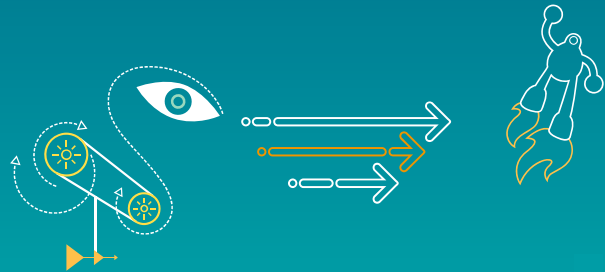


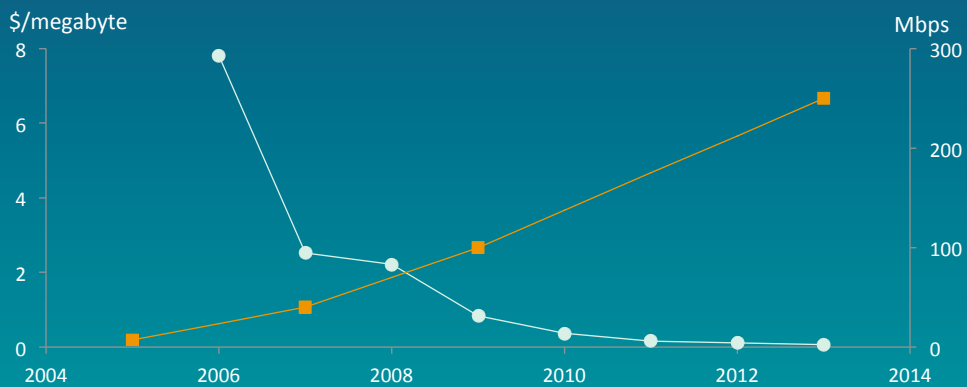
Nov. 5, 2015

Don Rosenberg Remarks GSMA-George Washington University



Mobile innovations lower costs and improve performance

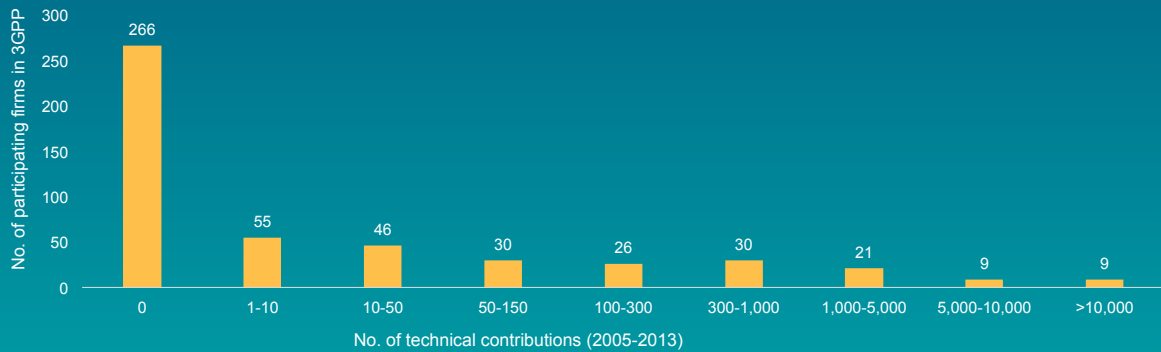
Consumer cost of data per megabyte relative to data consumption versus data speed



Sources: Boston Consulting Group, "The mobile revolution: How mobile technologies drive a trillion dollar impact" (2015)
Note: Data speed indicates the maximum downlink speed, not average observed speeds. The average observed speeds depend on many factors, including infrastructure, subscriber density, and device hardware and software.

Few participants invest in R&D

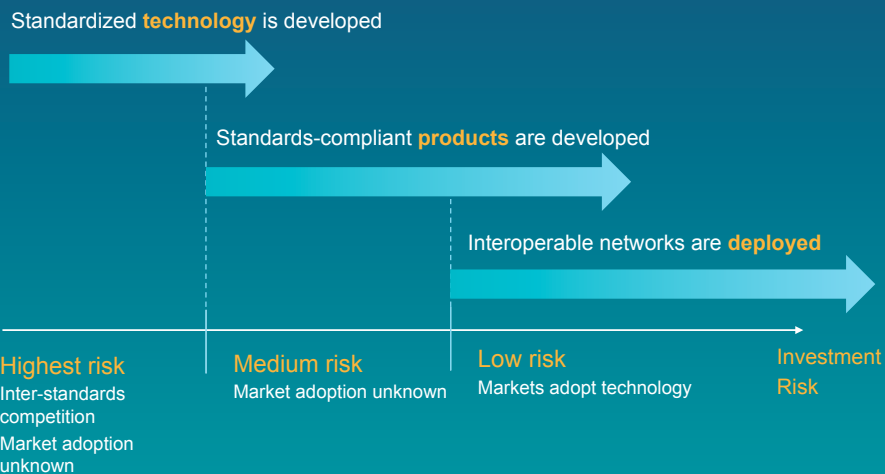
- Minority invest actively in R&D -- Fewer than half, ~45% of participants ever submitted any technical contribution.
- Among those that did contribute their technology to standards, the distribution is highly skewed with the top 2% entities responsible for >60% of all contributions.



Sources: Baron and Gupta, "Unpacking 3GPP standards", forthcoming, Journal of Economic and Management Strategy (2016), based on data from www.3gpp.org

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The mobile wireless industry – development stages

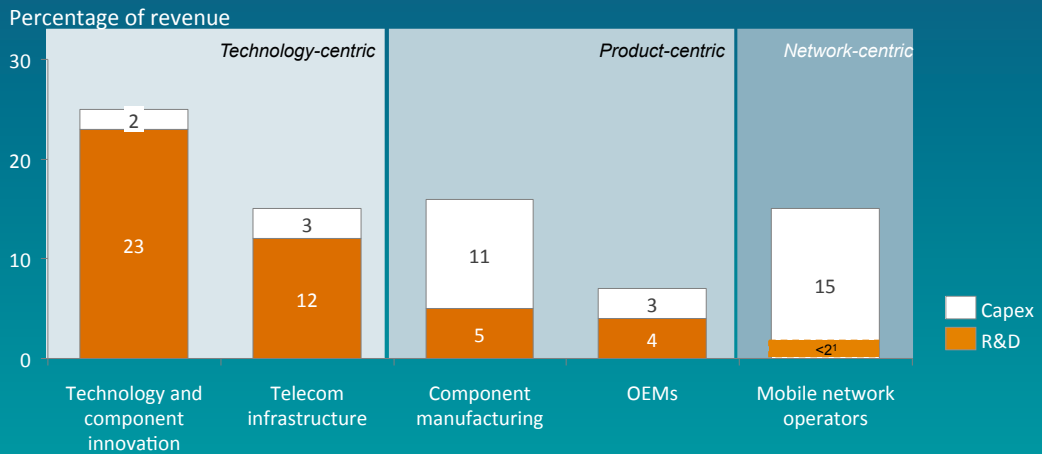


Sources: Gupta, "Technology standards and competition in the mobile wireless industry", GMU Law Review (2015)

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R&D risks in core technologies enable major capex investments

Mobile value chain R&D and capex-to-revenue ratios



Sources: Boston Consulting Group, "The mobile revolution: How mobile technologies drive a trillion dollar impact" (2015) (based on data from Ovum; Gartner)
 Note: These figures come from pure players and represent a five-year average of R&D and capex-to-revenue ratios from 2009 through 2013.
 1 Mobile network operators typically do not report R&D spending separately from other expenses.

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Thank you

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