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## The smart feature phone revolution in developing countries: Bringing the internet to the bottom of the pyramid

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### ABSTRACT

Until recently, the only way for the population of developing countries to access the Internet was through expensive smartphones, designed in and for developed countries. In the past few years, however, a major new innovation has emerged, the smart feature phone with Internet connectivity, which was specifically designed for those with low incomes in developing countries. This paper explains the development process for the smart feature phone, how this has influenced the nature and extent of adoption, and its use by low-income groups, including their demonstrated preference for uses related to entertainment rather than more traditional “work-related” goals. The focus is on the case of India, where the JioPhone has already reached millions of people with low incomes.

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### Introduction

In 2017, only three categories were needed to specify the ownership and non-ownership of mobile phones in developing countries – owners of smartphones with Internet connectivity, owners of basic models with few features and no Internet connectivity, people who owned no mobile phones at all (see Table 1).

Now, the picture would not be complete without a fourth category – owners of smart feature phones (roughly, a hybrid between a simple phone and a smartphone). Featured most prominently in India, in the form of the JioPhone, smart feature phones saw a 252% growth in demand in 2018 and are predicted to exhibit rapid growth in the next few years (it has just been introduced in many sub-Saharan African countries). Estimates provided by Counterpoint Research, moreover, suggest that nearly 370 million smart feature phones are expected to be sold, across the world between 2019 and 2021 (Wang 2019).

The questions to be answered are: What shaped the development of the new technology? What has been the extent and nature of the adoption? What impact it has had on those with relatively low incomes? These questions are best addressed, in my view, with a sequential analytical framework, running from the development of smart feature phones and continuing

through their diffusion to the impact they might have had. This framework is based on the recognition that since the various phases influence one another, they need to be considered together.

I begin, accordingly, with the critical first phase that has to do with the way in which the new technology was developed.

### The genesis of the smart feature phone

I take note in the first place that the location of an innovation tends to bear on its subsequent rate of diffusion in different markets. This is the case mainly because technologies developed in and for a particular location, tend to fit in with the circumstances prevailing there, where they will to this extent be more readily adopted. For many decades, however, this mechanism worked largely in one direction, because of a widespread lack of innovative capabilities in most developing countries, especially those that were particularly backward in terms of their available technological capabilities.<sup>1</sup>

Thus it was that most of the world's innovations were developed in the rich countries and reflected, more or less closely, the socio-economic characteristics of those countries. Technologies designed in and

**Table 1.** Categories of ownership of mobile phones in select African countries, 2017.

	% of sample reporting ownership		
	smartphone	basic phone	no phone
South Africa	51%	40%	9%
Ghana	35%	45%	20%
Senegal	34%	46%	21%
Nigeria	32%	48%	20%
Kenya	30%	50%	20%
Tanzania	13%	62%	25%

Source: Silver and Johnson (2018).

for the problems of low and middle income groups in poor countries were rare and their needs were largely ignored. It was for this reason that there were calls in the nineteen seventies and eighties for “intermediate” and “appropriate” technologies<sup>2</sup> in developing countries, especially those with relatively low incomes and small markets for technologies developed in the rich world. And while it is true that there were many attempts to supply those technologies,<sup>3</sup> they were generally on a small scale and rarely scaled up to anything like the national level<sup>4</sup> (though there are some notable exceptions such as the Rural Access Roads Project in Kenya<sup>5</sup> and the “Nirma” brand of detergents sold in India<sup>6</sup>).

The broad picture of the global innovation system I have just painted, however, has changed quite markedly in recent decades, especially perhaps in the largest developing countries, such as India. In that country, for example, R&D grew rapidly over the period 2000 to 2015, leading one observer to remark that it was rapidly moving toward becoming an innovation hub in Asia (Financial Express 2019b). On the demand side, too, there have been significant changes. Average incomes of developing countries as a whole, for example, have risen and the numbers of those living in extreme poverty have declined in many poor countries (World Bank 2018b, 2018c). To this extent, the effective demand for technologies that meet developing countries’ needs, will also have risen.

More specific reasons are needed, however, to account for the features of the JioPhone and its subsequent popularity in India. One of them has to do with the fact that the two major actors – Reliance Industries and KaiOS – were both driven by the same overriding goal of filling the formidable gap between basic mobiles and smartphones. In the former case, one has to look to the visionary qualities of the CEO, Mr. Mukesh Ambani, who was not content with making marginal change to the telecommunications ecosystem that existed prior to the introduction of the Jio smart feature phone. Rather, he was committed to a vision of massive change to be wrought by smart

feature phones that would alter the lives of tens of millions of less advantaged Indians, by connecting them at low cost to the Internet through smart feature phones.<sup>7</sup> For its part, KaiOS Technologies, the software developer, expressed the goal it was pursuing in the following terms: “KaiOS and our partners have been driving forces in bringing the smart feature phone segment to life. We developed our platform with emerging regions and niche user groups in mind, from those priced out of the existing market, to others looking for an alternative to smartphones. There’s a huge demand for reliable affordable technology in regions like Asia, Africa and Latin America” (Wang 2019).

