The telecommunications industry is playing a critical role in supporting digital transformation.

Digital transformation is emerging as a key driver of sweeping change in the world around us. It has the potential to significantly improve consumer lives and create broader societal good, while providing businesses with new opportunities for value creation and capture.

The telecommunications (telcom) industry is at the forefront of this transformation, both as an industry witnessing large-scale change in its market environment and as a key driver of worldwide digitalization. Investment by the telecommunications industry in technology and interoperability has underpinned an immense shift in information and capital flows through the global economy, while providing the building blocks for the emergence of entirely new business models across industries. In parallel, access to a globally connected network has empowered millions of people around the world, by giving them access to real-time information, marketplaces and social programmes that will have long-term implications for quality of life.

It is clear that digitalization will be a source of transformational change, but there are a number of challenges that need to be overcome. In many cases, the gains from digitalization have been inequitable, with the benefits not reaching those who need them most. At the same time, the exponential increase in global information flows has created new risks for data privacy and security. Businesses across sectors are grappling with challenges related to changing customer expectations, cultural transformation, outdated regulation and skill shortages, among others.

The World Economic Forum is committed to helping leaders understand these implications and supporting them on the journey to shape better opportunities for business and society.
INTRODUCTION TO THE DIGITAL TRANSFORMATION INITIATIVE (DTI)

In a world where game-changing innovation has become the norm, DTI provides a unique insight into the impact of technology on business and society over the next decade.

The past 12 months have brought a series of exciting technological breakthroughs. Self-driving Tesla cars can now be seen on the road; Uber is testing autonomous taxis in Pittsburgh; Google DeepMind’s Alpha Go demonstrated a leap forward in artificial intelligence with a famous victory at the board game Go; and augmented reality hit the mainstream with the success of Pokémon Go. Game-changing innovation has become the norm.

Digital innovation is reshaping industries by disrupting existing business and operating models. But it is also having a profound impact on society, presenting a series of opportunities and challenges for businesses and policy-makers.

The Digital Transformation Initiative (DTI) is a project launched by the World Economic Forum in 2015 to serve as the focal point for new opportunities and themes arising from the latest developments in the digitalization of business and society. Over the past two years, DTI has analysed the impact of digital transformation across 13 industries and five cross industry themes. We have also developed a unique value-at-stake framework to support a consistent approach to measuring the impact of technology on business and wider society. An overview of this framework is included on the next slide.

Our goal is for this framework to provide an evidence base and common language for public-private collaboration focused on ensuring that the benefits of digital transformation are fairly and widely shared.

Bruce Weinelt
Head of Digital Transformation
World Economic Forum

Mark Knickrehm
Group Chief Executive
Accenture Strategy
DTI: A NEW FRAMEWORK FOR PRIVATE-PUBLIC COLLABORATION

Our unique economic framework helps business leaders, regulators and policy-makers unlock the $100 trillion of value that we estimate digitalization across all industries could generate over the next decade.

- We have developed a unique economic framework that aims to quantify the impact of digital transformation on industry and broader society.
- Our framework is new and will be iterated further over the next year, but it can already be applied at all levels of government and business, helping stakeholders make the decisions that deliver the full potential of digital transformation.
- It provides a consistent evidence base and library of definitions for digital concepts, supporting a global, multistakeholder dialogue about digitalization and its implications.
- We have achieved proof of concept of the framework at an industry level (11 industries) and successfully piloted its application at a national / state level (in Denmark, India, the United Kingdom and the Indian state of Telangana).

VALUE IMPACT OF DIGITAL TRANSFORMATION

INDUSTRY IMPACT
- Value Migration and Value Addition

SOCIETAL IMPACT
- Consumers
- Environment
- Society

ILLUSTRATIVE
(levers customised to each industry)
- Free Cash Flows / Operating Margins
- Value Drivers
  - Cost Savings
  - Time Savings
  - CO₂ Emissions
- Employment
- Productivity

Value Drivers
Revenues
Costs
Allocated Capital

Value Drivers
(ARPU, number of subscribers, product mix, non-service revenue etc.)

