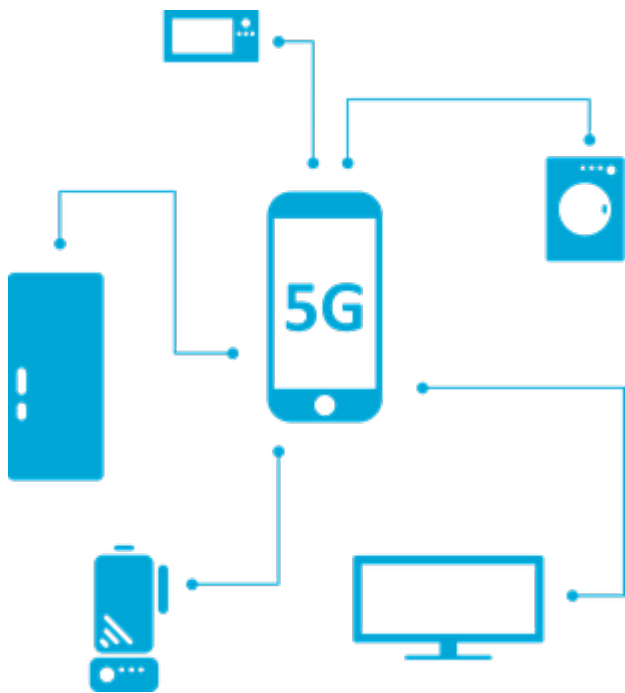# Progress with 5G Digital Coverage in the UK & Developing World Implications

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 sharedby 4 operators	Using competitive 50Mbps networks except for ruralareas 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

			Not viable; the lower rural bandwidth avoids the cost rising exponentially to cover the final 10% of population
Study Conclusion	Not viable; Scotland is dramatically more expensiveexcept for S8	Not viable; Scotland is dramatically more expensiveexcept for S8	

Notes: (i) M**ost 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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[1] David Fellows is a specialist in public financial management and digital government reform and is a director of

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

[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/

Using Digital Technology to Improve Sustainable Development Goal (SDG) Delivery
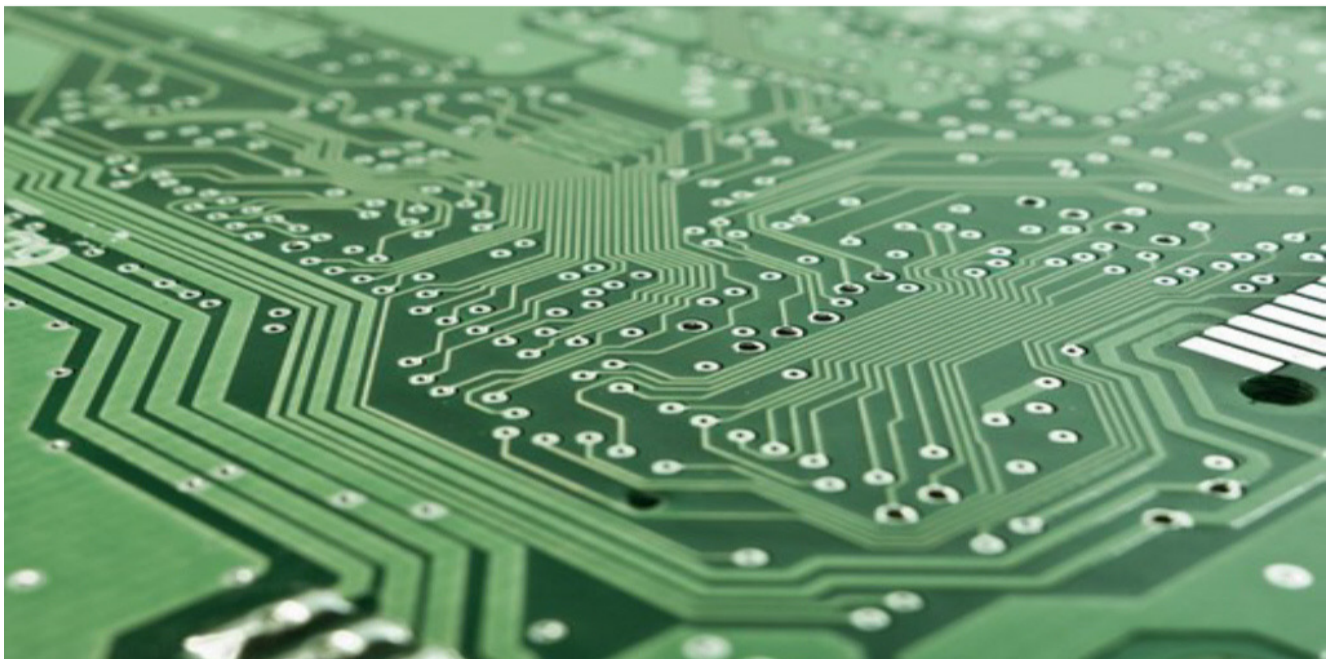
by David Fellows and Glyn Evans[1]

