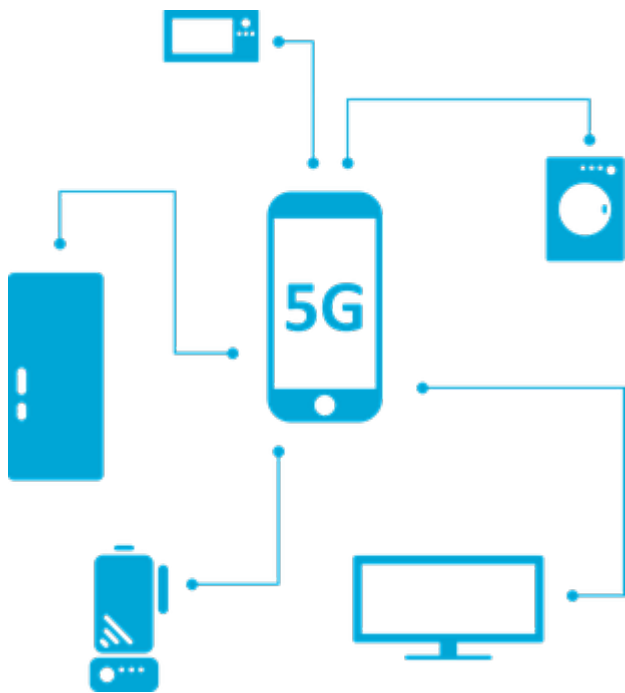


Progress with 5G Digital Coverage in the UK & Developing World Implications



Smartphone Technique

by David Fellows [1]

The 5G mobile communication offers the prospect of high bandwidth reception for rapid video downloads, gaming, instant replay coverage at major sporting events and simultaneous service to heavy concentrations of digital devices. It is a highly topical subject across the world including developing countries.

This article tempers expectations of widespread 5G coverage in developed countries on grounds of financial viability and suggests that developing countries are better served by

centring digital infrastructure investment on broadband cable and lower frequency 4G mobile services.

Digital Communication costs and coverage

I start by introducing a sense of realism about internet speeds and coverage by looking at actual practice in the UK which has reasonably average internet services for a developed country.

Table 1: UK internet speeds

User	Mobile	Fixed Line	Comments
Personal devices	4G (15/30 Mbps) 5G (2/100+Mbps)	Approx 30 Mbps (usually advertised as 50)	4G reaches 75% to 90% of the population depending on provider. 5G has hardly started(see discussion below). All-fibre cabling of 120 Mbps will become common in the next decade.

Small/ Medium businesses	—	100Mbps/ 1000Mbps	In this group call centres tend to need the higher capacity
Major businesses	—	1000Mbps+	

Note: 4G speed depends on provider and time of day [2], the better the infrastructure provision the better the service. 5G is said to relieve congestion although this too is infrastructure-dependent (see Table 3). For some time to come, even in developed countries, 4G will outstrip 5G coverage by some considerable margin.

In 2016 Universities of Cambridge & Madrid undertook a study [3] into the viability of introducing 5G mobile communication in the UK. Tables 2 & 3 summarise some conclusions from the study.

Table 2: UK Demographic Profile (total population 63 million)

Settlement Type	Proportion of Population (%)	Approximate Distribution of Total 5G Cost (%)
Urban	8	2
Suburban	62	19
Rural	30	79

Notes: (i) total cost adds capex & opex (see Table 3 below);
(ii) the study anticipates that the roll out of 5G will take

place over the next decade.

Table 3: 5G Options for UK (selected from UC&M study)

Aspect	Option S2 £bn	Option S5 £bn	Option S8 £bn
Features	One 50Mbps network shared by 4 operators	Using competitive 50Mbps networks except for rural areas where a shared 50Mbps rural network applies	Using two 50Mbps networks shared by 4 operators except for rural areas where a shared 10Mbps network applies
Capital Cost	22	24	15
Revenue Cost (10 yr NPV)	13	17	10

Study Conclusion	Not viable; Scotland is dramatically more expensive except for S8	Not viable; Scotland is dramatically more expensive except for S8	Not viable; the lower rural bandwidth avoids the cost rising exponentially to cover the final 10% of population
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Notes: (i) Most 5G signals are highly directional, require a direct line-of-sight between the antenna and the device receiving the signal and can be absorbed by humidity, rain, and physical object including trees, therefore they don't travel as far as the more robust, omnidirectional 4G signals (as a result they require very high aerial density and present problems for some applications under discussion such as driverless vehicles) [4]; (ii) 5G networks can make use of existing 4G aerial stock and cable support but the higher aerial density makes the transition from 4G very expensive; (iii) the cost of covering the most expensive 10% of population at 50Mbps is equivalent to that for the first 90%; (iv) the study assessed the total cost (capex & opex for 10years) of 5G coverage for the UK's rail and motorway networks would be £0.922bn & £0.253bn respectively.