Costs
(Network costs, sales and marketing, R&D expenses, sourcing costs etc.)
Enabling the digital revolution

The ever-wider availability of technologies such as mobile, artificial intelligence, cloud, analytics and platforms is dramatically altering the way we live, work and interact – in what has been termed the Fourth Industrial Revolution. The telecommunications (telecom) industry is playing a critical role in enabling this digital revolution unfolding around us.

The telecom ecosystem has provided the fundamental building blocks – access, interconnectivity and applications – that are enabling this digital revolution to take place. A large share of potential value stemming from digitalization across global industries over the next decade is dependent on the telecom industry delivering essential infrastructure, applications and productivity improvements in many areas.

Missing out on a digital windfall?

So far, the role that the telecom industry has played in accelerating digital business and service models for external industries has not translated into new value for the operators themselves.

In the following slides, we explore these themes in more detail.
THE TELECOM INDUSTRY IS CENTRAL TO THE DIGITAL TRANSFORMATION OF INDUSTRIES...

The telecom industry is expected to unlock more than $10 trillion in value for five key industries over the next decade.

Cumulative digital value at stake for external industries and society enabled by digital transformation in the telecom industry
($ trillion, 2016-2025)

<table>
<thead>
<tr>
<th>Industry</th>
<th>Value to Society</th>
<th>Value to Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Media and entertainment</td>
<td>0.7</td>
<td>0.6</td>
</tr>
<tr>
<td>Electricity</td>
<td>0.7</td>
<td>0.7</td>
</tr>
<tr>
<td>Logistics</td>
<td>1.3</td>
<td>0.8</td>
</tr>
<tr>
<td>Automotive</td>
<td>2.2</td>
<td>0.4</td>
</tr>
<tr>
<td>Consumer industries</td>
<td>1.3</td>
<td>1.7</td>
</tr>
</tbody>
</table>

Note: The values above reflect only the share of total industry and societal value directly enabled by telecom infrastructure and applications. Rounded values may not add up. Source: World Economic Forum / Accenture analysis.

Contribution of the mobile industry to global GDP in 2015
4.2%

Jobs directly supported by the mobile industry by 2020
20 million
...BUT VALUE FROM DIGITALIZATION HAS SO FAR ELUDED TELECOM OPERATORS

Telecom operators' share of the industry profit pool is shrinking, despite their central role in enabling digitalization.

Telecom industry profit pools (2010-2018)

Data and connectivity has exploded in recent years

400 million times

Increase in total mobile data traffic over the past 15 years¹

Global share of data that will be stored in the cloud in 2020, requiring networks to access and share²

Sources: 1. Cisco; 2. IDC

Source: World Economic Forum / Accenture analysis based on data from S&P Capital IQ
THE INDUSTRY’S COMPETITIVE AND REGULATORY ENVIRONMENT IS EVOLVING

Some key trends are likely to increase pressure on margins by forcing operators to undertake large investments just as competition is intensifying.

1,000x capacity driving new technology paradigms
The growth in data consumption and the surge in the number of connected devices are likely to require future networks to have 1,000 times more capacity than is available today.

Colliding on platforms: “the fight for the middle”
Application developers and digital service providers have already recognized the large revenue and profit opportunities for those who develop their own integration systems and middleware (e.g. Amazon Web Services). At the same time, network operators are developing new capabilities in the middle platform layer to move beyond the relatively slow-growing infrastructure layer.

Diminishing differentiation
The emergence of data-driven business models means competitive differentiation is achieved by companies that can best utilize consumer data to drive business models.

Customer 3.0
Customers now expect levels of personalization, on-demand access and quality that match the leaders in any industry.

Networks as national assets
Several countries are deploying widespread fibre-to-the-premises (FTTP) networks at a national scale. These efforts could put pressure on operators’ profits through greater regulatory scrutiny, pricing pressures or even wide-ranging nationalization of telecom assets.