KaiOS, as Leung (2019) points out, seemed to have come entirely out of the blue. Toward the end of 2017, it lacked even a website. A few months later, the firm’s operating system was running on more than 30 million phones in India and North America. Roughly a year later, KaiOS was being offered in no fewer than 100 countries across the globe. In reality it has a somewhat longer history. It was borne of efforts to keep the essence of the open source Firefox OS alive in the mobile connectivity arena, after Mozilla Foundation discontinued the mobile phones version of Firefox OS in 2016 (Leung 2019).

It is convenient to begin this story at the end of 2015, when Mozilla announced that it was abandoning the Firefox operating system as a platform for smartphones. For many in the industry, this seemed to put an end to the idea of a mobile OS that was built around the open web (Summers 2019). Yet, only a few years later, through a series of more or less coincidental events, Firefox reappeared, in much modified form, as the operating system for the JioPhone. Much had to do with the fact that KaiOS had begun in the United States with an Alcatel brand called “Go Flip,” which AT&T, Sprint, and T-Mobile were persuaded to stock, because of prior work connections between the parties. These events, in turn, allowed KaiOS Technologies to win a contract with Reliance Industries in India. Out of this collaboration, the JioPhone was ultimately born, owing much to the original Firefox OS, including the telling fact that KaiOS Technologies hired 30 former Mozilla employees to develop KaiOS (Summers 2019). In the eventual success of KaiOS, starting with JIO phone, Reliance Industries played a dominant role.

It is important to note that KaiOS has been “developed into something much more robust and expanded than the original Firefox OS” (Dey 2019). A major difference lies in the range of popular

applications that KaiOS Technologies managed to secure from major technology firms such as Google. These included Facebook, YouTube, WhatsApp and Google Assistant. Some of these were especially important because they bore on the ability of poor, illiterate users to use the Internet and to do so effectively. Consider first, in this regard, the case of WhatsApp. According to a recent article in *The Economist* (2019b, n.p), for example:

video is easier to post to your peers than writing is. And speech beats typing – as can be seen from the use of WhatsApp to send voice messages rather than texts. Though usually associated with pricey first-world gadgets such as the Amazon Echo, voice-input systems have found enthusiasts in the poor world, too. New Internet users in India routinely use voice commands to operate their phones, including for such tasks as making calls.

Or, to take another pertinent example from India, “an illiterate cab driver in Mumbai, uses Uber’s ride-hailing app through a combination of voice input and audio direction. When he has to send messages, he speaks into a voice-to-text app, copies what turns up on the screen onto a messaging app and sends it to his waiting passenger-to-be, hoping it makes sense” (The Economist 2019b, n.p.).

The Google Assistant too, reduces the limitations of illiteracy in the use of smart feature phones such as JioPhone, because it allows the substitution of voice for text communications. For example, questions posed to the Assistant in voice are answered in the same mode. And “In places where people are coming online for the first time, millions are discovering that voice is a more natural way to interact with technology, overcoming technological hurdles that previously seemed out of reach” (Bronstein 2019).

Other aspects of the KaiOS phone design, moreover, warrant attention because they bear on the suitability of the product for those with low to middle incomes in poor countries (and hence the extent of subsequent diffusion amongst these groups). It is well to recall, in this regard, the basic KaiOS philosophy; that is, that whereas “Most companies are trying to make Internet-connected devices ever more powerful and capable – KaiOS went the other way. It rethought everything to keep the essential capabilities of the smartphones but strip out costs and preserve battery life for people who likely have spotty access to electricity” (Ovide 2019).

Note too that the specific design changes to which I now refer, apply also to the phones recently introduced into many African countries by KaiOS Technologies in partnership with MTN and Orange,

which sell at roughly 20 dollars apiece (which I shall discuss further in the next section). In particular,

the body of a KaiOS phone is as basic as it gets. There’s no touchscreen, which tends to be the priciest smartphone component and a battery hog. The models that Orange sells ... have a screen that’s less than half the size of the latest iPhones and controlled with an old-school keypad. The keys are made from the least expensive plastic possible ...

To save money, KaiOS also shrank the memory to about one-quarter or less that of the cheapest Android smartphone. That means the phones can handle only one task at a time ... For some KaiOS models, Qualcomm Inc. refashioned an old version of its processor, the phone’s brain, at an estimated cost of about \$3, compared with the roughly \$50 version found in top-end smartphones. In total, KaiOS-powered phones are made from about \$15 worth of parts – Apple Inc.’s top of the line iPhone has \$390 worth of stuff (Ovide 2019).

Nor, one should add, were cost reductions the only way in which KaiOS attempted to increase the appeal of its product to those seeking Internet connectivity but are unable to afford a smartphone. Another way, for instance, was to increase the relevance of the Internet to prospective buyers. In February 2019, for example, the company introduced a new pre-installed program called “Life,” which was intended to assist inexperienced users. To this end, what Life offers is a directory of curated content such as on woman’s empowerment, health, education, and agriculture. It also incorporates a Digital Skills app to develop skills such as Internet navigation, privacy, and security (Leung 2019). It basically helps inexperienced users get started with build-up digital skills as they go.