Part way through 2019 several UK mobile service providers have commenced or announced their intention to provide 5G coverage. Some have published city roll-out programmes although details of schedules, geographical boundaries and bandwidth are sketchy at present. None of this equates to a city-wide coverage commitment let alone national coverage.

Unsurprisingly the focus appears to be areas of potential high traffic where improved service reliability will be the driving advantage. Available bandwidth could be as low as 2Mbps for entry level packages.

5G services may be offered for pop concerts, major sporting events, shopping malls, some public buildings and crowded city centres. Some of the infrastructure could be provided by venue owners or organisers as Wi-Fi is at present.

The European Union produced a policy document '5G for Europe: An Action Plan' in September 2016 that seeks to drive progress towards realising substantial financial benefits from the technology. The Action Plan, quoted in a recent review of the Commission's achievements, seeks to harmonise European preparations giving priority to infrastructure coverage of major urban areas and transport routes by 2025.

Implications for Developing Countries

1. Given the financial viability challenges in developed countries such as the UK it is clear that rolling out 5G services in developing countries will be hampered to an even greater extent by the financial returns required to support infrastructure provision.
2. 4G coverage is indisputably more readily viable than 5G and is a more obvious objective for developing countries for the foreseeable future. Governments need to consider their bandwidth licencing programmes accordingly.
3. Conventional public Wi-Fi systems can offer mobile text communication to supplement overloading of 3G and 4G reception in public areas with high demand for digital

services.

4. In the author's opinion 4G mobile coverage and fibre-optic cabling of CBD areas for super high bandwidth communication offer the basis for viable digital communication strategies in developing countries.

General conclusions

1. At the present time commercial ambitions for 5G in the UK appear limited. The financial viability of the aerial installation costs on a large scale compared to 4G is a considerable constraint. For some time to come 5G may be largely confined to high income high demand locations and some venues where owners provide the necessary infrastructure as an added attraction. It is a solution waiting for a killer application or acceptance as a social status imperative. The current service and economic priority for mobile infrastructure must be the completion of 4G coverage. This reasoning would seem applicable throughout the world although it is reported [6] that Malaysia intends to adopt 5G fully by 2023. Malaysia is undoubtedly a leader in [digital technology](#) but this claim is something that requires clarification.
2. It is generally presumed that the long-term intention of 5G service providers is transmission speeds of 50+Mbps but at current revenue levels this form of coverage is deemed to be unviable in UK rural areas. The UC&M study suggests that shared rural networks operating at 10Mbps would reduce cost significantly and a broadly similar cost reduction could be achieved by omitting 10% of the population (equivalent to 33% of rural population) from 5G coverage. Even these two reduced service options would still appear unviable assuming current service revenues.
3. The UC&M study hints that technologies under development

may deliver significant cost savings for 5G provision although details of how this might happen are not well understood at present.

4. 5G viability in the UK and other developed countries would therefore seem to depend on some or all of: (i) restricted service provision targeting areas of high demand; (ii) technological advances bringing cost-savings; (iii) user willingness to pay higher fee rates for 5G than its predecessor services; and (iv) modest, possibly shared, bandwidth in rural areas.
5. Given these 5G service limitations, upgrading to 5G-enabled smartphones may be a nuanced decision for many users for some considerable time. Roll-out costs and user hesitancy will, in turn, impact commercial investment.

In My Opinion

1. Countries have much more to gain from improving the reach of 4G mobile communication than encouraging service provider interest in 5G roll-out which will be a niche offering for some years to come. Developing countries should not feel that they must jump now or miss the bus.
2. 5G mobile communication is not a natural alternative to fixed cable support for business purposes. In this market fibre optic broadband cable services offer the ideal of high bandwidth, service reliability and relatively low cost.

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PFMConnect. He is a recipient of the Swedish Prize for Democratic Digital Service Delivery.