The digital communications ecosystem

Web-scale disintermediation
Network quality and capacity limitations, along with a relatively high cost of access for consumers, mean some digital businesses are reducing their reliance on existing service providers. Web-scale players such as Google, Microsoft and Facebook are moving quickly – more quickly than telecom operators in most cases – to fill key gaps in core telecom services and connectivity.
There are signs that the next phase of competition in telecommunications will accelerate the need for operators to abandon incremental initiatives in favour of transformational innovation. Four themes will be especially important.

**Networks of the Future**

Rising demands on networks and associated cost pressures are leading operators to accelerate the development of ‘smart pipes’ and new models of extending internet access.

**Beyond the Pipe**

Digitalization offers important opportunities to extend revenue streams beyond just connectivity.

**Redefining Customer Engagement**

To win customer mindshare in a digital world, and exceed B2C and B2B customer expectations, operators must rethink customer service.

**Bridging the Gap on Innovation**

Rapidly accelerating innovation cycles are forcing industry players to go beyond in-house R&D and transforming company culture to attract the best digital talent.

**Total value at stake**

- **Industry**
  - $440 billion
  - $650 billion
  - $30 billion
  - $160 billion

- **Society**
  - $580 billion
  - $290 billion
  - $2 billion
  - $1 billion
DIGITAL TRANSFORMATION IN THE TELECOM INDUSTRY: A $2 TRILLION OPPORTUNITY

Digitalization could unlock $2 trillion of value for the industry and wider society over the next decade. By enabling the digital transformation of other industries, the sector also generates societal benefits.

Of this $2 trillion, the value to the telecom industry could exceed $1.2 trillion in cumulative operating profit from 2016 to 2025. Society and consumers could benefit from more than $800 billion in value – the majority of which will come from efforts to connect the billions of people still unconnected to the internet.

Telecommunications: value at stake for industry and wider society (by digital theme)

<table>
<thead>
<tr>
<th>Potential Business Impact ($ billion)</th>
<th>Potential Societal Impact ($ billion)</th>
<th>Total Value at Stake ($ billion)</th>
<th>Emission Reduction (million tonnes CO₂)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Networks of the Future</td>
<td>440</td>
<td>580</td>
<td>1020</td>
</tr>
<tr>
<td>Beyond the Pipe</td>
<td>650</td>
<td>290</td>
<td>940</td>
</tr>
<tr>
<td>Redefining Customer Engagement</td>
<td>30</td>
<td>2</td>
<td>32</td>
</tr>
<tr>
<td>Bridging the Gap on Innovation</td>
<td>160</td>
<td>1</td>
<td>161</td>
</tr>
<tr>
<td>Cumulative total</td>
<td>1280</td>
<td>873</td>
<td>2153</td>
</tr>
</tbody>
</table>

Source: World Economic Forum / Accenture analysis
Digital capabilities will enable networks that are more reliable, secure and autonomous, with increased flexibility to meet diverse and dynamic customer requirements.

**Software-differentiated Competition**

Network differentiation is shifting away from the underlying hardware to a new paradigm, defined by software-based centralized control and virtualized functions. This initiative could generate $220 billion of industry value, as network and operational technology spend drops up to 30% and energy costs fall by up to 50% by 2025.

**Autonomous (Zero Touch) Networks**

Future networks will be self-provisioning, self-optimizing and self-healing, deploying the latest machine learning and analytics technologies to manage growing complexity and costs. This initiative could unlock $100 billion of value for the industry, while also boosting network reliability and customer satisfaction.

**Cyber-Resilience**

A growing threat from cyberattacks will require a relentless focus on cyber-resilience to secure global benefits from digitalization. Reducing the costs associated with data breaches will contribute to generating up to $100 billion of value for industry and $60 billion for consumers.

**Extending Connectivity**

New solutions including balloons and drones can help connect more people to the internet. This could unlock significant value for society, which we estimate at $490 billion – not only for new users brought online but also from the multiplier effect on the wider economy.
B2C and B2B business models will be repositioned as new digital services move participants beyond connectivity towards a future exemplified by cross-industry competition and collaboration.

