



D4: Executive Summary: Evidence of mobile internet usage in Sub-Saharan Africa and South Africa

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D5: Final Report: Evidence of mobile internet usage in Sub-Saharan Africa and South Africa

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D4: Executive Summary

Evidence of mobile internet usage in Sub-Saharan Africa and South Africa

The latest GSMA 2024 report shows that 2015 marked a turning point, with more of the world's population now living within mobile broadband coverage. However, it also reports that the mobile internet usage gap has widened and is worse in Sub-Saharan Africa (SSA) and South Africa (SA). While these findings provide a broader macro-level perspective, a nuanced micro- or individual-level picture of why people do or do not use the internet is largely lacking. In particular, there is a lack of synthesised evidence or reporting on the factors or drivers of mobile use, whether people use the internet, what they use it for and the impact of their use.

Accordingly, this evidence gap map (EGM) is the first such initiative by the GSMA Foundation M4D team with the assistance, internally of the GSMA Foundation marketing team and externally, the Basic Internet Foundation, Norway, to examine the evidence and gaps in mobile internet usage or its gap. Broadly, an EGM refers to a synthesised body of evidence and gaps based on a literature review on what is known (evidence) or not known (gaps about the knowledge) in an area of interest to inform priorities for intervention. The analysis involves 113 empirical peer-reviewed journal articles published between 2015 and 2024, with 66 qualitative, 41 quantitative and 16 mixed methods papers. A caveat is that this does not reflect the whole universe or experience as it excludes grey literature, including policy reviews and practitioner reports where such evidence may exist. Nevertheless, the EGM gives an overall picture and dipstick understanding of the situation and is a valuable starting point and tool to inform policies and programmes for accelerating mobile internet usage.

The GSMA M4D team's theory of change informed the overall methodology. It involved an iterative process with co-creation workshops internally, between the GSMA Foundation M4D and Marketing teams, and externally between the GSMA M4D team and the Basic Internet Foundation, Norway, with brainstorming, scoping the research questions, an initial literature review, an initial systematic literature review and developing an EGM framework. The EGM framework was validated by experts and users using interviews through an online survey. Then, a final systematic literature review was conducted, followed by a synthesis of the evidence and gaps in a report.

Overall, the EGM evidence points to some low-hanging fruits or quick wins to accelerate mobile internet usage by amplifying enablers such as access to information, the youth dividend and education while reducing or removing barriers such as costs and socio-cultural norms, gender and rural-urban divide. This increases access to services such as utilities, mobile money and banking, and connecting with family and friends, which impacts the user's life management and economic prospects. Also, consistent with the Mobile Gender Gap Report 2023, the evidence shows that mobile internet plays an important role in women's empowerment but needs targeted policies to accelerate its uptake by this disadvantaged demographic group.

However, the evidence seems to be of low quality and sparse, in general, and in specific countries, except for a few on salient drivers, activities and impacts of mobile internet and nothing at all in some, if not the majority of SSA countries (48 out of 54). Also, the analysis

suggests a gap between what researchers report on and what practitioners understand as challenges. For instance, in contrast to GSMA Connected Women's recommendation, there seems to be a lack of evidence on the role of policy and regulation, which can help address issues of relevance and mobile internet uptake by women. Furthermore, the evidence is skewed towards users and neglects the role of service providers. This report is intended for GSMA staff, association members, policymakers, development practitioners, and the broader stakeholder and research community.

Summary of findings

What do the numbers tell?

1. The growth of the literature shows a rise in empirical studies on mobile internet usage across the SSA and SA region from 2015 up to 2021. Although it declined from 2022, the average number of articles shows fair attention on the subject across the period.
2. The 113 articles include 66 qualitative, 41 quantitative and 16 mixed methods papers.
3. The geography of the evidence covers a total of 29 countries, 22 in SSA, 7 in SA and no evidence in 31 SSA countries. In the 22 SSA countries, the evidence varies from very little research (1 article in 5 countries) to a significant level (19 articles in Ghana). There is a similar trend for SA countries.

What is the evidence?

1. Drivers

- The enablers of mobile internet usage are digital skills, access to information, the youth divide, and education.
- The main barriers to mobile internet usage are costs and socio-cultural norms with gender and rural-urban divide also playing a role.

2. **Activities/uses of mobile internet:** access services and connect with family and friends.

3. Impacts:

- Improved social and emotional well-being.
- Better life management and economic opportunities.
- Increased women's participation in income generation.

What are the gaps?

The findings reveal a dearth of evidence on several key aspects, including:

- The absence of explicit policy regulations;
- The lack of attention to the role of service providers;
- The failure to consider the use of mobile internet for entertainment;

- The omission of emergency services, legal awareness, human rights and community safety;
- The inadequate treatment of digital skills, particularly in terms of their acquisition;
- The lack of attention to the potential negative uses and adverse consequences of mobile internet.

Recommendations

1. Practitioners

- The GSMA and its stakeholders need to pay attention to the nuances of digital literacy and user profiles, and strive to meet training and user needs;
- Find innovative ways, including inclusive business models and governance processes, to address cost, cultural and social norms, particularly those that prevent women from using the mobile internet, such as access to digital health information;
- Leverage the need for access to services as an enabler for mobile internet adoption by supporting an inclusive digital ecosystem, including connected schools and community learning and living labs, to foster digital entrepreneurship with tailored services that respond to local needs.

2. Policymakers

- Develop and implement targeted policies, especially regulations, to address the cost of access and the negative uses and consequences of mobile internet.
- Instantiate the Digital Public Infrastructure (DPI) in their respective country to ensure an inclusive access to mobile Internet.
- Support efforts to increase digital literacy and the use of mobile internet for women's empowerment.

3. Researchers

- Research on under-researched aspects of mobile Internet, such as policy and regulation, digital literacy, negative uses and consequences of mobile Internet, and the role of service providers.

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D5: Final Report: Evidence of mobile internet usage in Sub-Saharan Africa and South Africa

1. Mapping Mobile Internet Usage And Challenges In Sub-Saharan Africa And South Asia

The GSMA 2023 report³ on the state of mobile internet connectivity across the world shows that 2015 is a year that represents a turning point indicating that significant efforts have been made to connect the unconnected at which 95 per cent of the world's population now live within the footprint of mobile broadband coverage, meaning more and more people are connected than ever bridging the physical digital divide. According to the report, people can be unconnected in two ways, "either they live in an area not covered by mobile broadband, or they live in an area that is covered but they do not use mobile internet" (p11).

Thus, while significant efforts have been made to connect the unconnected and ensure no one is left behind, the paradox is that other forms and higher levels of the digital divide have emerged. The first level digital divide refers to physical access, and higher levels including the second and third levels refer to differences in internet use and its impact respectively⁴. Although 96 per cent of the global population is now physically connected, the GSMA reports that only 57 per cent have access to mobile internet. The rest cannot access it, and most do not own mobile phones. This usage gap (39%) is more than eight times the coverage gap (4%) and appears to widen as the coverage gap narrows. Further considering, meaningful connectivity, which goes beyond physical access to include affordability, appropriate technologies, knowledge, skills and relevance⁵, the percentage of people meaningfully using mobile internet to participate in the digital economy makes the challenge even more glaring. Compared to high-income countries (HICs), the report shows that this challenge is worse in low to medium-income countries (LMICs), where the intersection of gender and the rural-urban divide, the affordability of data and devices and digital skills present high barriers to entry to mobile internet usage. In LMICs, Sub-Saharan Africa (SSA) and South Asia fare the worst, and the impact is severe for underserved people and communities. Overall, the GSMA 2023 report gives a high-level or broader outlook at the macro level for mobile internet connectivity and usage patterns.

However, there is a need to go beyond these numbers or black box and get a nuanced picture at the individual level and examine the evidence regarding the extent to which these benefits accrue to different population groups across various geographies. Therefore, our study sought to

³ <https://www.gsma.com/r/wp-content/uploads/2023/10/The-State-of-Mobile-Internet-Connectivity-Report-2023.pdf>

⁴ Ogbo, E., Brown, T., Gant, J., & Sicker, D. (2020). when being connected is not enough: An analysis of the second and third levels of the digital divide in a developing country. *Journal of Information Policy*, 11, 104–146. <https://doi.org/10.5325/JINFOPOLI.11.2021.0104>

⁵ https://www.gsma.com/solutions-and-impact/connectivity-for-good/mobile-for-development/gsma_resources/policy-considerations-to-accelerate-digital-inclusion-for-women-in-low-and-middle-income-countries/.
<https://www.isocfoundation.org/2024/10/whats-the-gender-digital-divide/>

address two key questions: What are the individual-level results, both positive and negative, for people accessing mobile internet in SSA and SA? How prevalent and consistent are these results?

