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Diversification of 5G Supply Chain

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Outline

- Potential 5G benefits – work in progress
- 5G ambitious targets, UK
- Current supplier landscape, UK
- Consolidation of supplier landscape – UK/global
- Nature and degree of competition
- Drivers of consolidation
- Analysis of scope of diversification
- Analysis of effects of dependence and implementation
- Analysis of potential policy remedies / market based solutions

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Potential 5G benefits – work in progress

- We are working on analysis to understand the benefits of 5G to the UK economy
  - It is expected to transform our lives – faster downloads speeds, low latency, increase capacity and connectivity (VR, IoT, AI …)
- Most existing estimates for the UK include factors such as:
  - Increased GVA in the mobile sector
  - Increased GVA in related industries
  - Wider economic effects on GVA (e.g. increased productivity from use of new technology)
- Not all studies are clear on what basis the figures are calculated (i.e. real or nominal).

Source	Estimate	Year	Notes
Barclays (2019)	£51.9bn-£89.6bn	2030	Business revenues, upper estimate assumes more rapid rollout of 5G infrastructure and faster take-up by residential and business populations, 2018 prices
FCCG interim report (2016)	£64bn-£168bn	2030	Output, upper estimate includes 'General Economy' and 'Productivity Improvements' estimates, price base unclear
IHS Markit / Qualcomm (2019)	£58.5bn	2035	Output as sum of 5G value chain core and supporting layers, 2016 (USD) prices, assume USD-GBP exchange rate of 0.77, figures from 2017 study

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5G ambitious targets (FTIR July 2018, SCR July 2019)

- To deliver a reliable, secure and widely available digital infrastructure across the UK
  - Delivered in a timeframe competitive with the rest of the world
  - Transition to full fibre and 5G mobile networks
  - Facilitate significant, long-term investment by network operators and major supply chain deals

Commitment: majority of population to have 5G coverage by 2027

- A priority to promote investment and innovation in 5G
  - Making it easier and cheaper to deploy infrastructure
  - Supporting the growth of models that promote competition and investment
  - Reducing the risk for business models through the 5G Testbeds and Trials Programme
  - Securing a diverse set of innovative 5G services through spectrum policy

- Supply chains are sophisticated, global and interconnected with strong reliance on suppliers from a handful of countries.
- Delivering this ambition needs flexible and forward-looking policies and regulations

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Current supplier landscape in the UK

Market segmentation / definition - (The EC, Nokia/Siemens, Nokia/Motorola)

- Mobile access equipment, mobile core equipment, and network/business management systems software (OSS/BSS) considered as separate relevant markets - the interchangeability of network products in each of these categories not equivalent.
- 2G, 3G and 4G not substitutes to operators - offer different functionalities. Will 5G change this?
- Geographic market at least EEA-wide, and possibly global.

The UK landscape (SCR July 2019)

- Leading suppliers are Huawei, Ericsson and Nokia – all have ability to provide end-to-end network equipment.
  - High risk of increasing dependence on a single vendor in the fixed and mobile access:
    - **4G access -** Huawei is the leader.
    - **Fixed access –** Huawei also the leader.
    - **In 5G access network –** expected significant increase in the use of Huawei overall compared to current (3G/4G) networks.
  - Core network functions – greater diversity of established suppliers, eg Cisco and Juniper active alongside Huawei, Nokia and Ericsson.
  - Transport, transmission, and management systems (OSS, BSS) - low levels of dependency on a single supplier.

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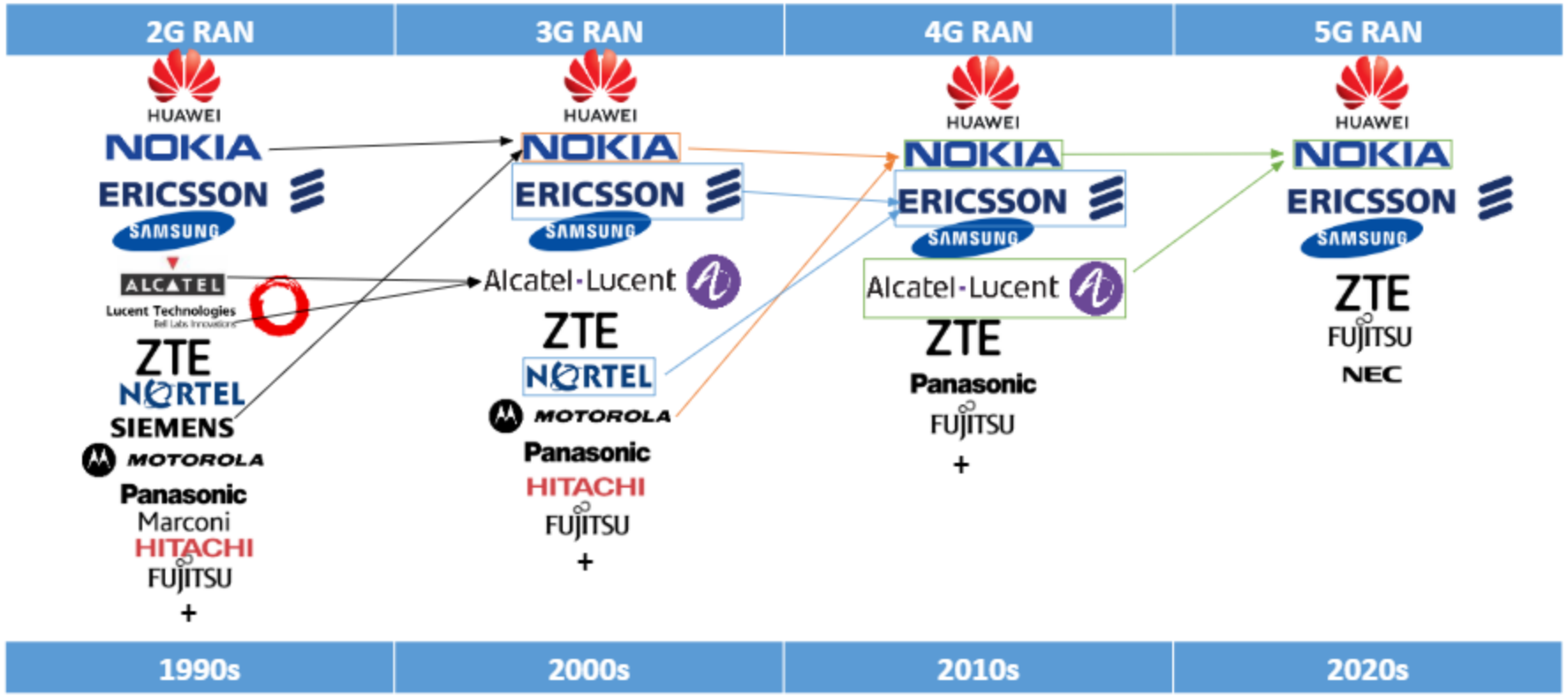
Supplier consolidation (vs expanding digital demand)