[2] See: <https://www.ispreview.co.uk/index.php/2019/02/countries-ranked-by-4g-download-speed-at-different-times-of-day.html>

[3] See: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/577965/exploring_the_cost_coverage_and_rollout_implications_of_5G_in_britain_-_oughton_and_frias_report_for_the_nic.pdf

[4] See: [Lifewire https://www.lifewire.com/5g-vs-4g-4156322](https://www.lifewire.com/5g-vs-4g-4156322)

[5] See: <https://5g.co.uk/news/ee-5g-launch-plans-roadmap/4900/>

[6] See: OpenGov Asia (10th September 2019): <https://www.opengovasia.com/malaysia-will-fully-adopt-5g-by-2023/>

Digital Government in Developing Countries



Posted by David Fellows and Glyn Evans[\[1\]](#)

With the aid of development partners, developing countries are making commitments to maximise the use of digital technology. The ICT industry is right behind them. In these reforms, digital technology is being represented as the principal transformative medium of government. But to think of “Digital Government” as necessarily transformative, almost an end in itself, is misguided. Governments should be primarily concerned to provide their services and engage with electorates in the most cost-effective way. Digital technology may or may not have a role in that process.

Here are some of the fields in which digital technology has demonstrated that it has a potential role to play in

developing countries:

- Transparency and public engagement
- Basic public service delivery in the fields of health and education
- Public safety and security
- The collection of tax and non-tax revenues
- The management of population growth in urban areas
- The sustainability and development of rural communities
- Skill shortages throughout the economy
- Economic diversification
- Measures to combat corruption
- Resilience to natural disasters

We do not accept, however, that the answer to any of these challenges is necessarily a massive investment in digital technology, say a 'digital city' or a fully integrated expenditure, revenues and payments system.

Many developing countries are not well positioned to make sustainable progress with digital technology in huge multi-faceted programmes requiring vast initial expenditure. This form of development may do little more than provide substantial fee income for international consultancies and software developers. Once the consultants are gone and system design faults surface, client needs change or in-house staff are poached by others, then the facilities that promised so much may become more of a hindrance than an advantage.

Things may not even get that far. Without governments having sufficient staff with the necessary technical skills, digital systems may never be properly configured and the client may be left with a partially implemented system. Nevertheless, it is

surprising how many such projects are specified and funded. Problematic factors are sometimes acknowledged without being fully taken into account.

We suggest that an evolutionary approach to digitally-enabled reform offers a more realistic way forward. The process should start with an analysis of the operational imperatives for improvement. This requires the following ten-point strategy:

1. A clear vision for future service delivery and the developing relationship between citizens and the government
2. A thorough assessment of internal resources (skills, knowledge, staffing commitments and budgets) required to support the implementation of reform and new ways of working
3. An overhaul of management philosophy and governance arrangements
4. The identification of mechanisms to address relevant gaps in capacity including improvements in the recruitment and training of in-house staff and encouragement of local firms to upgrade their ICT capacity incrementally to support public service digital applications (multinational collaboration for the [professional development of public servants](#) and the [improvement of governance and working practices](#) are addressed in previous blogs)
5. An examination of the various options by which change can be achieved
6. A robust approach to investment appraisal
7. An assertion of priorities based on sound information and analysis
8. A clear strategy to deliver project sustainability (including security)
9. The identification of the benefits sought and how such

benefits are to be achieved, and

10. A relentless focus on benefits realization accompanied by the modification of working methods to rectify performance shortfalls.

This approach is based on our past work, which we can illustrate with examples of two completed major projects, as well as our experience in developing countries.

The first example in Knowsley, one of the UK's most deprived areas, was one of the world's first "smart city" projects, started in 1997. It featured public information systems, electronic application forms, payment facilities, public feedback on quality of service, schoolwork support, an interactive liveability learning application for mentally challenged young adults, digital enablement schemes and public availability of PCs in libraries and community centres.

The second project in Birmingham, the UK's largest metropolitan municipality was probably the largest digitally-enabled change programme ever undertaken in a European city. It included the digitisation of procurement, HR (including performance management) and accounting practices, providing managers with accurate, real-time information, and digitising customer contact and the fulfilment management of customer requests, resulting in customer satisfaction improving by 20 percentage points. The entire change programme realised revenue savings of £100 million a year.

These examples suggest that it is possible to make significant reductions in the risk to both funders and recipients of digital-enabled developments by:

- Preparing an organisational readiness analysis and development strategy as set out above
- Establishing the necessary roles and finding the right people to fill those roles
- Monitoring and evaluating progress, and
- Responding with operational modifications as necessary to achieve the desired outcomes, and as technological advances offer fresh opportunities.

Some developments will not necessarily require state financial or operational support. Private sector encouragement may be sufficient. For example, physical planning that offers confidence to developers or infrastructure standards that support the public use of digital technology.

In our view, a challenging reform agenda demands a flexible approach, cool judgement and realistic timescales. Those in positions of responsibility should take steps to avoid being found friendless and trapped by the expectations and largesse heaped upon them.