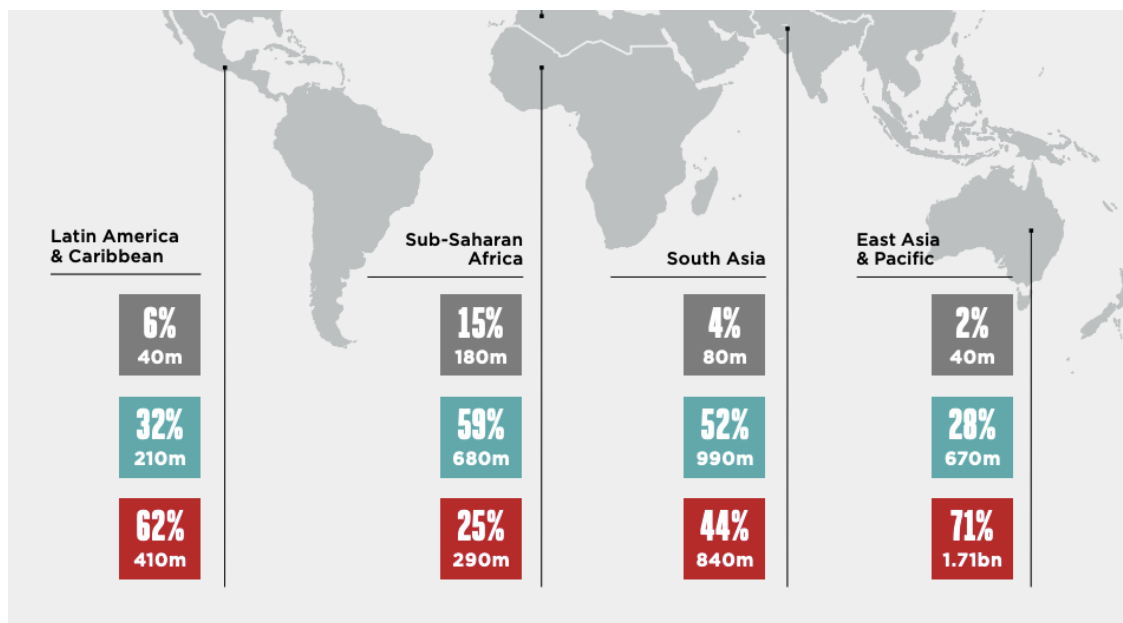


Figure 1: Mobile internet usage gap across the world

Accordingly, we conducted an evidence gap map (EGM) of 113 empirical journal articles (66 qualitative, 41 quantitative and 16 mixed methods papers) published between 2015 and 2024 to explore the evidence and gaps in mobile internet usage in SSA and SA, focusing on the drivers or barriers and enablers and the socio-economic results, including the activities and impacts of the access to mobile internet for different groups of people. An EGM is a tool that “provides an innovative and visual approach to establishing what we know and do not know about the effects of interventions in a thematic area”⁶. Simply put, what we know is the evidence and what we do not know are the gaps. The tool makes evidence available in an accessible format for users, especially providing practitioners and policymakers with evidence-based research to inform policies and programmes. The next step was to use the framework to further analyse the 113 articles to create the EGM. The outcomes involve a descriptive analysis of the existing evidence, which is presented in a visual map where the number of cited studies is represented by “the size of the spheres, and the level of evidence by applying a colour code to signify low, moderate and high levels of evidence, and no evidence. The the visual map is accompanied by a narrative form and report discusses the results including the extent of evidence and the analysis of gaps.

In summary, the evidence suggests that access to information, young age and education are enablers of mobile internet usage whereas costs and socio-cultural norms are the main barriers to mobile internet usage but gender and rural-urban divide also play a role. The internet mainly

⁶ Snilstveit, B., Vojtkova, M., Bhavsar, A., Stevenson, J., & Gaarder, M. (2016). Evidence & Gap Maps: A tool for promoting evidence informed policy and strategic research agendas. *Journal of clinical epidemiology*, 79, 120-129.

provides access to services and allows users to connect with family and friends, which positively impacts the user's life management and economic prospects. However, there is less evidence of policy regulation and mobile internet's negative uses and adverse impacts. Based on this evidence, the report provides recommendations to practitioners including GSMA and its members as well as policy makers on what they can do to facilitate the uptake of mobile internet in SSA and SA, and consequently address the usage gap.

This report is intended for GSMA staff, association members, policymakers, development practitioners, and the broader stakeholder and research community and be valuable input for designing their programmes and interventions. Understanding the drivers, uses, and impact of mobile internet plays an essential role in the GSMA M4D's theory of change. Currently, there is no synthesised evidence. The evidence on mobile internet use varies regarding the extent to which determinants and benefits accrue to different population groups across various geographies. Therefore, obtaining a complete picture and understanding of mobile internet usage in SSA and SA countries is essential in M4D's future program design and related GSMA programmes such as Connected Women. In addition, the EGM will inform future collaboration and planning and better understand the mobile ecosystem in LMICs, especially the Global South, and its potential role in development.

2. Overall Methodology: Framing And Identifying The Evidence

2.1 Building the EGM framework

The overall process of gathering and analysing the evidence involved three main stages with iterative steps anchored on co-creation workshops involving the GSMA M4D team, internally with the GSMA Marketing team, and externally with the Basic Internet Foundation. The co-creation workshops also served for validation or pivoting, where each outcome is tested against assumptions and fine-tuned to achieve its purpose. Although a systematic literature review (SLR) traditionally guides EGMs' development, we creatively extended the process by developing a novel approach that we termed the EGM Builder, which was then used to inform the final analysis of the evidence or literature to produce the EGM. The overall process, as illustrated in Figure 2, has three main stages or components:

1. The initial keywords with themes or topics identified from an initial literature review.
2. Revised keywords underpinned by a SLR with high-level aspects to identify articles and emerging themes to revise the initial categories
3. Final keywords informed by an internal validation workshop meeting, and external validation by users and experts through using an online survey interview questionnaire.

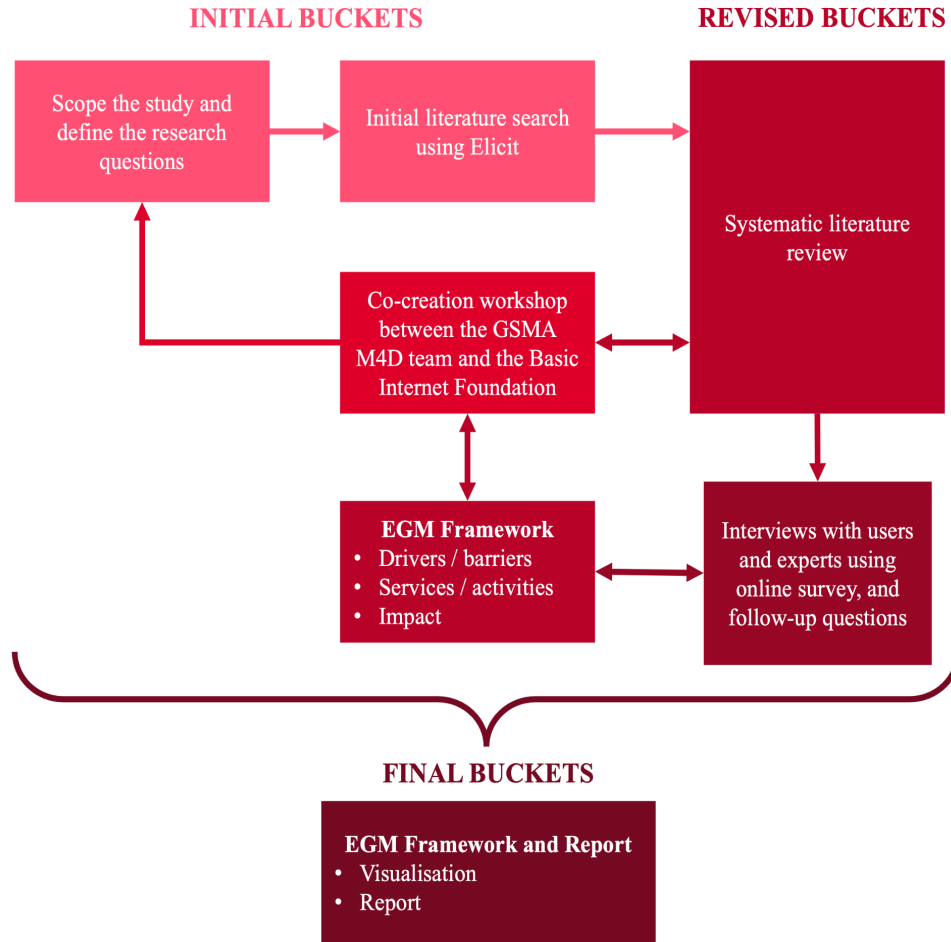


Figure 2: Process for EGM Builder and Final EGM

2.2 Stage 1: Initial keyword list

The GSMA M4D team, the Marketing team and the Basic Internet Team brainstormed the approach using co-creation workshops to explore what is out following the findings of the GSMA report for 2023 and the identified challenge of the mobile internet usage gap in SSA and SA to scope the key research questions and delimit the study. The key research questions also guided by an initial literature review, taking a rapid literature review or quick scan conducted with the aid of an AI tool, Elicit. 13 articles were identified and used to create the initial list of topics to make categories to guide the development of the EGM framework. The outcome was a list with 51 broad topics, also termed keywords. The initial literature review helped to avoid imposing a framework but to work deductively from the literature to theoretically ground the EGM framework. These broad topics or keywords were narrowed to 17 keywords in line with the key research questions through a co-creation workshop and provided the search terms for an SLR, which formed the input of boolean operators with “OR” and “AND” as follows:

"Mobile broadband" OR "Mobile coverage" OR "Mobile internet" OR "3G" OR "4G" OR "5G" OR "Mobile network*" OR " Smart phone*" OR "Mobile applications" OR "Mobile apps" OR "Mobile data*" OR "Mobile services" OR "Mobile health" OR "Mobile Money" OR ((“Mobile internet” OR “Mobile phone” AND “E-government”)) OR ((“Mobile internet*

" OR "Mobile phone" AND transaction*)) OR (("Mobile internet" OR "Mobile phone" AND e-learning*).

2.3 Stage 2: Revised keyword list

The SLR started by conducting a search using the Scopus database, which was used to conduct the SLR. Although Scopus and Web of Science are the most used and appropriate databases for social science topics, we only used the first because it is the most comprehensive, 7 and covers almost 99.11% of the journals indexed in the second database. Our search focused on articles' titles, abstracts, and keywords. The inclusion/exclusion criteria were that the articles must be empirical at the micro-level, focus on the target population of individuals or groups such as SMMEs or communities, and explicitly address the mobile internet issue. Initially, the scope was limited to 2010 to 2024 and yielded 731 articles. The rationale is that GSM emerged in 2000, and we expect its impact to have a lagged effect at least ten years later. The 731 articles were uploaded to Rayyan, a screening software tool, following PRISMA guidelines. The screening excluded 529 articles and remained with 202 articles for full-text screening and assessment for eligibility. We narrowed the period of interest to between 2015 and 2024. The rationale was that the GSMA report 2023 highlighted 2015 as the turning point where the first level digital divide of physical access had been addressed, but with higher level divides of usage becoming apparent. The final and full-text screening and eligibility assessment yielded 113 articles for analysis. An initial analysis based on full-text screening in Ryaan yielded 18 keywords or topics with 44 subtopics. The keywords or topics were further analysed using an Excel sheet and workshopped by the co-creation teams. Four main categories of the topic emerged:

1. **Target population** group addressing the population, types of businesses, and societal aspects including levels of analysis and demographic groups, e.g. gender, youth, and women.
2. **Drivers** include barriers (negative aspects) and enablers (positive aspects), where costs, ownership, culture, and online safety are barriers, while digital skills, education, and access to information are enablers.
3. **Services/use of mobile internet** include activities describing how users interact with mobile internet. Examples include connectivity to family and friends, social networking, mobile financial services, and entertainment.
4. **Impact** refers to changes, effects, and results that occur or appear directly or indirectly due to an intervention, in this case, the use of mobile internet. Like drivers, an impact can be positive or negative, such as social inclusion, and cybercrimes like scamming respectively.