Mergers & acquisitions overtime reducing the number of global players
eg: **Nokia/Siemens** (2006), **Nokia/Motorola** (2010), **Ericsson/Nortel** (2011), **Nokia/Alcatel-Lucent** (2015)



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Nature and degree of competition

Bidding market

- High shares of supply not necessarily evidence of market power
- Interested in the degree to which alternative sources of supply are easily available to the buyer – whether existing providers can be seen as providing a credible alternative in negotiations.

Bargaining Framework

The competitive pressure faced by sellers depends on the buyers' and sellers' bargaining power.

- **Few players -** currently a business-to-business market characterised by relatively few firms.
- **Negotiations -** terms of trade (price and non-price elements) negotiated bilaterally between vendors and operators – through tender process.
- **Bargaining strength -** outcome of negotiations depends on relative bargaining strengths of seller and buyer.
  - it depends on the consequence, for each party, of not reaching an agreement with the other party.
- **Best alternative / outside option** - the higher the value of a party's outside option, relative to what it can achieve through negotiations, the stronger that party's bargaining power.

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Drivers of consolidation

- **R&D investment is a key barrier to entry** - high levels of R&D and time taken to develop technically capable products.
- **Economies of scale** - high R&D requirements require significant investments, some of which involve fixed and irrecoverable costs, and volumes in order to reduce average costs and offer lower prices than smaller rivals. Access to a large home market can act as a competitive advantage.
- **Intense competition** - UK operators have sophisticated procurement strategies which allow them to leverage vendors against each other, particularly on price elements, reducing scope for high profits and entry.
- **Switching costs -** in mobile and fixed access, switching costs are high once the equipment of a particular vendor is deployed. Most notable in mobile access network – replacement of costly legacy equipment, due to the non-standalone nature of 5G deployment in the next few years.
- **Reputation, track record and global relationships** - track record, relationships, and the need to demonstrate technical ability (local and international).
- **National policies** - key strategic advantage, supporting the growth of incumbent suppliers – subsidies - industrial and support policies, subsidies, R&D funding

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Analysis of scope of diversification

Diverse potential risks => need to consider diverse scope for diversification

- Economic, political, natural, logistic, etc
- Technology specific, company specific, country specific, International risks, etc
- Unintended, intended, etc

Security of supply - need sufficient, secure, reliable connectivity to meet increasing demand

- Benefits - to consumers, businesses, economy, wider society …
- Confidence – eg in markets (consumers, businesses, investments) …

Policy/strategy – security framework (security standards, security requirements)

- Monitoring and incentivising operators to comply/improve their standards
- Addressing security challenges posed by vendors, eg high risk vendors
- Reducing dependence / creating sustainable diversity in the supply chain

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Analysis - effects of dependence and diversification

Assuming dependency:

- Does national dependency on specific vendors increase susceptibility to risks relating to products and to suppliers?
- Does national dependency on individual high risk vendors in particular pose significant security concerns?
- Does the growth of large firms with high market shares and weaker rivals drive down competition, potentially increasing prices, reducing quality and stifling innovation in the longer term?

Balancing against implementation challenges / costs – eg:

- ***Diseconomies*** – managing multiple suppliers (communication, education, assistance, maintenance …)
- ***Handling incumbents*** – rip and replace of legacy equipment/solutions, competition effect, collaboration/transition
- ***Attracting new vendors*** – incentives, adjustments, capacity constraints …
- ***Self supply questions*** – building (or getting rid of) in-house/local capabilities …
- ***Implementation/Compliance/Regulation*** – certification, standards, trade regulations …

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Analysis of potential policy remedies / market based solutions

- **Do we need a new security framework** to support greater market diversity by incentivising commercial practices that place higher priority on cyber security?
- **Can we develop a targeted diversification strategy,** in those parts of the network that pose security and resilience risks - incentivising entry and growth of new players, promoting interoperability, attracting established players …?
- **Do we need market design and R&D support** - considering policies to support market expansion in 5G – improving access to spectrum, removing barriers to roll-out and promoting new infrastructure models?
- **Do we need to target public investment and support** at those areas which can address market failures and yield the strongest security and prosperity benefits to the UK – eg software-based innovation in core network functions, open architectures in access networks, and cyber security in small cell technologies?
- **Can we promote greater interoperability and more open interfaces** - to facilitate new entrants. Interoperability in technical standards not sufficient - industry must ensure equipment from different vendors is interoperable in real world deployments?

The UK set up a Diversification Task Force in September 2020 and intends to publish a Diversification Strategy later this year.