[1] David Fellows is a director of PFMConnect Ltd, a management consultancy specialising in financial, digital and engineering services for developing countries. He is a winner of the Swedish Prize for Democratic Digital Service Delivery. Glyn Evans is the Vice President of the Major Cities of Europe IT Users Group and former CIO of various major cities.

Developing Systems to Combat Corruption



Posted by David Fellows [\[1\]](#)

Introducing the concept of “objective data”

In March 2018, we republished a short note on the use of [objective data](#) to combat corruption [\[2\]](#). The piece highlighted statistical techniques being used in western countries to identify corruption by correlating unorthodox procurement practices with aberrant supplier behaviour established from factually based ‘objective’ administrative data. It was suggested that less complex approaches to the analysis of ‘objective’ data could be used to indicate the need for further forensic examination of officials, suppliers, and politicians. The emphasis was on finding workable approaches for developing countries that were compatible with the available resources.

The term ‘objective’ data refers to factual information

derived from official government records. It represents data on transactions, activity schedules, and personal information, recorded through established processes, that give the information credibility. This contrasts with 'subjective' data which is often based on opinions or experience that is poorly evidenced and of limited application, as is the case with corruption perception surveys.

Frequent use of objective data

Objective data is checked and compared in dozens of administrative processes which can produce anomalies that may indicate the presence of corruption. For example, invoices are checked against orders and goods received notes or contract certificates, or payroll submissions are checked against timesheets. In addition, national bodies charged with the oversight of public administration – such as supreme audit institutions and public procurement commissions – are routinely engaged in the examination of objective data which can also lead to the identification of corruption.

Such findings are then included in published reports that may be used to identify process deficiencies or potentially to prosecute cases of fraud and corruption. These oversight functions can be particularly effective when they are invested with independence from government, extensive powers of enquiry, transparency of reporting, and due consideration of findings.

Developing objective administrative data systems

Apart from routine scrutiny provided by administrative processes and oversight arrangements, programs of administrative reform provide excellent opportunities for the development of systems that incorporate the automatic validation and cross-referencing of administrative data to

help identify patterns of corrupt activity.

Such arrangements are straightforward, well known, and remarkably simple to put into effect but in practice they are rarely complete or well executed. Too often there is a lack of expectation that good administration will have a beneficial effect. This places a premium on those who hold relevant managerial roles, requiring them to value high standards of administrative practice; exercise oversight responsibilities courageously, insightfully and in partnership with others as necessary; and ensure that reform opportunities are used to best effect. Well prepared and committed management is a prerequisite to any well-intentioned anti-corruption initiative.

Objective administrative data applications

Some examples of objective administrative data and its use to combat corruption are included in an Appendix available [here](#).

The use of objective data could also be developed in other ways. For example:

1. Countries could prepare anti-corruption strategies that include the use and development of objective data and staff training. Such strategies should be accompanied by operational guidance. Anti-corruption strategies and related material are often referred to as being part of the standard anti-corruption armoury but are rarely made available. In practice, however, few of these documents have been produced to a reasonable standard anywhere in the developing world, and perhaps it is time to redress this omission.
2. Additionally, collaboration between states, perhaps on a regional basis, could be helpful in developing techniques for interrogating data, preparing anti-corruption strategies, sharing knowledge of corrupt practices, and building operational cooperation between

countries

3. Consideration should also be given by multilateral agencies and regional representative bodies to the development of an international systems assessment schema (akin to PEFA methodology^[3]) that would indicate the efficacy and shortcomings of individual administrative systems for the purposes of combatting corruption.

This article is written with government administration in mind, but similar considerations apply to local governments and state-owned enterprises.

^[1] Director, PFMConnect. The author thanks John Leonardo for his helpful comments.

^[2] This blog was first published at <http://blog-pfm.imf.org/pfmblog/2018/03/how-useful-are-perception-indices-of-corruption-to-developing-countries.html>

^[3] See https://pefa.org/sites/default/files/PEFA%20Framework_English.pdf

Forthcoming blog: Developing Systems to Combat Corruption



In a March 2018 blog PFMConnect co-principal David Fellows discussed the [deficiencies surrounding corruption perception indices](#) and outlined how objective data analysis could offer a clearer insight into the systemic nature of corrupt behaviour, thus providing a more precise indication of the corrupt parts of an administration, the number of external parties that are engaged in corruption, and features of the [public financial management \(PFM\) system](#) that need to be strengthened in order to combat corruption.

In a forthcoming blog **“Developing Systems to Combat Corruption”**, David describes how an objective data system is used in practice and how the concept may be developed. Some further examples of objective data and their use to combat corruption is available [here](#).