2.4 Stage 3: Final keywords and validation: EGM framework

The draft keywords developed in stage 2 were further refined into an EGM framework, as shown in Figure 3, in an iterative process by the co-creation teams by asking probing questions. The first question was, what are the drivers of mobile internet uptake, which can be either an enabler or a barrier? For drivers, seven keywords or topics emerged along two dimensions: at the

micro level, the individual level drivers are handset affordability, fear and lack of trust, user profiles and access to information as a driver; at the macro level, framework conditions include regulations and coverage, and cultural factors or norms around phone ownership and use.

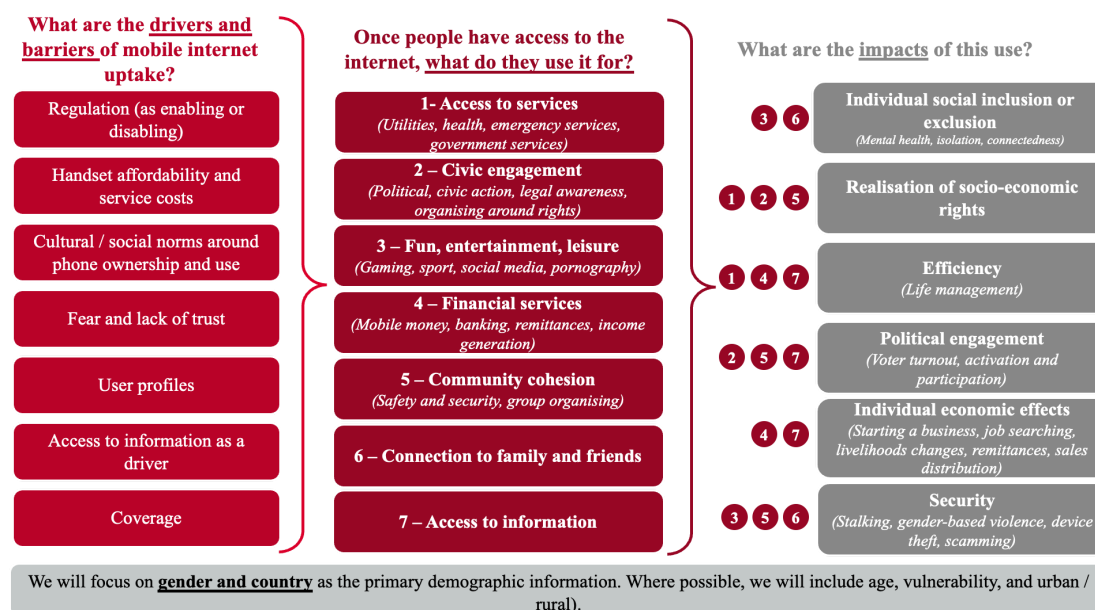


Figure 3: EGM framework (Source co-creation by GSMA M4D and Marketing teams and Basic Internet Foundation, Norway)

The second question we explored was: Once individuals have Internet access, how do they utilise it? Conversely, if individuals lack Internet access, what opportunities do they miss? This perspective allowed us to view the activities turned on by internet access or off by lack of it. 7 topics or keywords were identified and explain how individuals use mobile internet. Lastly, The third and last question asked what the impacts of these uses are. We ended with six topics with a cross-cutting nature with mobile internet, as shown in Figure 2, where at least one impact is related to more than one use or activity. The EGM framework was employed to re-analyse the 113 articles. The results are presented first, starting with numbers or statistics and followed by the actual analysis of the evidence.

3. Analysis Of The Evidence Base: The Growth And Geography Of The Evidence

The evidence shows a cumulative growth of 113 empirical studies, 41 quantitative, 66 qualitative, and 16 mixed-method articles on mobile internet usage across the SSA and SA region, as depicted by the rise from 2015 to 2021 in Figure 3. Although the number of articles started declining from 2021 to 2024, the number suggests relatively fair attention to the subject.

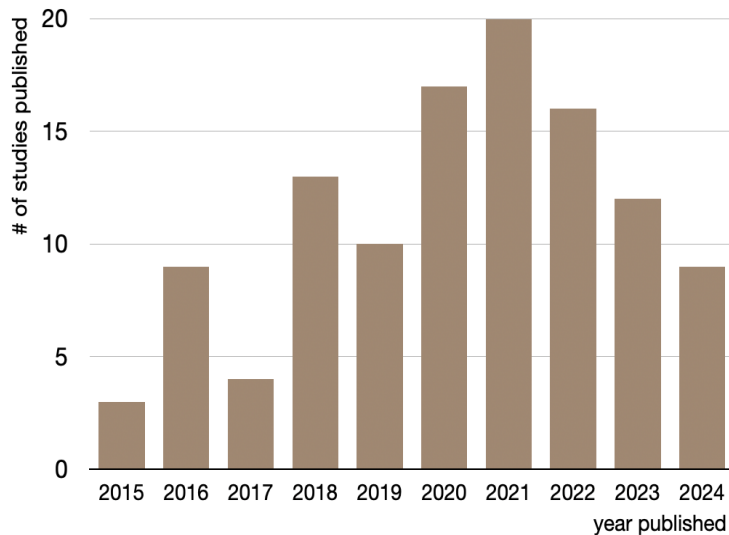


Figure 4: Number (#) of studies published per year, out of the total of 113 studies

The geography of the evidence gives a total of 29 countries, with 22 in SSA and 7 in SA, as shown in Figure 4. The map shows no evidence in 31 countries in SSA, with varying extents in the 22 countries, from very little research to significant levels, as shown by the colour intensity of the map. Similar trends appear in the 7 South Asia countries. In general, and in the specific context of individual countries, the geography of the evidence shows that there is very little or sparse reporting on the salient drivers, activities and impacts of mobile internet usage.

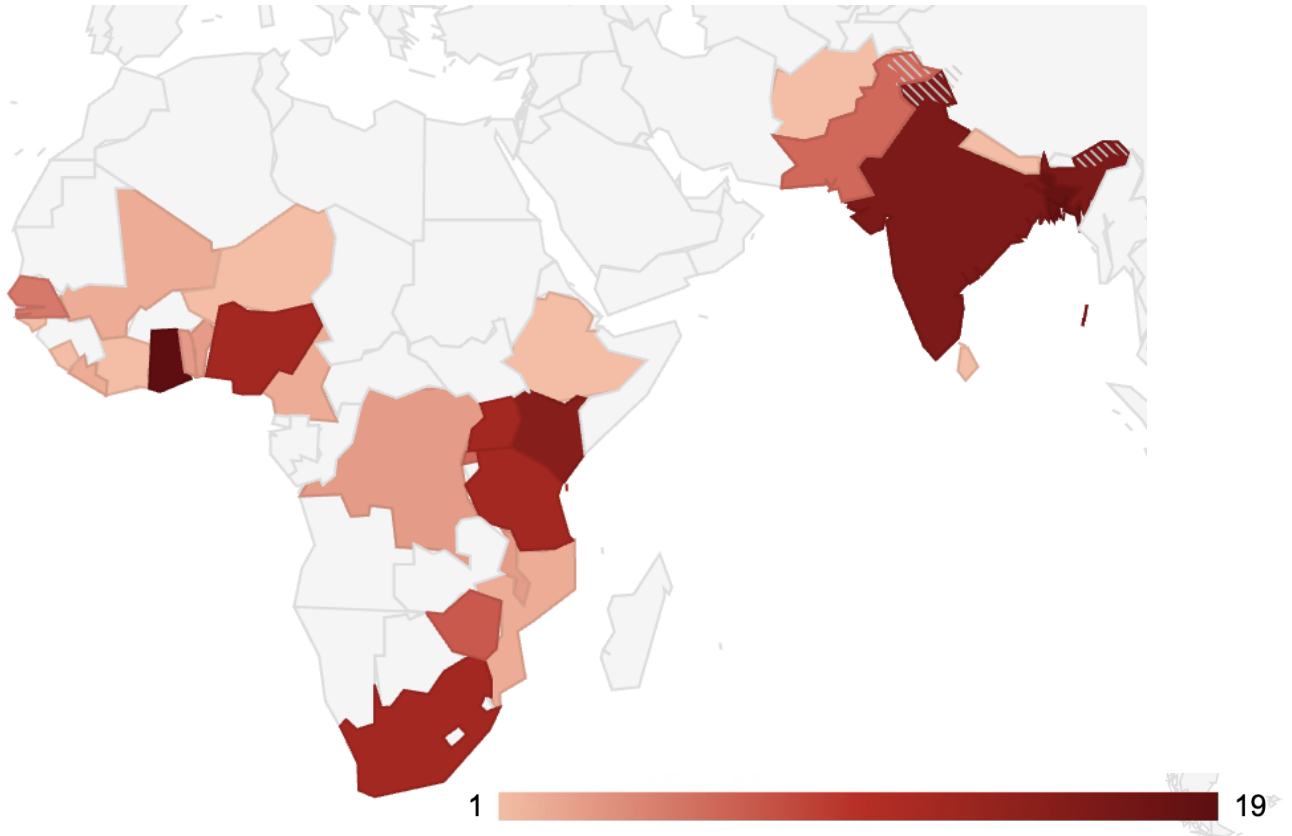


Figure 5: Geography of Evidence in SSA and SA based on scientific publications

Further, as presented in Figure 6, there is no evidence on all 7 themes across most countries in SSA and SA, 9 countries. The exception of relatively few gaps (5 to 8 themes) in 11 countries and very few gaps on 2 to 3 themes in 9 countries, 8 in SSA and 2 in SA and little evidence on many themes that the existing interventions and their impacts in accelerating mobile internet usage, seem to be of low quality. Most countries have very little evidence ranging from 1 to 3 articles, a few in between with 4 to 5 articles and very few with 6 to 8 articles. Overall, Figure 6 shows that the evidence is of low quality regarding the drivers, uses, and impact of mobile internet in SSA and SA.