Here it is important to note the difference in price between the KaiOS phones in Africa and the JioPhone in India. For it is a difference that is likely to bear quite heavily on the patterns of diffusion in the two regions. In particular, while I have already noted that the MTN and Orange phones in Africa are sold for around \$20, I should also point out that the JioPhone is effectively given away by Reliance for nothing – this extreme behavior seems to motivated by Reliance’s desire to build up a base of support for the long run, while, at the same time, destroying a lot of the competition. Indeed, since the introduction of JioPhone, six competing firms have gone out of business (The Economist 2019a). The larger point, as noted by Peter Richardson, Director of Counterpoint, (2019b), is that Reliance is far from being a typical telecoms company in that its strategy hinges on developing a large base of users, which, in turn, calls for a vast amount of

**Table 2.** Market share of major feature phone brands (first quarter 2018).

Brand	% share
Reliance Jio	15%
Nokia HMD	14%
ITEL	13%
Samsung	6%
Tecno	6%
Others	40%

Source: Srivastava (2018).

subsidization. “For more conventional telcos,” on the other hand, “The economics of serving marginal communities is not easy to make work” (Richardson 2019a). That is why the KaiOS-based phones in Africa may be more difficult to promote than the experience with the JioPhone in India.

### The diffusion of smart feature phones

While many of the design features of the JioPhone may have contributed to its subsequent success in India, few doubt the role in this of the effectively zero price. According to one Indian source, for example, “In the first quarter of 2018, Reliance JioPhone ... held a 15% share of the global feature-phone market ... The brand managed this in *less than a year* of its launch in July 2017, mostly on the back of its ‘effectively free’ 4G feature phones’ (Bhattacharya 2018, n.p., italics added). In fact, by the first quarter of 2018, the JioPhone had, with a 15% share of the world’s feature phone market, reached the top place globally among feature phone brands, as Table 2 shows.

Moreover, projections for the years 2019 to 2021 show continuing rapid growth (see Table 3).

It needs to be recognized, though, that for all its phenomenal success thus far, the JioPhone is not the only vehicle through which the smart feature phone will be delivered to poor countries. One reason is that other telecommunication companies have also chosen to rely on the KaiOS OS, especially, but not only, in sub-Saharan Africa.

Orange and MTN, for example, two of the largest telecommunications firms in Africa, have recently formed partnerships with KaiOS to sell their smart feature phones in many countries in the region. At a price of around \$20, the two similar African brands offer users the chance to “leapfrog” smartphones and move directly to the Internet at a much lower price. As yet, however, no sales figures for these brands are available (they were only introduced in Africa in early 2019). What has been reported, though, is that MTN

**Table 3.** Projected global smart feature phone shipments.

Year	Shipments in millions of units
2017	20.8
2018	73.6
2019	97.5
2020	121.0
2021	152.0

Source: Wang (2019).

plans to sell 10 million of its new KaiOS-based phones in the next three years (GSMA. 2019).

The degree to which the two African brands are successful after their recent introduction, will provide an important test of the viability of the smart feature phone concept, in contexts other than the artificial situation in India, where, as noted above, the JioPhone is effectively given away free because of massive subsidization by Reliance Industries. Few other firms, in India or Africa, however, command the level of resources that are required to emulate this feat. Much therefore remains to be seen in Africa where phones similar to the JioPhone are sold for around \$20. As already noted, it is premature to answer this question, though there are some who expect products such as Orange’s “Sanza phone” to do much to bring the Internet to poor African countries, where, up until now, this technology has been confined to only a very small segment of the population.<sup>8</sup> According to GSMA, as per African Wireless (2019, n.p.) reporting, “the \$100-200 price tag of a smartphone is preventing 64% of people in Africa from upgrading their phones to 3G/4G devices that can access the Internet.” On the other hand, research conducted by GSMA also suggests that the price threshold for making the transition from 2G to 3G/4G phones is \$34. “Below that point, even those in the lowest income groups are said to be capable of upgrading to data-enabled devices” (African Wireless 2019). According to this calculation, therefore, the phones sold by MTN and Orange, should be affordable to many of the poor in Africa (though, of course, price is not the only determinant of adoption).

Unfortunately, no research that I am aware of, provides detailed information on the status (income or education) of those who adopt smart feature phones in India or sub-Saharan Africa. As such, it is difficult at this stage to describe these phones precisely in terms of appropriate technology, which, as noted above, has the potential to alleviate poverty. It could theoretically be the case, for example, that buyers are drawn from among the most affluent groups, seeking to possess a second mobile phone (apart that is from a smartphone). Or, equally, it might be that those who adopt smart feature phones are more from those

**Table 4.** Activities undertaken on mobile Internet, based on selected usage in developing and developed countries.

Use	Social networking	Play games	Order or purchase goods online	Access health information	Access government services
Developing countries	76%	53%	21%	18%	14%
Developed countries	75%	50%	45%	31%	26%

Source: GSMA (2019).