The SDGs

The United Nation's [SDGs](#) present an array of complex social, engineering, medical, scientific and managerial challenges for member states set in different contexts and mostly requiring very significant investment, organisational capacity and community involvement. Nations have made commitments to this agenda and it is accepted as guiding the key purposes of international development work worldwide. It is a hugely ambitious enterprise yet we suggest that current development work could be more successful.

The need for a powerful learning system

At a general level perhaps the greatest challenge is the creation of a learning system that is powerful enough to develop and distribute relevant knowledge and an understanding of how that knowledge can be best applied in the very different circumstances that exist across the world. As SDG performance criteria are finalised and adopted a [report by ESCAP](#) makes it clear just how difficult it is going to be to make a real difference.

We are not suggesting a great deal of organisation to create this necessary learning system. We propose a loose system of networking between experts based on digital communication. This would enable advice to be made available to community-based projects with greater levels of expertise being made available to the development of major programmes and projects. It would also facilitate feedback on project progress and performance. The use of digital technology would also improve the public information base and support public engagement.

Learning system features

The basis of this networking would be a digital communication system that would be largely self-driven by those in the field and a support network that will evolve around them. Key aspects of this digital communication system are illustrated below.

At national and local level:

- *Provide* feedback on progress made at
  local level within the country
- *Request the public to identify key factors to be taken into account*
  when designing SDG initiatives
- *Seek feedback on the regulations*
  required to support SDG initiatives
- *Engage in shared learning (perhaps amongst scattered populations) between ordinary people who are trying to cope*
  with SDG challenges on limited resources

At regional level:

- *Undertake shared research programmes*
- *Share experiences of adapting recognised approaches to particular circumstances*
- *Improve monitoring techniques*
- *Share monitoring and advisory services*
- *Encourage the development of problem-solving support networks*
- *Undertake peer reviews of projects and governance*

arrangements

At international level:

- *Build worldwide expertise to address fundamental scientific, engineering, economic, social and implimentation challenges*
- *Identify and promote successful strategies and initiatives*
- *Recognise issues for which effective solutions remain elusive*
- *Create networks capable of addressing significant and urgent challenges*
- *Develop modeling tools to help design solutions*

Supporting technology would include:

- *Websites including chat rooms, website messaging, on-line data monitoring and online questionnaires*
- *Video-conferencing for expert dialogue and advisory sessions*
- *Cloud-stored databases and shared document development*
- *Email for public interactions(newsletters), dispatch of documents, technical & administrative correspondence and technical update circulars*
- *Learning management systems to support training programmes that develop skills and expertise*
- *Application software to assist the gathering of performance data including the collection of data from administrative*

> *sources (ESCAP Report ibid: page x)*
>   - *Text messaging and social media for public dialogue*
>   - *Massive open online courses to raise general awareness*

In general such a system would require relatively unsophisticated technology dependent only on fairly low level digital communication. Expert dialogue would tend to benefit from good connectivity at reasonable bandwidth to support video conferencing although this is not absolutely essential. Proprietary software is readily available for most of these applications although bespoke monitoring, modelling and assessment tools could be created as the approach gained traction.