		Benin	Cameroon	Cote D'Ivoire	DRC	Ethiopia	Ghana	Guinea-Bissau	Kenya	Liberia	Mali	Mozambique	Niger	Nigeria	Rwanda	Senegal	Sierra Leone	South Africa	Tanzania	Togo	Uganda	Zimbabwe	Afghanistan	Bangladesh	India	Maldives	Nepal	Pakistan	Sri Lanka	
	#	3	2	1	3	1	19	1	15	2	3	2	2	1	12	6	5	1	12	12	3	12	7	1	18	16	1	1	6	
Digital skills	20	1				1	2		3	1	1	1		5	2		1	1	2		2	2		4	3		1	2	1	
Gender	39	2		1		1	6	1	5	1	2	1	2	1	6	3	2		4	8	2	6	5	1	3	6	1	1	5	1
Youth	26						7		3	1	2			3	1			4	2	1	3	4		2	3	1		1		
Education level	43	2	2	1	1	1	6	1	3		1	1	1	1	6	2	1	1	3	5	2	4	2	1	7	7	1	1	2	1
Adolescent	5	1		1				1		1		1		1							1				2			1		
Rural	12						1		1					2	1	1				2		2	1		2			1		
Urban	23	2		1			3	1	6	1	2	2		1	3	3	1		3	1	2	3	1		3			1		
Policy - regulatory	9	2		1			1	1	1			1		2	1			1	2	1										
Handset affordability and service costs	41	2		1	1	1	7	1	8	2	3	2	1	1	8	3		1	7	6	2	8	3	1	6	4		1	3	1
Access to electricity	9	1		1		1	2	1	2		2	1	1	1	3	2	1		1	2	1	1	1		1	1		1	1	
Cultural /social norms	41		1			1	7		6	2	3		1		5	2	1	1	3	5		6	3	1	8	6		1	5	1
Lack of trust in pricing	15	1				1	2		2		1	1	1		2	1	1		3	2		2	1		5	3		1	1	1
Fear and lack of trust	0																													
Device theft and security	19						5		1		1								3	1	1	2	1		3	4	1			
Access to information	37				2		8		3		1			3	2			6	3	1	2	3		4	5	1		1		
Mobile network	13	1		1			1	1	2			1		1	1	1	1		1	2	1	1	2		3	1		1		
Access to electricity	10	1		1		1	2	1	2		2	1	1	1	3	2	1		1	2	1	1	2		1	1		1	1	

Figure 6: Overview of articles per country in SSA and SA

4. Evidence And Analysis Of Mobile Internet Usage

4.1. Overview of the evidence and analysis

Evidence Gap Map Mobile Internet: from Drivers & Barriers to Service usage and Impacts		1- Access to service s	2 - Civic engage ment	3 - Fun & entertain ment	4 - Financi al service s	5- Comm unity cohes ion	6 - Connec tion to family and friends	7- Access to Informa tion	Individual social inclusi on or exclusi on	Realisa tion of socio- economic rights	Efficien cy& Life manag ement	Politica l engage ment	Individ ual econo mic effects	Securit y& violenc e	SSA	SA
Digital skills	20	11		2	11	5	7	3	9	4	18		13	1	14	5
User profiles	75	35	2	9	38	15	24	21	35	21	68	3	32	3	54	15
Policy - regulatory	9	5	1		4		1	1	4		8	1	4		9	
Handset affordability and service costs	44	20	1	7	17	7	11	16	20	11	39	3	17	1	38	8
Cultural /social norms	41	18	1	7	18	7	13	11	21	10	33		15	3	27	12
Fear and lack of trust	23	17	2	1	14	4	11	2	10	7	21	1	9	1	12	7
Access to information	37	23	1	1	26	10	18	10	14	12	31	1	19		26	6
Network coverage	17	8	1	1	8	2	4	5	7	1	16	1	8		14	4

Figure 7: High-Level Results of drivers, activities and impacts based on the EGM framework

Figure 7 presents a dipstick or overview of the evidence on the drivers of mobile internet usage and its outcomes. The evidence for drivers suggests a fair balance between the enablers and barriers for activities or uses of mobile internet. The evidence suggests that user profile, followed by access to information and user profile, handset availability and service costs, cultural/social norms, fear and lack of trust, digital skills, network coverage and policy regulation are the main determinants of uses of mobile internet. These factors, respectively, mainly affect financial services, followed by access to services, connection to family and friends, and access to information, but the least in their descending order are community cohesion, fun and entertainment and civic engagement. While some of the factors are clear and can be delineated into barriers or enablers, the user profile combines education, youth and gender, where the first two are enablers and the last is a barrier. A similar pattern emerges for the impacts of these drivers, which mainly affect efficiency and life management, followed by individual social inclusion or exclusion, individual economic effects and realisation of socio-economic rights. There is more evidence in SSA than in SA.

4.2. Granular evidence and analysis of drivers and uses

Overall, the EGM evidence points to some low-hanging fruits or quick wins to accelerate mobile internet usage by amplifying enablers such as digital skills, the youth dividend and education, and the need for access to services. While digital skills are presented as an enabler for mobile internet usage, we know less about where and how users get them. Thus, digital skills are treated as a black box; where and how people acquire them remains mute. At the same time, the evidence suggests that there is an opportunity for targeted measures or interventions to reduce or remove barriers such as costs, socio-cultural norms, and gender and to bridge the rural-urban divide. The evidence also suggests an intersection between gender and cultural and social norms. Hence, women are less likely to use mobile internet. Reasons for the gender gap include lack of access to phones, income to purchase mobile broadband, fear of technology and cost control, and value perspective of services/content for daily life. Similarly, gender seems to be treated largely as a blackbox without paying attention to the nuances of the circumstances women might find themselves in. Some of the little evidence suggests mixed outcomes on the use of mobile internet by women varying from restrictive to permissive circumstances depending on their marital status and patriarchal norms. While in some societies, patriarchal norms restrict women from owning a mobile phone and using mobile internet, in others, the mobile internet is perceived to create affordances for women by enabling them to engage in income generating activities, especially widowed and single women. Nonetheless, the evidence suggests that in both societies, a change in men's attitudes could be key to transforming women's lives. Overall, a closer look at the evidence suggests that aspects that are enablers of mobile internet usage and those that are barriers seem to counteract each other.

Evidence Gap Map Mobile Internet: Drivers & Barriers and Impacts			1 - Access to services				2 - Civic engagement				3 - Fun & entertainment				4 - Financial services				5- Community cohesion		6 - Connection to family and friends				7-Access to information				
			Health care	Utilities	Emergency services	Governmental services	Political engagement and action	Civic action	Legal awareness	Human rights	Gaming	Sports	Social Media	Sex& Pornography	Mobile Money	Banking	Remittances	Income generation	Community safety	Community building	Income generation	Remittances	Mobile Money	Income generation	Connection to family and friends	e-Learning	Search	News	Income generation
		9	58	0	9	3	3	1	1	6	0	9	5	20	21	9	35	0	17	8	9	14	4	20	18	7	0	11	
Digital skills		20	1	10		1					2		1		1	2	1	9		4	1	1	1	2	3	3	1		1
User profiles	Gender	39	1	15		2	1	2	1	1	1		6	4	5	4	3	13		6	6	3	2	2	10	2	6		7
	Youth	26	2	10			1	1			1		7	4	6	4	1	7		7	3	1	1	1	8	3	5		4
	Education level	43	4	19		2	1	1			2		1	1	5	7	4	12		7	3	4	4		9	8	3	2	3
	Adolescent	5		2									1	1	1			2		1	1				1	1		1	1
	Rural	12	1	4		2							1		3	1	1	1		2		1	2		3	1	2		
	Urban	23	1	7							3		3	1	5	2	1	8		5	3	1	2	2	5	1	5		5
Policy - regulatory		9		4		2	1									1		4						1					1
Handset affordability and service costs	Cost of access to data and internet	41	3	17		1	1	1			3		7	4	8	1	1	11		7	2	1	3	1	9	10	5	1	3
	Access to electricity	9		3										1	2			4		1					2	2	3		1
Cultural /social norms		41	2	15		3		1	1	1	3		6	3	6	5	1	11		7	1	1	2	1	11	8	6	1	4
Fear and lack of trust	Lack of trust in pricing	15	2	12		2	1	2	1	1			1	1	2	3	4	5		1		4	2		3	1	1		
	Mis- and Disinformation	0																											
	Device theft and security	19	3	13		1					1		1		4	5	2	3		4	1	2	3		5		1		3
Access to information		37	4	21		2	1						2		10	8	5	13		7	5	5	8	3	5	3	2		6
Network coverage	Mobile network	13	1	8		2	1						1		2	1	1	5			2	1	1	1	1				3
	Access to electricity	10		4										1	2			5		1	1				2	2	3		2

Figure 8: Granular results of drivers and services based on the EGM framework

Consequently, once people have access to mobile internet, the evidence shows that the primary uses are accessing services, particularly utilities and learning opportunities, mobile money, income-generating projects, and connecting with family and friends. One of the services popular in rural areas is accessing agricultural extension services. Thus, the evidence suggests that intervention efforts, either by amplifying the enablers or reducing and removing the barriers as the evidence suggest increase access to services such as utilities, mobile money and banking, and connecting with family and friends, which impacts the user's life management and economic prospects, especially empowering women. The evidence for women's empowerment is consistent with the Mobile Gender Gap Report 2023, which reveals that the mobile internet plays a vital role in women's financial inclusion, including income generation. Surprisingly, there is less evidence on accessing services such as health and civic activities when digital technologies are perceived to create opportunities for scaling up services and offer greater convenience, personalisation, and privacy than before. However, the evidence is skewed more toward users and the affordances provided by mobile internet but pays less attention to the role of service providers, as a result, the extent to which existing services are relevant for users remains assumed.