Integrated on IoT

Industry participants are going beyond connectivity services to enable the wider Internet of Things (IoT) value chain. This initiative could generate $350 billion of value for the industry, stretching across the IoT value chain, from semiconductor manufacturers to operators.

Digital Services

Revenue generation opportunities in consumer and enterprise digital services will be pursued more aggressively over the next decade. Opportunities in consumer and enterprise markets could be worth $200 billion for the industry, and unlock $170 billion for consumers through time and cost savings.

Winning the Battle of Ecosystems

Competition across industries is being transformed by platform business models that are redefining competitive dynamics based on network effects. This initiative was not included in our value-at-stake analysis.

Reimagining Communication

Innovations from natural user interfaces and holography to augmented and virtual reality (AR / VR) show the potential to transform the way we interact among ourselves and with the world around us. AR / VR technologies could add $105 billion in value for the industry.
Companies will stay ahead of rapidly changing customer expectations by using digital tools and capabilities to build seamless, contextualized and delightful experiences.

**Delighting the Digital Customer**
Customers in the digital world have markedly different expectations than those in the past. Digital tools that help operators improve customer experience through personalization and digital customer service options will create value by both growing revenue and reducing costs. This opportunity could be worth $27 billion for the industry.

**Brand Atomization**
As the battle for customer mindshare intensifies, companies are 'super distributing' their brands through a wide range of complementary services. Such brand atomization shapes brand experiences according to each user's requirements and gives companies greater reach. This initiative has not been included in our value-at-stake analysis.

Illustrative case studies:
- Spotify
- giffgaff
- Comcast
The need for rapid innovation, greater convergence and new services will require operators to fill key capability gaps using new innovation models and revamped talent strategies for a digital workforce.

‘Outside In-ovation’

The need to increase the pace of innovation is likely to see increased adoption of more open innovation models across the industry. Opening up R&D projects to partners will potentially impact both future revenue realization and internal R&D spend, contributing to an opportunity worth $163 billion for the industry over the next decade.

Transforming for Digital Talent

Companies must break traditional silos and reform company culture to attract digital talent. The shift in network differentiation towards software capabilities will require a large transition in employee skills and organization, as will the need to rapidly evolve and innovate new digital services. This initiative was not included in our value-at-stake analysis.
Here are just three of the more than 20 case studies that can be found in our white paper on digital transformation in the telecom industry.

Google, Facebook: Connecting the Unconnected

Google’s Project Loon aims to spread connectivity to remote areas by establishing a network of balloons in the stratosphere, at a height twice as high as aircraft flight paths and weather systems. By entering into spectrum-sharing partnerships with telcos, each balloon has the potential to provide LTE coverage directly to consumer devices within an 80km-wide area. After a successful pilot in New Zealand in 2013, the company has launched similar pilots in Indonesia, Brazil and Australia. Facebook has been also conducting pilots, using drones rather than balloons to beam wireless broadband access over remote areas.

Orange: Creating Mobile Only Banking Services

Orange, the largest telecom operator in France, recently signalled its strong intent to build new digital revenue streams in mobile banking. In April 2016, the carrier acquired a 65% stake in French insurer Groupama’s banking unit, with the intention of setting up a 100% mobile-only “Orange bank”. The entity is expected to attract about 2 million customers in France alone and, together with Orange’s existing mobile payments businesses, generate around €400 million in revenue by 2018.

GiffGaff: Revolutionizing Customer Service

GiffGaff, a large UK-based mobile virtual network operator (MVNO), decided to completely do away with a call centre-based customer service model. Instead, the company developed an online community where its own members share and resolve queries. In doing so, the company not only saved a massive amount of costs but also was able to significantly drive up customer engagement. The company’s transparency and customer centricity has meant that it has overtaken more than 160 other MVNOs in the country to become the third largest.
To seize digitalization’s $2-trillion opportunity, the telecom industry must tackle each of the challenges below.