in middle-income groups, with more education and better digital skills. In that case, it would be incorrect to describe the outcome in terms of Prahalad's (2006) notion of "bottom of the pyramid." Clearly, for both conceptual and policy reasons, there is a pressing need to conduct survey research that is capable of throwing some light on the socio-economic status of those who own the new smart feature phones.<sup>9</sup>

There is, however, some information that strongly suggests involvement by the poor. Some of it pertains to the location of the JioPhone in India. In particular, survey research shows that in percentage terms, the share of the rural areas in the overall subscriber base of Reliance Industries grew from 4.25 two years ago, to over 32 in September of 2018 (Financial Express 2019a). This is a remarkable increase in the percentage share of the JioPhone in areas that are often known to be reluctant to accept new technology in general and information technology in particular (James 1989). In fact, according to a recent estimate, there are over 62 million subscribers to the JioPhone in the rural areas of India (Financial Express 2019a). Since it is in these same areas that the poor are concentrated, it is well-nigh impossible to imagine that the poor will have been entirely bypassed by the new technology. Moreover, since the majority of JioPhone buyers appear to be first time users of the Internet, they must, prior to that, have been unable to afford a smartphone and as such, were unlikely to be among those with relatively high incomes (Reliance Jio Infocomm 2019).

Consider in this regard, the actual case (reported by the *Wall Street Journal*) of a sidewalk vegetable seller in New Delhi, who earns roughly \$80 a month putting him on a daily basis at around \$2.6 and not far above the World Bank's poverty line. When he decided to replace his basic mobile device, he was unable to afford even the cheapest, bare-bones smartphones that cost around \$100. So, he paid about \$20 for JioPhone. With his new smart feature phone "he listens to Bollywood music on the job, using Google's built in voice assistant to search for Hindi-language tunes on YouTube. At night his family crowds around the device to watch movies" (Purnell 2019, n.p.).

This example points to an important aspect of Internet use in developing countries, which is quite different than that in developed countries. Whereas

talk about the use of the Internet in developing countries has tended to focus on staple development issues such as farmers seeking information on grain prices, women searching for information on maternity, and students eagerly signing up for online education, the reality has confounded these expectations (The Economist 2019b). That is, "where people planning development strategies imagined, metaphorically at least, Blackberries providing new efficiencies and productivity, consumers wanted the chat, apps and games of the iPhone. Worthier uses tend to follow, but they are the cart not the horse" (The Economist 2019b, n.p.).

It is useful to examine these tendencies in terms of the most recent data provided by the GSMA. (2019), as set out in Table 4.

Whereas those living in developing countries show similar percentages as inhabitants of rich countries with regard to social networking and playing games, this is not the case with uses such as ordering online, accessing information about health, and accessing government services (or what may be called development activities). In a strict "consumer sovereignty" framework, these differing preferences of poor countries need, of course, to be respected. But one also needs to bear in mind that the relatively low use of development services such as education or e-government, may sometimes be less about preferences and more about the availability of such resources, especially in rural areas of poor countries. In any case, there is nothing sacrosanct about the conditions in which preferences are formed: whether, for example, they provide undue support to one use over another.

Then, there is the need for recognition of a calculation made by the GSMA (2017, 30) that "For those living below \$2 per day, a \$100 handset accounts for 14% or more of annual income. A phone in the range of \$15-35 would be *closer to the affordability threshold for this group*" (GSMA 2018, n. p.). This estimate is so important because KaiOS-based feature phones tend to be available for a figure of around \$20, that lies well within the said range of affordability for those with low incomes in developing countries (GSMA. 2019). Consider, finally, that prior to the recent emergence of the smart feature phone, Internet connections were being made by relatively educated and high-income individuals in developing countries,

**Table 5.** Types of digital skills.

Type of skill	Description
Basic	“Basic digital skills enable us to function at a minimum level in society – Basic skills cover hardware (for example, using a keyboard and operating touch-screen technology), software (for example word processing, managing files on laptops – and online operations (for example, e-mail, search, or completing an online form).”
Intermediate	“These are effectively job-ready skills since they encompass those skills needed to perform work-related functions such as desktop publishing, digital graphic design and digital marketing. For the most part, these skills are generic, meaning their mastery prepares individuals for a wide range of digital tasks needed to participate as engaged citizens and productive workers.”
Advanced	“Advanced skills are those needed by specialists in ICT professions such as computer programming and network management – These include artificial intelligence (AI), big data, coding, cybersecurity, Internet of Things (IoT) and mobile app development.”

Source: ITU (2016).

using smartphones (Pew 2018). When the smart feature phone was introduced, such individuals would, in the main, have been reluctant to trade in their smart phones for an alternative that was better suited to meet the needs of those with much lower incomes.

I conclude this section with an observation about smartphone diffusion around the world. Thus, “smartphone uptake across and within regions and markets is not balanced, risking leaving large populations without the means to come online” (GSMA 2017a, 2). Written in 2017, before the take-off of smart feature phones, this GSMA report goes on to provide useful data concerning the geographical pattern of imbalance in the distribution of smartphones. In particular, “Eastern Africa and South Asia are the regions lagging behind the most, with smartphone adoption levels as of mid-2017 at 25% and 30% respectively – much lower compared to the global average of over 50%. A major contributing factor to this inequality is the high rate of poverty. South Asia and sub-Saharan Africa are home to the majority of the world’s poor people – India is a clear example of this, where – an average priced smartphone can cost up to 16% of income for poor and low-income groups” (GSMA 2017a, 2).