However, the evidence reveals gaps in policy regulation, negative use of mobile internet and its negative consequences or increased vulnerability of users. Contrary to existing social practices, we also find a lack of evidence on safety and security especially challenges of disinformation and scamming. In particular, the lack of evidence on disinformation is surprising, given the challenges it posed during the COVID-19 pandemic. Surprisingly, except for gender, cultural/social norms, lack of trust in pricing, and youth, there is no evidence that the driver affects mobile internet use for political engagement, civic action, legal awareness, human rights

and news. Also, across the themes, there is no evidence of using the internet for sports and as a tool for community safety.

4.2. Granular evidence and analysis of drivers and impacts

As presented in Figure 9, the evidence also shows how the drivers impact services. There is an impact on the user's social and emotional well-being, the realisation of socio-economic rights, life management, and economic prospects, including business development, employment, and income-generating activities. This is also true in the specific context of gender, where there is a clear impact on efficiency and life management, followed by social and emotional support and economic prospects, whether it's business, employment, or livelihoods.

However, there is also less evidence of the impact of mobile internet usage on political and civic engagement, its role in mental health and isolation, and security and violence that includes gender-based violence, scamming, cyber security and device theft. Several reasons explain this, such as whether the public or participants will likely be free to participate in research on political issues. Depending on the country's political context, such views may be perceived as personal, private, or unsafe to share or express. Or the researchers themselves share similar concerns which dissuade them from pursuing such issues. However, nothing explains why the researchers avoid investigating security or safety concerns. The GSMA Connected Women's Mobile Gender Gap Report 2023 report suggests that women might shy away from using mobile phones or the internet due to safety concerns.

Evidence Gap Map Mobile Internet: Drivers & Barriers and Impacts			Individual social inclusion or exclusion			Realisati on of socio- econom ic rights	Efficienc y & Life manage ment	Politic al eng agement	Individual economic effects					Security & violence		
			Menta l health	Isolati on	Social and emoti onal conne ction				Busin ess develo pment	Emple yment	Livellh ood impro vemen t	Remitt ances	Incom e gener ation	Gende r- based violence	Scam ming and cybers ecurit y	Theft
		#	2	2	44	36	94	5	28	12	8	10	14	2	2	0
Digital skills		20			9	4	18		10	1	2	1	2	1		
User profiles	Gender	39	2	1	20	12	34	3	8	8	6	5	10	2	1	
	Youth	26	1	1	14	10	24	3	6	6	4	2	6		1	
	Education level	43		1	15	12	39	1	10	4	3	4	4			
	Adolescent	5			3	1	5		1	1			1		1	
	Rural	12		1	3	5	10		4	2	2	1				
	Urban	23		1	14	9	21	2	5	5	1	2	5	1		
Policy - regulatory		9			4		8	1	4							
Handset affordability and service costs	Cost of access to data and Internet	41	1	2	17	11	36	3	11	4	5	2	7	1		
	Access to electricity	9	1		4		9		3	2	1	1	2			
Cultural /social norms		41	2	2	21	10	33		7	5	5	2	6	2	1	
Fear and lack of trust	Lack of trust in pricing	15			4	3	14	1	4			3		1		
	Mis- and Disinformation	0														
	Device theft and security	19			7	6	18		3	3	1	1	3			
Access to information		37			14	12	31	1	14	5	1	4	6			
Network coverage	Mobile network	13			3	1	12	1	3	3	1	1	2			
	Access to electricity	10	1		4		10		3	3	1	1	3			

Figure 9: Granular results of drivers & barriers versus impacts

While the evidence that mobile internet can impact political participation and social development through access to information, expanded capabilities for women and raising their legal and human rights awareness to combat gender-based violence, social/cultural norms limit its effectiveness. Men shape decisions about mobile phone ownership and control, with most women having to ask their husbands for permission. There is less evidence of rural areas than urban areas, but it suggests another negative aspect: rural areas are likely to be left behind. But also in rural areas, the analysis shows that digital access and benefits are unevenly distributed within communities, with teachers, business people, and youth often being early adopters. For youth livelihoods, mobile phones play a significant role in communication and information exchange about employment opportunities, though impacts can be both positive and negative.

However, the evidence overlooks the negative aspects of using mobile internet. While policy regulation is a necessary driver for mobile internet and is likely to address these negative aspects, the evidence remains sparse and limited only to social and emotional wellbeing, efficiency and life management, political engagement, and business development.

5. Synthesis Of Gaps

The EGM suggest that the evidence seems to be of low quality and sparse, in general and in the specific individual countries, except for a few salient drivers, activities and impacts of mobile internet usage; there is nothing at all in some, if not the majority of SSA countries (48 out of 54). There is a gap between what researchers report on and what practitioners understand as challenges. For instance, in contrast to GSMA Connected Women's recommendations, there seems to be a lack of evidence on the role of policy and regulation and the issue of relevance and safety. Also, in contrast to existing and emerging social practices, there are gaps in the use of mobile internet for emergency services, legal services, and human rights, in addition to safety, and there is very little evidence on the negative uses and consequences of mobile internet. It is somewhat surprising that although the reviewed literature acknowledges the digital divide, it takes a normative and relatively optimistic outlook for mobile internet usage. However, it seems to overlook that its use or uses could reinforce the existing digital divide. Also, the role of digital skills is acknowledged but presented as a black box overlooking where and how people acquire them. Gender seems to be treated in the same way, and there is very little or no evidence on how its dimensions, especially the different statuses of women, may affect their mobile internet usage. Furthermore, the evidence is skewed towards users and neglects the role of service providers.

During the detailed analysis of the scientific papers, three areas have been selected:

- Handsets, and handsets plus skills - what are the evidences on handset affordability and digital skills for Mobile Internet adoption?
- Livelihoods and income - what are the evidences of mobile internet on people's micro-businesses, finding jobs?
- Gender norms - does the adoption of mobile internet change the gender- or social-norms? Do we see evidences on how to overcome norms hampering the uptake of mobile internet by women?

These aspects are addressed in the Appendices B.1 to B.3 in detail. The analysis is mainly based on the full-text analysis using the AI-based tool Elicit.com, and then cross-checked with the papers themselves.

5.1 Handsets availability, and handsets and skills

In analysing the relation between handsets and skills for the uptake of Mobile Internet, we analysed the 9 papers matching both keywords. The majority of the papers focussed on the hinders, e.g. Ezech et al. (2021) pointing out that adoption was hampered by unavailability of network coverage in rural area (84%), lack of institutional policy for application of mobile apps

in extension service (75%), low ownership of smartphones among farmers (73%), poor farmers' knowledge on the use of mobile apps (67%), and poor internet connectivity (66%). None of the papers studied a separated assessment of barriers, e.g. handset costs vs network costs.

Given that rural areas see agriculture activities as the dominant work opportunity, the majority of the analysed papers focussed on rural farmers. Nwokoye et al. (2019) pointed out income improvements among ICT adopters, and other studies addressed the perceived benefits as drivers for mobile internet adoption. As such, the detailed literature analysis supported the findings from our interviews, addressing the fear of costs for accessing mobile internet as an entry barrier besides lack of devices and other factors.

5.2 Input Livelihoods/income

In analysing the relation between Mobile Internet and Livelihood, our studies revealed a total of 8 papers. The work of Nwokoye et al. (2019) was common in the analysis of the livelihood and the handsets and skills, and resulted in income improvements among ICT adopters. They pointed out the degree of awareness, perception, education, income level, age, training and costs of ICT devices as significance determinants of ICT adoption. Their finding on "income improvement" were not reflected in a similar study by Nyagango et al. (2023) in Tanzania, where age (younger farmers) and education, besides the need for family income, were driving the use of mobile phones.

The promise of ICT adoption through mobile internet, addressed by Kibere (2016) for Kenya, are reflected as opportunities for social mobility and socio-economic well-being (Gwaka, 2018), creation of virtual infrastructures for trading (Tsarwe and Mare, 2020), and the five freedom factors including economic freedom, protective security and social opportunities (Hasan et al. 2022).

Though, we could not find evidence for a quantifiable relation between mobile internet usage and income increase. Other factors such as marital status and farming experience (Nyagango et al., 2023), use of mobile phones for security purposes (Rahim et al., 2020), cultural aspects like men's control over women's phones (Summers et al., 2020), and structural inequalities (Kibere, 20216) hamper the uptake and the economic development.

As such, the detailed literature analysis suggests a tailored approach for increasing the uptake of mobile internet, e.g. using health information as a digital good to ease the path of Maasai women into the digital world.

5.3 Mobile Internet aspects on Gender

The analysis of gender norms is widely represented in the academic literature, with a total of 38 papers. As discussed already in the livelihood section earlier, women empowerment in Maasai communities is hampered by cultural norms (Summers et al., 2020), cultural stereotypes (Bailur and Masiero, 2017), family dynamics (Ibtasam et al., 2019), risk of social repercussions (Hussain and Amin, 2018) or lack of resource ownership and use (Nyagango et al., 2023). While positive attitudes and behavioural intention can be triggered through specific campaigns, the expected impact often does not take place, as described by Kishore et al. (2016). Porter et al. (2020) argued

even stronger, when pointing out: “Women's agency is still mired within wider structures of patriarchy and chronic poverty: existing inequalities are being re-inscribed and reinforced.”

Even in areas where the access to mobile phones is high, such as in urban areas, the development of digital skills lags behind (Breuer et al., 2016). Ease-of-use turns out to be the strongest determinant for the uptake of services (Mandari and Chong, 2018).

The digital divide, visible through the interviews in this study, showed that people either see mobile phones as part of their daily life, or see the phones as less relevant for daily life activities. Rahim et al. (2020) provided evidence of 56% women use their phone for daily life activities, while 24% did not. With 72% addressing security purposes for using the mobile phone, we assume that tailored services for women, easy to use and providing real value, might be a pathway ahead. The recommendation of tailored services is confirmed by studies on health information uptake (Wanyama et al., 2018) and training boosting adoption in agricultural (Nwokoye et al., 2019). Once mobile internet usage is adopted, services like mobile money and bank services contribute to inclined use of mobile internet (Hasbi and Dubus, 2020).