**Encumbered by Legacy**

Telecom operators’ vast infrastructure assets, OSS / BSS systems and ‘op-co’ structures are big impediments to rapid innovation. Disjointed and clunky IT stacks make it difficult to respond to changing customer demands. Disjointed op-co structures get in the way of seamless customer experiences.

**Innovator’s Dilemma**

Publicly listed incumbents are being held back from radical innovation by conservative corporate cultures and/or the short-termism of investors. This often means that companies pursue short-term incremental innovation rather than large transformational changes that might cannibalize existing revenue streams.

**Limited Public-Private Collaboration**

Regulatory frameworks are not always aligned with the need for the industry to rapidly evolve business models. Lack of globally consistent regulatory policies, differences in governance and rules for digital operators and telcos, and high spectrum fees and taxes all create impediments to business model transformations.

**Digital Knowledge and Skills**

The telecom industry faces significant skill gaps today. These go beyond a mere shortage of digital skills and an ageing workforce, speaking to a more fundamental change in the way that incumbent companies address the talent question going forward – especially when viewed in comparison to digitally native businesses.
With sweeping changes ahead, the telecom industry must adapt. What follows are practical recommendations for industry leaders and policy-makers to unlock value from digitalization for industry and wider society.

**Imperatives for industry**

**Define near-term action plans for main transformation areas**
- Leaders will need to identify partners in a new ecosystem, engage employees in this transformation, conduct a gap assessment between current and future state, etc.

**Identify a model for effective vertical market collaboration**
- Determine the most useful model based on capabilities, revenue potential and ability to address challenges. Model examples include direct partnership, investor, community approach and platform approach.

**Drive cultural change from the top**
- Culture is increasingly identified as a main inhibitor of transformation, meaning C-suite level and board members need to champion an environment of openness and collaboration.

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**Imperatives for policy-makers**

**Create regulatory certainty across jurisdictions**
- Countries need to take steps to protect the privacy and rights of citizens on a consistent basis across borders. This will also help create a competitive environment for telecom operators and digital new entrants.

**Drive coordination through national digital agendas**
- Create incentives for infrastructure rollout and ecosystem development that encourage collaboration across government agencies. In turn, this will create a digitally empowered society and knowledge economy.

**Incentivize industry to unlock societal value**
- Facilitate connectivity models that ensure fair competition, affordability, proliferation of digital skills, and strong institutions. This will help companies maximize the value of digitalization for society and across industries.

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The DTI Telecom White Paper includes detailed recommendations and an indicative action plan for digital transformation.
Over the past two years, DTI research has focused on understanding the impact of digital transformation in 13 industries and drawing insights from the cross-industry themes that came out of that analysis.

We have covered five cross-industry themes:

- **Digital Consumption**: explains how the rapidly changing expectations of digital customers are forcing enterprises to reinvent themselves.
- **Digital Enterprise**: looks at how companies can respond by rethinking every aspect of their business.
- **Platform Economy**: focuses on the immense impact of one type of digitally enabled business model – B2B platforms.
- The adoption of new digital business and operating models is having a profound impact on society, a theme we analyse in **Societal Implications**. We then introduce our quantitative analysis of the impact of digitalization on business and wider society in our final cross-industry theme, **Societal Value and Policy Imperatives**.

Our industry deep dives have covered 13 industries:

- Automotive
- Aviation, Travel and Tourism
- Chemistry and Advanced Materials
- Consumer
- Electricity
- Logistics
- Media
- Mining and Metals
- Oil and Gas
- Professional Services
- Retail
- Telecommunications

White papers, SlideShares, articles, an overall executive summary for the DTI project, and a library of video interviews can be found on our website.

**Key features**

- Mobile-responsive, platform-agnostic site
- 13 industry white papers
- 5 cross-industry white papers
- 13 SlideShare summaries of white papers
- 60+ video snippets and mini documentaries
- Online case study repository
- 4 animations on digital challenges

Visit DTI website
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• Level 3
• Liberty Global
• Matrixx Software
• Microsoft
• Millicom
• Nokia
• O3B Networks

• OneWeb
• Ooredoo
• Orange
• Qualcomm
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