Put another way, the point is that the opportunities for smart feature phones tend to be greatest in precisely these Internet-deprived regions, where the inhabitants most need it<sup>10</sup>, but are least able to be connected. And, as we saw earlier in this section, it is in these same areas (India and sub-Saharan Africa) where the growth of smart feature phones tends to be concentrated.

## The impact of smart feature phones

What has been discussed so far falls into the category of the “first” digital divide, i.e., the differential extent to which Internet access is available in developed and developing countries. The case of India indicates that with the widespread adoption of smart feature phones, the Internet access gap will have narrowed and will narrow even more in the coming years (though these phones are also adopted to a limited degree in developed countries such as the USA) (Chokkattu 2018).

The impact of Internet diffusion in India and other poor countries, however, does not depend only on the reduction of the “first” digital divide. For, much also depends on what is referred to as the “second” digital divide: that is to say, the differential degree to which analog complements are also available (World Bank 2017). I am referring here, for example, to literacy, numeracy, and digital skills. What matters, for welfare, that is to say, depends not only on access to technology, but also on what is done with it (Sen 1985).<sup>11</sup>

It is true, as discussed earlier, that KaiOS-based feature phones in India and Africa are designed specifically to overcome certain problems that make it difficult for poor, uneducated users to engage effectively with the Internet (such as the use of voice rather than text communications). But whether and to what extent these design features actually promote digital skills is not at all clear at this stage and the need for research is all too obvious. Consider, for the sake of argument, the definition of these skills as provided by the ITU. (2016). As shown in Table 5, a distinction is drawn between three levels, ranging from basic to advanced, with standard in between.

As far as I can judge, the two most advanced categories will be largely out of reach for many, if not most, of the rural, uneducated groups, that lack the contextual background and required skills set to perform, what for them, seem to be relatively complex tasks (recall, in this regard, the surveys noted above, which show the perceived inability to operate the Internet as a major source of nonuse in several developing countries).<sup>12</sup> Even in the case of basic skills, there appears to be a substantial gap between the developed and the least developed countries, as is evident from Table 6.

Still more telling is the fact that as much as 80% of those in the least developed countries, lack the basic skills needed to operate the Internet (such as managing files, e-mail, search or filling in an online form). It has to be recognized, though, that in countries where KaiOS smart feature phones have spread widely, such as India, the number just cited will be

**Table 6.** The divide in digital skills between developed and developing countries (basic and standard skills).

Type of digital skill	Developed countries (average proportion of individuals)	Developing countries (average proportion of individuals)
Basic	65%	46%
Standard	49%	20%

Source: ITU (2018).

**Table 7.** Countries with lowest engagement scores.

Country	Engagement score
Ivory Coast	1.4
Cameroon	1.3
Nigeria	1.3
Egypt	1.1
India	1.1
Uzbekistan	1.0
Sierra Leone	0.9
Myanmar	0.8
Pakistan	0.8
DRC	0.6
Ethiopia	0.5

Source: GSMA (2017b).

lower, because the phones are themselves designed to reduce the constraints imposed by illiteracy and inadequate digital skills. Unfortunately, little or no research has been conducted on this important issue.

Yet, a large-scale survey conducted by the GSMA (2017b), of “mobile user engagement” in 56 countries throws some indirect light on what one can expect. The basic idea, as expressed by the GSMA, is to calculate two scores for each country surveyed, namely, usage score (“the average number of mobile phone use cases adult phone owners engage in”), and frequency score (“how often they engage in the use case on average”) (GSMA 2017b, 4). The higher are the scores, the more engaged is the user. In fact, GSMA has constructed an index based on these scores, which, in a rough way, can be considered as indicators of digital skills.

And since I am primarily interested in countries that are most lacking in digital skills, I list in Table 7 the bottom ten countries on the mobile user engagement score.

The scores associated with each country should be interpreted as follows. At the one extreme, a zero score indicates that, on average, the participants in a particular country never use mobiles for any of the 29 use possibilities mentioned in the survey. Conversely, a score of 10 means that, on average, users in a country participate in all such possibilities every day.

Note that seven of the bottom 10 countries are drawn from sub-Saharan Africa, and one, India, was the subject of our previous discussion on JIO phone. These countries, it seems, are especially likely to be plagued by problems of digital skills, when their inhabitants come to use smart feature phones. And one other country in the table, Myanmar, warrants

special mention in this regard, because although smartphone ownership is relatively high, users have gained only very limited benefits. More specifically, “In Myanmar, >50% of unique subscribers own a smartphone but their user engagement pattern is below the developing world average. Just over 60% of smartphone users in the country claim that their usage is prevented by the fact that they have trouble understanding how mobile Internet applications, websites or e-mail work on a mobile phone” (GSMA 2017b,11). What is probably lacking in this case of a divergence between the “first” and “second” digital divides, is a severe shortage of literacy and digital skills among the population. Recall, in this regard the substantial gap in the availability of such skills between the developed and least developed countries (which include Myanmar and many African countries), shown in Table 7.