Our assessment is that the 14 papers below address sufficiently clear the opportunities and challenges in gender norms, though we recommend further work with a detailed review of all 38 papers.

6. Implications And Recommendations

6.1 Mobile internet usage gap programming and policy

Based on this evidence, practitioners, including GSMA and its stakeholders, must pay attention to nuances of digital skills and user profiles and strive to meet training and user needs. Where and how people acquire the required digital skills could unravel some of the hidden challenges for accelerating mobile internet usage in SSA and SA countries, but also provide pathways such as developing and mainstreaming digital competencies, including mobile internet skills, into the education curriculum and professional continual development of these at the frontline of delivering services to under-served communities. There is an opportunity to address cultural and social norms, especially those that hinder women from using mobile internet, by developing innovative ways and amplifying existing efforts by the GSMA Connected women and its stakeholders, such as making mobile internet and related services socially acceptable for women. Although women are aware of rights and services for domestic violence prevention, their ability to act on this information is limited by entrenched patriarchal norms and distrust in help-seeking agencies and constrained by persistent gender inequality and patriarchal structures, which restrict women's agency and choices. Also, GSMA, its members and complementary service providers can leverage the need to access services, an enabler for mobile internet uptake, by supporting digital entrepreneurs in addressing the issue of relevance by developing tailor-made services responsive to local needs.

Equally, policymakers can lead or complement these efforts by developing and implementing targeted policies, especially through regulations that can correct the perceived market failure to address the cost of access and adverse uses and consequences of mobile internet. In addition, a

simple regulatory state and an entrepreneurial state can play an active role in creating digital public goods and facilitating the uptake of mobile internet. In the same way, policymakers can support efforts that amplify digital skills and the use of mobile internet to empower women. Mobile internet access and digital technologies significantly impact political, economic, and social outcomes in developing countries, especially m-government. A good example of m-government is efforts by the Government of India through Digital India through the Unified Payments Interface (UPI)⁷. While such efforts encourage the uptake of mobile internet through the provision of service, they also create economies of scale and network effects that result in lowering the cost of use following the principle of zero marginal utility costs⁸. The mechanism by which the government can act is to create constraints that safeguard the digital commons, such as flexing its regulatory muscle and widening the scope of cyber laws to address safety issues.

6.2 Future research and evaluation or synthesis

The findings on the evidence suggest that it is of low quality and sparse, in general, and in the specific individual countries in SSA and SA, except for a few salient drivers, activities and impacts of mobile internet usage. There is nothing in some if not most, SSA countries (48 out of 54). Also, there is a gap between what researchers report and what practitioners understand as challenges. At the same time, some of the drivers of mobile internet usage, such as policy and regulations, digital skills, its adverse uses and consequences of mobile internet, and the role of service providers, remain understudied, and particularly digital skills and gender are treated as black boxes. Therefore, researchers could advance research and deepen our understanding of mobile internet usage on at least three fronts:

1. Extending or replicating existing studies across countries could help build theories, test them, and explain them in the context of mobile internet usage and different societies.
2. Researchers need to bridge the gap between research and practice or policy so that the two can shape each other. While research provides evidence for informing decision-making and programming, practitioners and policymakers can also inform research needs. But also provides evaluative practices, including EGM, to help practitioners appraise their work.
3. The future research agenda could focus on the understudied aspects of mobile internet, such as policy and regulations, digital skills, gender, the adverse uses and consequences of mobile internet, and the role of service providers. Policies, including regulation, must be examined further to understand how they can correct market failure, especially how they create incentives to encourage investments and improvement in services or constraints to curb undesirable outcomes such as mobile internet's undesirable or unintended consequences. Also, while digital skills are acknowledged, more must be done to

⁷ <https://www.npci.org.in/what-we-do/upi/product-overview>

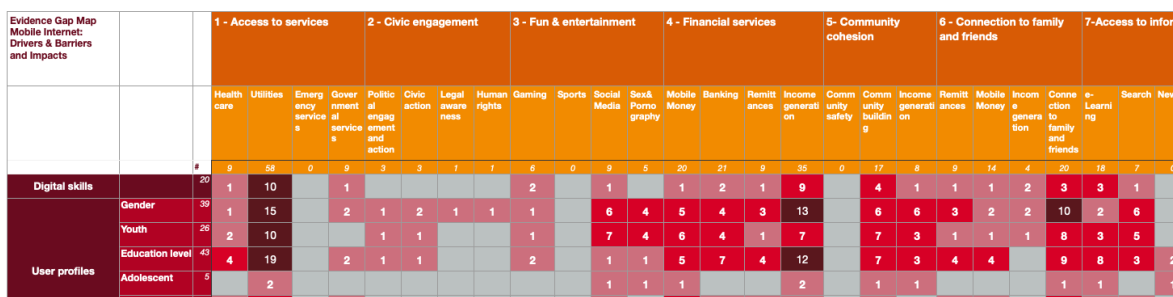
⁸ Rifkin, J. (2014). *The zero marginal cost society: The internet of things, the collaborative commons, and the eclipse of capitalism*. Macmillan.

understand where and how users acquire them, as well as the role that service providers and other stakeholders can play in addressing this second-level digital divide in mobile internet use. The same applies to the need to unpack the nuances of gender, whether all women are affected regardless of whether it depends on their marital status and intersectionality with other social, political, and economic factors. Lastly, researchers need to be reflexive and mindful of both the positive and negative aspects of mobile internet use and the nature of complex dependencies as a wicked problem to give a balanced view that helps practitioners avoid creating new problems while trying to address old problems.

Overall, more research in this area will create new knowledge or provide evidence-based research to inform interventions and enrich efforts to conduct EGMs and other evaluative practices.

1. Spreadsheet “GSMA_EGM_bucketed_final.numbers” with the references to all academic publications (“papers”), their corresponding Rayyan identification, and the mapping of keywords found in the papers

2. Spreadsheet “EGM_comparison_final_output.numbers” with all the diagrammes used in this report



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Filename	Authors	Year	Title	Abstract	Main findings	S
5922-Adeleke-2024.pdf	Richard Adeleke, Ayodeji Emmanuel Iyanda, Chinonso Chris-Emenyonu	2024	Analyzing the relationship between the experience of intimate partner violence and female internet use in Nigeria	Female internet use is abysmally low (17.48%) in Nigeria, and it has become an issue of serious concern due to its negative impact on their health and economic well-being. While most of the scholarly debates centers on the influence of individual socio-economic characteristics and geographical factors to understand and improve female internet use, this study contributes to the literature by...	- Female internet use in Nigeria is abysmally low at only 17.48%. - There is a significant spatial concentration of female internet non-use in Northern Nigeria compared to the South.	- '(1 ar nk ek .
5933a-Togar-2024.pdf	Eurisha Togar, Marjolijn L. Antheunis, Tom De Leyn, Mariek M P Vanden Abeele	2024	"I am not human without my phone": How the socio-cultural realities of Liberia shape Liberian mobile youth culture	Mobile youth culture (MYC) is a concept that refers to the distinctive ways in which young people adopt and use mobile phones. However, most studies on MYC are situated in the Global North, where the lived realities of teenagers are different from teenagers in the Global South. Through an investigation of how MYO manifests in Liberia, this article adds to the existing literature on mobile...	- Liberian teenagers use mobile phones to mobilize resources and gain autonomy, but this is constrained by their socioeconomic realities. - Mobile phones are viewed as status symbols, but economic constraints	- ur Li fr or W
5938-Hafez-2023.pdf	Md Hafez	2022	Examining the effect of consumption values on mobile banking adoption in Bangladesh: the moderating role of perceived security	Purpose: The objective of this study is to investigate the effect of consumption values (functional, social, epistemic, and emotional value) on mobile banking (m-banking) usage intention and intention to recommend m-banking services in the context of the Bangladeshi banking sector. Furthermore, this study examines how perceived security moderates the effects of consumption values on m...	- Functional value, epistemic value, and emotional value positively influence mobile banking usage intention. - Mobile banking usage intention positively influences recommendation intention.	- ' fu < 4. = bi
5942-Cirolla-et-al-2023-silicon-savannahs-and-motorcycle-taxis-a-southern-perspective-on-the-frontiers-of-platform-	Uza Rose Cirolla, Rike Sitas, Andrea Polio, Alexis Gatoni Sebarezzi, Prince K Guma	2023	Silicon Savannahs and motorcycle taxis: A Southern perspective on the frontiers of platform urbanism	The rise of digital platforms in urban Africa has been rightfully critiqued as an example of global techno-capital seeking new frontiers of profit among precarious lives and from fragile infrastructures. However, this techno-pessimistic reading of so-called "platform urbanism" leaves us with a bleak outlook on the future of the African cities as a means of emancipation and socialization. In this...	- Platform proliferation in African cities like Kigali and Nairobi has depended on large-scale developmental investments in ICT infrastructure by African states, international donors, and private companies.	- or ar eo fo
5945-Misati-2024.pdf	Roseline Misati, Jared Osoro,	2024	Does Financial Innovation Enhance Financial	Purpose: The purpose of this paper is to examine the effect of digital financial innovation on financial health and	- There is a long-run positive relationship	- ')

Appendix B: Detailed overview of findings

Further to the summary description in Section 5.1 to 5.3, this Appendix B provides the details of the analysis of the scientific publications related to three topics, being:

- Handsets, and handsets plus skills - what are the evidences on handset affordability and digital skills for Mobile Internet adoption?
- Livelihoods and income - what are the evidences of mobile internet on people's micro-businesses, finding jobs?
- Gender norms - does the adoption of mobile internet change the gender- or social-norms? Do we see evidences on how to overcome norms hampering the uptake of mobile internet by women?

These aspects are addressed in the following Appendices B.1 to B.3. The analysis is mainly based on the full-text analysis using the AI-based tool Elicit.com, and then cross-checked with the papers themselves.

