well as wider cultural, social, political, economic and institutional intervening factors. The utility of mobile phones as a delivery channel for financial information and transactions could then be considered alongside other means within this broader context. Moving m-finance research into the mainstream of research into micro-financial services and pro-poor development would provide a welcome complement to existing research trajectories.

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Endnotes

[i] ITU data (International Telecommunications Union (2008)) shows in the case of the poorest continent – Africa – mobile penetration for individual countries has increased from an average of 2% of total population in the year 2000 to an average of 25% in 2007. This impressive growth masks extreme variations between countries, but overall, mobile cellular networks have now extended coverage to over 60% of the total African population creating network access potential for previously un-served communities in some of the poorest countries. Many sub-Saharan African countries with a GDP per capita less than US$500 (in 2007) are fast approaching near universal mobile network coverage. For example, Ghana stands at 68%, Rwanda at 80%, Sierra Leone at 70% and Uganda at 80% coverage of the total population.

[ii] Fungibility is the interchangeability of things that are identical or uniform. The term is frequently applied to money because any given amount can be used interchangeably with any other amount. The use of financial resources is highly fungible as the household budget shifts between consumption and investment in response to changing needs and opportunities. The divide between business and personal assets is often not clear.

[iii] Donner & Tellez (2008) classify these three functions of m-finance as the ability to: a) store value in a remote account accessible by a handset; b) convert cash in and out of the stored value account by visiting a bank branch or a retail agent that may be located locally in a kiosk; c) transfer the stored value between accounts of individual account holders by means of text message or menu driven commands and PIN numbers.

[iv] Porteous (2006:3) defines 'mobile payments' as financial transactions undertaken using mobile devices such as a mobile phone. Mobile banking (m-banking) includes m-payments but involves access by mobile devices to the broader range of banking services, such as account based savings or transaction products offered by banks. M-payments and m-banking are themselves subsets of the broader domains of e-payments and e-banking respectively.

[v] Research carried out by James & Versteeg (2007) distinguishes between mobile phone subscribers, owners and users and points to some of the methodological problems of defining access to mobile phone services, and the difficulties in relying on data from published sources (e.g., International Telecommunications Union) that define mobile phone penetration according to the number of subscriptions per head of population.

[vi] Online searches were conducted accessing a broad range of databases from within the social sciences – incorporating a broad range of disciplines – Economics, Banking and Finance, Development Studies, Business and Management Studies, as well as more specialised disciplines that reach across into the socio-technical and technical domains – Computer Science, Informatics, Information Systems, and Information and Communication Technologies for Development (ICT4D). Databases searched were: *ABI-Inform (ProQuest)*, *EBSCO Business Source Premier*, *Emerald Fulltext* and *Science Direct* as well as more general searches using both *Google* and *GoogleScholar*. Additionally, a number of websites specialising in the dissemination of research concerning mobile phones and development were searched (*kiwanja.net/ dgroups.org/ mobileactive.org*).

[vii] This model focuses specifically on mobile phone applications, but links into a broader avenue of research that falls outside the remit of this review. This includes a growing number of studies that investigate the adoption and use of ICTs by micro-finance institutions. These include use of ICTs for upgrading internal information systems as well as externally facing systems linking with micro-finance clients. See for example: Mathison (2007); Hishigsuren (2005); Magnette & Lock (2005); Hernandez & Mugica (2003).

[viii] Action research is a reflective process of problem solving led by individuals or teams or as part of a "community of practice" to address issues and solve problems. Action research can also be undertaken by organisations, assisted or guided by professional researchers, with the aim of improving their strategies, practices, and knowledge of the environments within which they practice. See, for example Greenwood (1998).

[ix] *Ex ante* assessment forecasts potential impacts as part of the planning process for m-finance initiatives, whereas *ex post* assessment identifies actual impacts associated with the implementation or as a result of the initiative having been implemented. *Ex post* impact assessment provides either for corrective action to be taken or lessons to be learned (see, for example, Kirkpatrick, et.al, 2001).

[x] For example, since 2000 there has been an unprecedented growth in the outreach of Brazil's banking system. The most striking has been the huge expansion in 'correspondent banking outlets' with 32,000 new outlets created between 2000 and 2004. The correspondent outlets focus mostly on transaction and payment services, including government benefits and payment receipts, as well sale of pre-paid cell phone cards and SIM cards. Correspondent outlets have been particularly successful in reaching poor

clients, due to the considerable reduction in variable and fixed costs of providing services (see: Kumar, et.al, 2006).

[xi] The methodology of the review has sought to search out a comprehensive range of literature concerning m-finance in developing countries and apply an objective and balanced analysis, but some limitations to the review are also noted: First, there are gaps in the literature coverage due to coverage being limited to peer-reviewed journals and other non-peer-reviewed sources printed in the English language. Coverage is also biased towards those countries where m-finance initiatives are underway, with a particular focus on African English-speaking countries such as South Africa and Kenya. Second, the review included available published sources only, which may have excluded 'grey literature' and other reports or studies compiled in developing countries that have not been disseminated via established networks or placed online.