A major question then arises as to whether and to what extent KaiOS-based smart feature phones in effect lessen the digital skills problem in the group of countries with very low incomes. For, as I have noted at several points in the preceding text, such phones are designed to simplify and enhance the access to and use of the Internet, by, for example, including a wider range of languages. But exactly how far these features of the new phones will help to narrow the gap in the demand and supply of digital skills, is as yet, anything but clear (and requires more and more detailed research).

What does seem clear though, is that, some degree of digital skills will be needed, especially in the poorest developing countries, since the features embodied in the KaiOS-based phones are not perfect substitutes for human skills (certainly not across the board). And I would venture to suggest, moreover, that digital skills will need to be promoted to a far greater degree than they have been in most developing countries up until now.

This is mainly because, as shown above, most poor developing countries are especially disadvantaged with regard to digital skills, which are becoming increasingly important for welfare of the individual and also the society as a whole (ITU. 2015). Moreover, there is some suggestion that it is especially rural areas that bear the brunt of the lack of these analog complements. Note, too, and relatedly, that the absence of



digital capabilities will tend to be most acutely felt by first-time users of the Internet, who will not yet have had the chance to learn by doing.

Yet, for all the benefits that are imparted by the acquisition of digital skills, governments in developing countries have, by and large, done precious little to promote them. In part, this is due to the way in which, at the implementation stage, there is often still a focus on access, rather than analog complements (i.e., on the “first” rather than the “second” digital divide). It may also be a part of the same “crisis in learning,” which has caused literacy and numeracy to stagnate over the past few decades (World Bank 2018a). In any event, the situation has prompted the World Wide Web Foundation (2017) to argue that “it’s time to prioritize digital literacy.” Such a view is underscored by the most recent data from the GSMA. (2019), which indicate that for four major regions of the developing world, a lack of literacy and digital skills, formed the main barrier to mobile Internet use.

One step toward redressing this situation has been taken by KaiOS itself, based on the recognition (noted above) that the lack of skills is felt most acutely by first-time users of the Internet. First-time Internet users will probably find the Life application on digital skills to be especially useful because it offers them the chance to learn the rudimentary aspects of the Internet. In this way, too, the design of the KaiOS-based feature phone itself contributes to a reduction in the “second” digital divide between developed and developing countries.

## Conclusions

Just a few years ago, there were three categories of mobile phone ownership in developing countries, namely, owners of basic devices (without Internet connectivity), owners of smartphones, and those who owned no mobiles at all (who might nevertheless have some means of going online through kiosks, telecentres, and other shared facilities). Not long, thereafter, however, a new category was needed to account for an innovative alternative – the smart feature phone. The questions to be answered are: What shaped the development of the new technology? What has been the extent and nature of the adoption? What impact it has had on those with relatively low incomes?

What I find in relation to the development phase of the new phone is that absolutely no effort was spared in the effort to reduce costs, without losing any essential functionality. (This was reflected partly

in the use of a modified form of open-source software.) In this sense, and given the vast numbers of low-income people it has apparently already reached, the new smart feature phone represents one of the most successful cases yet known, of what is known as appropriate technology (the more so, indeed, because of the range of benefits that the Internet offers).<sup>13</sup> But the KaiOS-based version of the technology also seeks to make phones easier to use, by, for example, enabling speech to replace text as a means of communication and by adding applications that help (first time) users to find relevant and helpful information (as is the case, for example, with a KaiOS application called Life). Finally, the said phone is or has already been introduced in regions most in need of it, namely, India and sub-Saharan Africa. Thus it was that the place of origination of the technology influenced both the pattern and extent of adoption and this, in turn, bore on the benefits that were derived.

I was at pains to emphasize, however, that the actual benefits derived from the Internet by low-income individuals, depend heavily on the digital skills they possess, a function, among other things, of the programs that are set in place.

To conclude, I refer to various points in the text, where note has been taken of what we do not know about the development, diffusion, and impact of the new technology. It is not of course my intention here to repeat all such gaps in our knowledge, but rather to revisit only a few of the most important of them.

It is not known, for example, with any certainty, who the users of the KaiOS based feature phones really are: whether they have high or low-incomes; where they live (in rural or urban areas), and how much education they have received (though some indirect evidence is available). As such, it is difficult to gauge with any degree of precision, the impact of the new technology on poverty and inequality in developing countries. Then too, little is known about the extent to which users of the new technology actually derive the gains that are available to them from the Internet. Recent data suggest that low-income users have a preference for entertainment rather than more traditional development goals. I have also shown, for example, that there is a very large gap in digital skills between the rich and the least developed countries. Will this gap result in differences in the extent to which gains are realized by those living in the two groups of countries? To what extent do the new smart feature phones reduce the need for minimum competencies in literacy and numeracy?<sup>14</sup> Or, for that matter, will digital skills themselves be

reduced? All these questions require far more survey research than they have hitherto received.