Appendix B.1: Handsets availability, and handsets and skills

In analysing the relation between handsets and skills for the uptake of Mobile Internet, we analysed the 9 papers matching both keywords. The majority of the papers focussed on the hinders, e.g. Ezech et al. (2021) pointing out that adoption was hampered by unavailability of network coverage in rural area (84%), lack of institutional policy for application of mobile apps in extension service (75%), low ownership of smartphones among farmers (73%), poor farmers' knowledge on the use of mobile apps (67%), and poor internet connectivity (66%). None of the papers studied a separated assessment of barriers, e.g. handset costs vs network costs.

Given that rural areas see agriculture activities as the dominant work opportunity, the majority of the analysed papers focussed on rural farmers. Nwokoye et al. (2019) pointed out income improvements among ICT adopters, and other studies addressed the perceived benefits as drivers for mobile internet adoption. As such, the detailed literature analysis supported the findings from our interviews, addressing the fear of costs for accessing mobile internet as an entry barrier besides lack of devices and other factors.

Adeleke et al. (2024) analysed the relationship between the experience of intimate partner violence and female internet use in Nigeria. Female internet use is abysmally low (17.48%) in Nigeria, and it has become an issue of serious concern due to its negative impact on their health and economic well-being. This study contributes to the literature by interrogating the role of women's experience of intimate partner violence (IPV) and other socio-economic and geographical factors based on the social theory of internet use. The analysis shows that experience of IPV, age, wealth status, education, being married, urban location, and residing in Northern Nigeria are significant predictors of female internet use.

Coggins et al. (2022) addressed digital extension tools (DETs) including phone calls, WhatsApp groups and specialised smartphone applications used for agricultural knowledge brokering. The study, based on interviews, found that DET use is commonly constrained by fifteen pitfalls (unawareness of DET, inaccessible device, inaccessible electricity, inaccessible mobile network,

insensitive to digital illiteracy, insensitive illiteracy, unfamiliar language, slow to access, hard to interpret, unengaging, insensitive to user's knowledge, insensitive to priorities, insensitive to socio-economic constraints, irrelevant to farm, distrust). These pitfalls partially explain why women, less educated and less wealthy farmers often use DETs less, as well as why user-driven DETs (e.g. phone calls and chat apps) are often used more than externally-driven DETs (e.g. specialised smartphone apps).

Daum et al. (2022) identified mechanization, digitalization, and rural youth engagement as central to African agricultural transformation. Each of these topics is associated with debates on opportunities, risks, and appropriate policy actions, which become visible in international research discourses and policy fora. Though, little is known on the view of local stakeholders. By interviewing 195 respondents, the following neglected aspects were identified, including the role of animal traction, the continued appeal of state-led mechanization, and data sovereignty concerns. Gender, age, and education influence the viewpoints on some topics. Local stakeholders believe in the transformative power of digital agriculture, though expressed fears about a digital divide, where only large and wealthy farmers will benefit from digital tools.

Ogbo et al. (2021) focus on the adaptation of traditional and over-the-top (OTT) mobile services, when “over half of the population remains unconnected”. Their main concern is the costs of mobile data hampering the significant use of OTT services.

Uwamariya et al. (2021) investigated if and how farmers in Rwanda adopt mobile money and integrate it into their everyday lives to foster their economic development and social well-being. The qualitative evidence is based on 72 semi-structured interviews with farmers in rural Rwanda. Rwandan farmers acknowledge the convenience of using m-money, they experience three major inhibitors that particularly affect its use for business: (i) limited opportunities for learning about m-money, (ii) high and non-transparent costs, and (iii) barely accessible network agents with insufficient liquidity. Uwamariya et al. suggest how policymakers and service providers can increase the adoption of m-money, and thereby reducing social exclusion of the unbanked farmers.

Ezeh et al. (2021) addressed mobile apps brought to the field by 100 extension agents. The most utilised mobile apps were WhatsApp (76%) and Facebook (53%). Though information packages on lowland rice production (65%), cassava/maize/vegetable production (58%), and upland rice production (47%) were mostly recommended. The adoption was hampered by the unavailability of network coverage in rural areas (84%), lack of institutional policy for the application of mobile apps in extension service (75%), low ownership of smartphones among farmers (73%), poor farmers' knowledge on the use of mobile apps (67%), and poor internet connectivity (66%). The authors suggested an e-extension policy, making mobile app extension services mandatory for public extension organizations.

Nwokoye et al. (2019) addressed ICT usage for improved agricultural productivity in South-East Nigeria. Based on the sample of 476 rice farmers, the study concluded that the degree of awareness, farmer's perception, educational attainment, income level, age, training, and cost of ICT devices are significant determinants of ICT adoption by farmers. Differences in gender do

not significantly determine ICT adoption. Findings also show income improvements among ICT adopters, concluding with the recommendation for ICT training to boost adoption.

Rangaswamy and Arora (2016) addressed the use of mobile internet in urban slums of India, with a specific focus on youth. Social mobility and romantic opportunities were pointed out as engagement pathways and gateways to reach out. They point out the lack of development programs addressing digital leisure practice (romance, play, entertainment), and suggest that leisure practices are powerful entry points to learning and mobile internet practice.

Sam (2015) studied how mobile internet is adopted and utilised in post-conflict context in Sierra Leone. The paper reveals an increasing popularity and usage of mobile internet among marginalised young people to build communication networks outside of their direct circles, access information and entertainment content. The underlining reasons were largely driven by perceived benefits such as the opportunity for improving their livelihoods. High cost of internet-enabled mobile phones, low level of ICT and literacy skills and limited knowledge in the productive use of mobile internet were seen as the major hinder. The recommendation, provided in this 2015 paper, are still valid today: cheaper and durable internet access and phone, awareness building and training on literacy and ICT skills.

Appendix B.2: Livelihoods and income

In analysing the relation between Mobile Internet and Livelihood, our studies revealed a total of 8 papers. The work of Nwokoye et al. (2019) was common in the analysis of the livelihood and the handsets and skills, and resulted in income improvements among ICT adopters. They pointed out the degree of awareness, perception, education, income level, age, training and costs of ICT devices as significance determinants of ICT adoption. Their finding on “income improvement” were not reflected in a similar study by Nyagango et al. (2023) in Tanzania, where age (younger farmers) and education, besides the need for family income, were driving the use of mobile phones.

The promise of ICT adoption through mobile internet, addressed by Kibere (2016) for Kenya, are reflected as opportunities for social mobility and socio-economic well-being (Gwaka, 2018), creation of virtual infrastructures for trading (Tsarwe and Mare, 2020), and the five freedom factors including economic freedom, protective security and social opportunities (Hasan et al. 2022).

Though, we could not find evidence for a quantifiable relation between mobile internet usage and income increase. Other factors such as marital status and farming experience (Nyagango et al., 2023), use of mobile phones for security purposes (Rahim et al., 2020), cultural aspects like men’s control over women’s phones (Summers et al., 2020), and structural inequalities (Kibere, 2021) hamper the uptake and the economic development.

As such, the detailed literature analysis suggests a tailored approach for increasing the uptake of mobile internet, e.g. using health information as a digital good to ease the path of Maasai women into the digital world.

Nwokoye et al. (2019) addressed ICT usage for improved agricultural productivity in South-East Nigeria. Based on the sample of 476 rice farmers, the study concluded that the degree of awareness, farmer's perception, educational attainment, income level, age, training, and cost of ICT devices are significant determinants of ICT adoption by farmers. Differences in gender do not significantly determine ICT adoption. Findings also show income improvements among ICT adopters, concluding with the recommendation for ICT training to boost adoption.

Nyagango et al. (2023) addresses how smallholder farmers in Tanzania used mobile phones for agricultural purposes. Based on a literature analysis, they created 8 hypotheses, addressing moderators like age, experience, sex, marital status, and household size influencing technological usage behaviour. With 78% of farmers having feature phones, the use of mobile internet was limited. The study pointed out that agriculture marketing information such as price and buyers information were the dominant marketing information being retrieved, predominantly by younger and educated farmers.

The study confirmed the gender divide of women being less likely to use the mobile phone, as women are not decision makers for resource ownership and use. Other factors such as marital status and farming experience had a strong correlation to the usage of mobile phones, suggesting that the need for family income is a driver for seeking agricultural marketing information.

Hasan et al. (2022) addressed the impact of ICT on the quality of life amongst indigenous people in Bangladesh. The study confirmed a strong relationship between ICT usage and Sen's five freedom factors (political freedom, economic freedom, social opportunities, transparency guarantees, and protective security). The capability approach (CA) used in the study revealed the substantial effect of political freedom on economic freedom, and economic freedom on social opportunities as well as transparency. The model explains a large proportion of the variance in economic freedom (79.5%), protective security (71.1%), and social opportunities (49.4%), but a much smaller proportion of the variance in transparency guarantees (13%).

Tsarwe and Mare (2020) established an exploratory study on the unregulated informal trading by Zimbabwean youths in exploring small-scale business opportunities. Informal field observations and informal interviews of 26 street vendors built the basis of the research. The main findings are the forming of physical and virtual infrastructures, dominated by Facebook and WhatsApp, to establish functional networks for the exchange of mobile money and trading. The limitations of the study with a small number of participants limits the usability for more generic models.

Summers et al. (2020) addressed the relation between mobile phones and women empowerment in Maasai communities. The interviews, performed in 2018, confirmed the low mobile internet adoption of Maasai women, and concluded with 5 main take-aways: (1) women's access to phones is fluid, often contingent by their husbands' control; (2) multiple pathways to empowerment and disempowerment exist; (3) phones reinforce inequalities; (4) women's identities are intersectional; and (5) women's networks remain homogenous. All aspects, but especially men's control over women's phones especially undermines women's stable access to mobile technology.

Rahim et al. (2020) addressed the use of mobile phones by women in rural Pakistan. Based on 200 interviews, the study revealed that 80% of women in the Hunza and Nagar districts own

mobile phones (access) and 63% have good skills of mobile phone usage for a variety of purposes. While a majority of 56.4% women use mobile phones in their daily life activities, 23.6% did not use the phone for daily life activities. The dominant use shows that 71.8% women use mobile phones for security purposes.