Examples from around the world

Our blog '[An International eCollaboration Route to Public Service Reform](#)'
(also published by the Australian National University's [DEVPOLICYBLOG](#) in July 2017) considers the diverse power of digital communication technologies. Examples of this technology used in ways relevant to this proposition are, as follows:

1. An example of 'Shared Learning' is set out in the UNESCO publication [Digital Services for Education in Africa](#). UNICEF has reported that in Vietnam 40% of children in rural areas used the internet for educational purposes, rising to 62% in urban areas.

2. Communities of practice have already been established in

[Canada](#) for green climate purposes

3. Social media has been used by PFMConnect for the past three years to raise public awareness on public financial management and governance topics reaching significant numbers of people in more than 50 countries.

Conclusion

This is not a system requiring heavy oversight and regulation. We seek cultural change to the way programmes and projects are developed. A more inclusive approach at expert and community level could be usefully supported by major development agencies and could become a requirement on contractors. For instance, these proposals could help the Green Climate Fund which appears to be heavily engaged in process issues at the expense of shared innovation.

Is it time to experiment with change?

End note

We should be pleased to discuss the ideas in this piece with those who believe that they may have relevance to their situation.

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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.

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Videos addressing good public financial management

We have commenced the publishing of videos about aspects of our work associated with supporting good public financial management.

We list below the videos available to-date:

Small island developing states need improvements in their digital communication infrastructure to help them recover from COVID-19. We have set out four collaboration approaches for SIDS and their stakeholders to consider actioning in our "[Small Island Developing States, COVID-19 and Digital Technology](#)" video based on our recent blog. [Petit États insulaires en développement, COVID-19 et technologie numérique](#). [Pequeno Estados em Desenvolvimento insular, COVID-19 e Tecnologia Digital](#). [Pequeña Estados Insulares en Desarrollo, COVID-19 y Tecnología Digital](#).

[Improving PFM digital transparency in SIDS finance ministries](#) (http://blog-pfmconnect.com/wp-content/uploads/Videos/Improving-PFM-digital-transparency-in-SIDS-finance-ministries.mp4) examines recent trends in the use of public financial management (PFM) digital platforms by the finance ministries

of small island developing states (SIDS) and potential opportunities. A shorter version of this video examines **SIDS finance ministries** use of [Facebook](#) to promote PFM digital transparency in small island developing states

[COVID-19, Brexit and the English Regions](http://blog-pfmconnect.com/wp-content/uploads/Videos/COVID-19-Brexit-and-the-English-Regions.mp4) discusses the UK Government's levelling-up policy for the English regions and the impacts of COVID-19 on the implementation of this policy.

[Virtual Schooling in the UK](http://blog-pfmconnect.com/wp-content/uploads/Videos/Virtual-Schooling-in-the-UK.mp4) examines the development of **virtual schooling** in the **United Kingdom** to support home education resulting from the Covid-19 lockdown.

[Digital government in developing countries](#), based on our recent [blog](#), recommends developing countries should employ an evolutionary approach to digitally-enabled reform and outlines a detailed implementation strategy for them to adopt in such projects. [Gobierno digital en países en desarrollo. Le gouvernement numerique dans les pays en developpement](#). [Governo digital nos países em desenvolvimento](#).

[Local government revenue systems corruption](#) outlines the different parts of local government revenue systems and presents strategies for combatting associated corruption. [Corrupción de los sistemas de ingresos del gobierno local. Corrupção dos sistemas de receita do governo local. Corruption des systèmes de revenus des administrations locales](#).

[Supporting good public financial management](#) provides images of some of the countries where we have supported the development of good public financial management (PFM). You can view all the countries and places where we have worked [here.](#)

[Evaluating public private partnerships](#) highlights a number of

questions to be addressed by public sector organisations when considering the merits of a public private partnership (PPP)