## Notes

1. Singer (1970) referred to this as international technological dualism.
2. By, most notably, Schumacher (1973) and Stewart (1977).
3. For a review see James (1989).
4. On the general problems of scaling up, see Hartmann and Linn (2008).
5. See the ILO's (International Labour Organization) own description of the program (ILO 1992).
6. For a description of the case, see Singh and Pandey (2005).
7. See for example the data in Table 1.
8. Other important ones, for example, are the availability of infrastructure and digital skills.
9. From a thorough review of the academic and non-academic (corporate) literatures, and discussions with some industry workers, I was unable find data on the socio-economic status of JioPhone users in India. What is called-for are micro surveys of samples of users.
10. This was also the case with basic phones as shown empirically by Waverman, Meschi, and Fuss (2005).
11. The idea has also been applied to education by Michaelowa (2001).
12. According to the World Bank (2017), for example, "More than 80 per cent of the entire working age population in Ghana and more than 60 percent in Kenya cannot infer simple information from relatively easy texts."
13. Note, though, the caveat noted above to the effect that it is still not known what percentage of the poor actually adopt the new phones. More generally, the benefits of the Internet in developing countries are described in numerous sources such as Deloitte (2014).
14. I showed that the text to speech application on the JioPhone reduces the need for literacy among the poor who are unable to reach minimum levels of this capability.

## References

African Wireless. 2019. New "smart feature phones" aim to address affordability issues for mobile users in Africa. Accessed May 2, 2019. <http://www.africanwirelesscomms.com/news-details?itemid=2508>.

Bhattacharya, A. 2018. In just 10 months, Reliance Jio's become the world leader in feature phone. Quartz India May 25. Accessed January 17, 2019. <https://qz.com/india/1288920/reliance-jio-has-become-the-world-leader-in-feature-phones-in-just-10-months/>.

Bronstein, M. 2019. Building the Google Assistant on phones for everyone, everywhere. Accessed June 2, 2019. <https://www.blog.google/products/assistant/building-google-assistant-phones-everyone-everywhere/>.

Chokkattu, J. 2018. A flip phone with Google Maps? KaiOS is making dumb phones smarter. Digital Trends March 2. Accessed November 4, 2018. <https://www.digitaltrends.com/mobile/kaios-smarter-feature-phones/>.

Deloitte. 2014. Value of Connectivity: Economic and social benefits of expanding Internet access. Accessed March 23,

2020. [https://www2.deloitte.com/content/dam/Deloitte/ie/Documents/TechnologyMediaCommunications/2014\\_uk\\_tmt\\_value\\_of\\_connectivity\\_deloitte\\_ireland.pdf](https://www2.deloitte.com/content/dam/Deloitte/ie/Documents/TechnologyMediaCommunications/2014_uk_tmt_value_of_connectivity_deloitte_ireland.pdf).

Dey, R. 2019. KaiOS- everything you need to know about this operating system. Accessed May 16, 2019. <https://www.blogpoke.com/kaios-everything-you-need-to-know-about-this-operating-system/>.

Financial Express. 2019a. JioPhone takes Reliance Jio to hinterland JiO India. *Financial Express* October 7. Accessed May 23, 2020. <https://www.financialexpress.com/industry/making-inroads-jiohone-takes-reliance-jio-to-hinterland/1728398/>.

Financial Express. 2019b. Indian R&D is pumping iron, must make policy choices carefully. *Financial Express* May 17. Accessed June 3, 2019. <https://www.financialexpress.com/opinion/indian-rd-is-pumping-iron-must-make-policy-choices-carefully/1580688/>.

GSMA. 2017a. *Accelerating affordable smartphone ownership in emerging markets*. London: GSMA. Accessed March 22, 2020. [https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2018/08/Accelerating-affordable-smartphone-ownership-in-emerging-markets-2017\\_we.pdf](https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2018/08/Accelerating-affordable-smartphone-ownership-in-emerging-markets-2017_we.pdf).

GSMA. 2017b. GMEI 2017: Global Mobile Engagement Index. Accessed August 5, 2018. <https://www.gsmainelligence.com/research/?file=e4549aeda553ac832ff9126c7d6c0861&download>

GSMA. 2019. The mobile economy: Sub-Saharan Africa. Accessed February 4, 2020. <https://www.gsma.com/mobileeconomy/sub-saharan-africa/>

Hartmann, A., and J. Linn. 2008. *Scaling up: A framework and lessons for development effectiveness from literature and practice*. Washington, D.C.: Brookings Institution.

ILO. 1992. *The impact of world employment research on technology*. Geneva: ILO.

ITU. 2015. *Measuring the information society report*. Geneva: ITU.

ITU. 2016. *Digital skills toolkit*. Geneva: ITU.

ITU. 2018. *Measuring the information society report*. Geneva: ITU.

James, J. 1989. *Improving traditional rural technologies*. London: Macmillan.