Gwaka (2018) researched the correlation of youth mobility and digital technologies in rural Zimbabwe. Social inequalities, particularly gender-based restrictions, limit the mobility of young women in rural communities. While lack of infrastructure, such as poor roads, is a key challenge impacting youth mobility, the adoption of digital technologies has led to emerge of virtual mobilities, providing an opportunity to enhance youth mobility and such socio-economic well-being of youths.

Faith N Kibere (2016) created a critical realist ethnographic assessment of the historical development of the Kenyan ICT ecosystem, addressing the components of social and physical structures in the Kibera slum. The paper is seen as contribution to the M4D and ICE4D activities, and concludes that mobile phone eases communication and strengthens existing social ties for the youth of Kibera, but the usage is predominantly in the existing network of those in the same lower income strata. Though the study acknowledges the potential of mobile technologies and internet, though points out the challenge to "amplify the structural inequalities" and divisions that already exist.

Appendix B.3: Gender norms

The analysis of gender norms is widely represented in the academic literature, with a total of 38 papers. As discussed already in the livelihood section earlier, women empowerment in Maasai communities is hampered by cultural norms (Summers et al., 2020), cultural stereotypes (Bailur and Masiero, 2017), family dynamics (Ibtasam et al., 2019), risk of social repercussions (Hussain and Amin, 2018) or lack of resource ownership and use (Nyagango et al., 2023). While positive attitudes and behavioural intention can be triggered through specific campaigns, the expected impact often does not take place, as described by Kishore et al. (2016). Porter et al. (2020) argued even stronger, when pointing out: "Women's agency is still mired within wider structures of patriarchy and chronic poverty: existing inequalities are being re-inscribed and reinforced."

Even in areas where the access to mobile phones is high, such as in urban areas, the development of digital skills lags behind (Breuer et al., 2016). Ease-of-use turns out to be the strongest determinant for the uptake of services (Mandari and Chong, 2018).

The digital divide, visible through the interviews in this study, showed that people either see mobile phones as part of their daily life, or see the phones as less relevant for daily life activities. Rahim et al. (2020) provided evidence of 56% women use their phone for daily life activities, while 24% did not. With 72% addressing security purposes for using the mobile phone, we assume that tailored services for women, easy to use and providing real value, might be a pathway ahead. The recommendation of tailored services is confirmed by studies on health information uptake (Wanyama et al., 2018) and training boosting adoption in agricultural (Nwokoye et al., 2019). Once mobile internet usage is adopted, services like mobile money and bank services contribute to inclined use of mobile internet (Hasbi and Dubus, 2020).

Our assessment is that the 14 papers below address sufficiently clear the opportunities and challenges in gender norms, though we recommend further work with a detailed review of all 38 papers.

Bailur and Masiero (2017) addressed relation between the affordances of mobile Internet and structural changes in the economic and societal status of subjects for women adopters in Ghana, Kenya and Uganda. Though the opportunities of new mechanisms for income generation are clearly addressed, older cultural stereotypes, and static policies underlying economic activities hamper the changes of societal structures and the uptake of mobile internet. The paper points out the discrepancy between the potential of mobile Internet for income generation and the actual used by women, with men more likely using mobile devices for earning money.

Kishore et al (2016) researched on a financial inclusion campaign in rural India to quell exclusion. Technology adoption factors, performance expectancy, effort expectancy, social influence, attitude, perceived risk, and behavioral intention (BI), were keywords for the initial assessment. They applied a mixed sampling technique to reach 959 samples, and a multiple regression–interaction analysis to analyse the findings. The expected impact did not take place, though the authors revealed age and gender as moderated attitudes towards behavioral intention of adopting mobile banking services. Age strengthened the positive relationship between attitude and behavioral intention, while gender dampened this relationship.

Breuer et al. (2016) assessed participatory development in an urban area in Togo. The study is based on 1498 respondents, suggesting that sociodemographic factors limiting political participation partially overlap with factors that limit access to ICT and the development of digital skills. Sociodemographic factors like gender, age, education, and income level are significant predictors of political participation, with males, older individuals, and those with higher education and income being more likely to participate. Access to ICTs, particularly mobile phones, is relatively high in the surveyed urban areas, but the development of digital skills lags behind. As little as 10.7% of users knew how to install applications, and 12.1% were not able to connect to Wifi, demonstrating the need for specific training on mobile phone usage.

Mandari and Chong (2018) addressed gender and age differences in rural farmers' intention to use m-government services in Tanzania. Based on the analysis of 407 questionnaires, relative advantage, ease-of-use, compatibility; and government support were found to be significant determinants of rural farmers' behavioural intention. Age and gender moderated the effects of relative advantage, though ease-of-use is the strongest determinant, indicating that rural farmers are more attracted to m-government services if they find the system easy to use.

Summers et al. (2020) addressed the relation between mobile phones and women empowerment in Maasai communities. The interviews, performed in 2018, confirmed the low mobile internet adoption of Maasai women, and concluded with 5 main take-aways: (1) women's access to phones is fluid, often contingent by their husbands' control; (2) multiple pathways to empowerment and disempowerment exist; (3) phones reinforce inequalities; (4) women's identities are intersectional; and (5) women's networks remain homogenous. All aspects, but especially men's control over women's phones especially undermines women's stable access to mobile technology.

Nyagango et al. (2023) addresses how smallholder farmers in Tanzania used mobile phones for agricultural purposes. Based on a literature analysis, they created 8 hypotheses, addressing moderators like age, experience, sex, marital status, and household size influencing technological usage behaviour. With 78% of farmers having feature phones, the use of mobile internet was limited. The study pointed out that agriculture marketing information such as price and buyers information were the dominant marketing information being retrieved, predominantly by younger and educated farmers. The study **confirmed the gender divide** of women being less likely to use the mobile phone, as women are not decision makers for resource ownership and use. Other factors such as marital status and farming experience had a strong correlation to the usage of mobile phones, suggesting that the need for family income is a driver for seeking agricultural marketing information.

Hussain and Amin (2018) addressed ICT in women's empowerment in Afghanistan. Our research shows that women in Afghanistan have high hopes that ICTs will be enabling and empowering. Yet the majority of women's ICT activities do not realise that vision; with a few exceptions around women's health, ICTs usually only enable women to meet their existing needs, and do not enable them to challenge patriarchal power relations. Though the opportunities in using the internet to learn about rights to divorce or citizen's rights, or sharing 'private' stories of abuse in social media spaces exist, these opportunities have a high risk of social repercussions. Hussain and Amin argue that these warnings and responses urge women to conform, and submit to control, and regulate women's interactions and movements, with few exception of individual women challenging the norms.

Wanyama et al. (2018) addressed the mobile internet usage of young adults attending an urban HIV clinic in Uganda. Of the 272 young adults interviewed, 75% were female and median age was 22.3 years (IQR: 20.6–23.5). Whilst there was a trend to females being more likely to use mobile phones compared to the males, this was not statistically significant (93.7% female versus 85.9%, $p = 0.057$). Fifty percent of mobile phone users used their phones for HIV-related activities such as medication reminders. General access and use of the internet was low at 34% and users were more likely to be males than females (45.5% versus 30.6%). Owning a mobile phone was associated with ease of access to HIV information and preference to receive messages via text messages ($p < 0.05$). Despite the rise in smartphones and internet access in Uganda, only 10% had a smartphone, which is significant higher than the national smartphone ownership of 4% in overall Uganda. In this age group of around 22 years, participants who were older in age, unemployed and those without children were significantly more likely to use the internet. Potential reasons for this could be that the older young adults may afford a phone and internet data plans; unemployed young adults may be searching the internet to look for jobs or pass time; non-parents may have more time or more disposable income to spend on the internet.

Nwokoye et al. (2019) addressed ICT usage for improved agricultural productivity in South-East Nigeria. Based on the sample of 476 rice farmers, the study concluded that the degree of awareness, farmer's perception, educational attainment, income level, age, training, and cost of ICT devices are significant determinants of ICT adoption by farmers. Differences in gender do not significantly determine ICT adoption. Findings also show income improvements among ICT adopters, concluding with the recommendation for ICT training to boost adoption.

Otioma Ana et al. (2018) addressed the urban digital divide in Rwanda at an intra-urban level. The authors described that existing urban inequality in infrastructure, urban agglomerative strength, planning status and household socio-economic status are replicated as correlates of the digital divide in Kigali City.

Ibtasam et al. (2019) addressed the role of the family in women's technology inclusion in the Islamic culture in area of Punjab, Pakistan. Building on 73 qualitative interviews with low-income women, they stated that family dynamics and considerations are the strongest factors that enable or limit low-income Pakistani women's access and use of technology. Gendered roles, generational differences, and wider socio-cultural and religious influences shape a Pakistani woman's experience with technology.

Porter et al. (2020) addressed female empowerment in SSA with data from Ghana, Malawi and South Africa. In the context of female empowerment, the study found little support for the concept of the mobile phone as an instrument of positive transformative change. The phone's application in romantic and sexual relationships demonstrates particularly strongly the way phones are complicit in constraining women's empowerment and points to potential wider repercussions, including for educational and entrepreneurship trajectories. Women's agency is still mired within wider structures of patriarchy and chronic poverty: existing inequalities are being re-inscribed and reinforced.

Rahim et al. (2020) described the use of mobile phone by Rural Women of Gilgit-Baltistan, Pakistan. Their results revealed that 80% of women in the Hunza and Nagar districts own mobile phones (access) and 63% have good skills of mobile phone usage for a variety of purposes. While 56.4% of women use mobile phones in their daily life activities, 23.6% did not use it. Though, 71.8% of women reported using the mobile phone for security purposes.

Hasbi and Dubus (2020) addressed mobile internet usage and financial inclusion in several countries in SSA, based on household surveys from 2013 to 2017. They showed that SIM card ownership and being part of an online social community has a strong positive impact on mobile broadband use. Furthermore, they highlighted a positive correlation between digital inclusion and financial inclusion as mobile money users and bank account users are found to be more inclined to use mobile broadband. As a general observation, Hasbi and Dubus found that those excluded from mobile broadband use are the eldest, those with the lowest level of education, and women.

Appendix C: References

The following references point to the 113 scientific publications which were analysed in detail, see Appendix A for the information flow. The RyaanID is added as an internal identified, being used in the matching

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