Leung, E. 2019. Life, a new initiative by KaiOS to help first-time Internet users make the most of mobile Internet access (press release). Accessed June 1, 2019. <https://www.kaiostech.com/life-a-new-initiative-by-kaios-to-help-first-time-internet-users-make-the-most-of-mobile-internet-access/>.

Michaelowa, K. 2001. Primary education quality in Francophone Sub-Saharan Africa: Determinants of learning achievement and efficiency considerations. *World Development* 29 (10):1699-716. doi: 10.1016/S0305-750X(01)00061-4.

Ovide, S. 2019. The next big phones could bring a billion people online. *Bloomberg Businessweek* June 7. Accessed July 7, 2019. <https://www.bloomberg.com/news/features/2019-06-07/the-next-big-phones-could-bring-a-billion-people-online>.

Pew. 2018. Social media use continues to rise in developing countries but plateaus across developed ones. Accessed March 23, 2020. [www.pewresearch.org/global/2018/06/19/social-media-use-continues-to-rise-in-developing-countries-but-plateaus-across-developed-ones/](http://www.pewresearch.org/global/2018/06/19/social-media-use-continues-to-rise-in-developing-countries-but-plateaus-across-developed-ones/).

Pralhad, C. K. 2006. *The fortune at the bottom of the pyramid*. London: Pearson.

- Purnell, N. 2019. The hottest phones for the next billion users aren't smartphones. *The Wall Street Journal*, July 23:23–2020. Accessed March. <https://www.wsj.com/articles/the-hottest-phones-for-the-next-billion-users-arent-smartphones-11563879608>.
- Reliance Jio Infocomm. 2019. Jio launches a digital literacy program “digital udaan” for first time Internet users (Press release, July 3, 2019). Accessed April 22, 2020. <https://jep-asset.akamaized.net/jio/press-release/Media+Release+-+Jio+Digital+Udaan+-+03072019.pdf>.
- Richardson, D. 2019a. Personal communication May 21, 2019.
- Richardson, D. 2019b. Personal communication, May 22, 2019.
- Schumacher, E. 1973. *Small is beautiful: A study of economics as if people mattered*. London: Blond and Briggs.
- Sen, A. 1985. *Commodities and capabilities*. Amsterdam: North-Holland.
- Silver, L., and C. Johnson. 2018. Majorities in Sub-Saharan Africa own mobile phone, but smartphone adoption is modest. Accessed July 19, 2019. <https://www.pewresearch.org/global/2018/10/09/majorities-in-sub-saharan-africa-own-mobile-phones-but-smartphone-adoption-is-modest/>.
- Singer, H. 1970. Dualism revisited: A new approach to the problems of the dual society in developing countries. *The Journal of Development Studies* 7 (1):60–75. doi: 10.1080/00220387008421348.
- Singh, A., and S. Pandey. 2005. *Rural marketing: Indian perspective*. New Delhi: New Age International.
- Srivastava, S. 2018. JioPhone takes the top spot in the global feature phone market – Q1 2018. CounterpointResearch.com, May 24. Accessed April 22, 2020. <https://www.counterpointresearch.com/jiophone-takes-top-spot-global-feature-phone-market-q1-2018/>.
- Stewart, F. 1977. *Technology and underdevelopment*. London: Macmillan.
- Summers, N. 2019. How KaiOS claimed the third-place mobile crown. Engadget, February 26. Accessed March 20, 2019. <https://www.engadget.com/2019/02/26/kaios-third-mobile-operating-system/>.
- The Economist. 2019a. Mukesh Ambani wants to be India's first internet tycoon. *The Economist*, January 26. Accessed February 26, 2019. <https://www.economist.com/business/2019/01/26/mukesh-ambani-wants-to-be-indias-first-internet-tycoon>.
- The Economist. 2019b. A global timepass economy. *The Economist* June 8. Accessed March 23, 2020. <https://www.economist.com/briefing/2019/06/08/how-the-pursuit-of-leisure-drives-internet-use>.
- Wang, Y. 2019. The birth of the smart feature phone in India, KaiOS. Accessed May 21, 2019. <https://www.kaios-tech.com/the-birth-of-the-smart-feature-phone-revolution/>.
- Waverman, L., L. Meschi, and M. Fuss. 2005. *The impact of telecoms on economic growth in developing countries* (Vodafone Policy Papers Series no. 2). London: Vodafone.
- World Bank. 2017. Skills development. Accessed March 22, 2020. <https://www.worldbank.org/en/topic/skillsdevelopment>.
- World Bank 2018a. *World Bank education overview: Skills*. Washington D.C.: World Bank. Accessed January 19, 2019. <http://documents.worldbank.org/curated/en/806751541081039061/World-Bank-Education-Overview-Skills>.
- World Bank. 2018b. *Ending extreme poverty and sharing prosperity: Progress and policies*. Washington D.C.: World Bank.
- World Bank. 2018c. *World Development Report*. Washington, D.C.: World Bank.
- World Wide Web Foundation. 2017. Why it's time to prioritise digital literacy. Accessed July 15:2018. <https://webfoundation.org/2017/09/why-its-time-to-prioritise-digital-literacy/>.