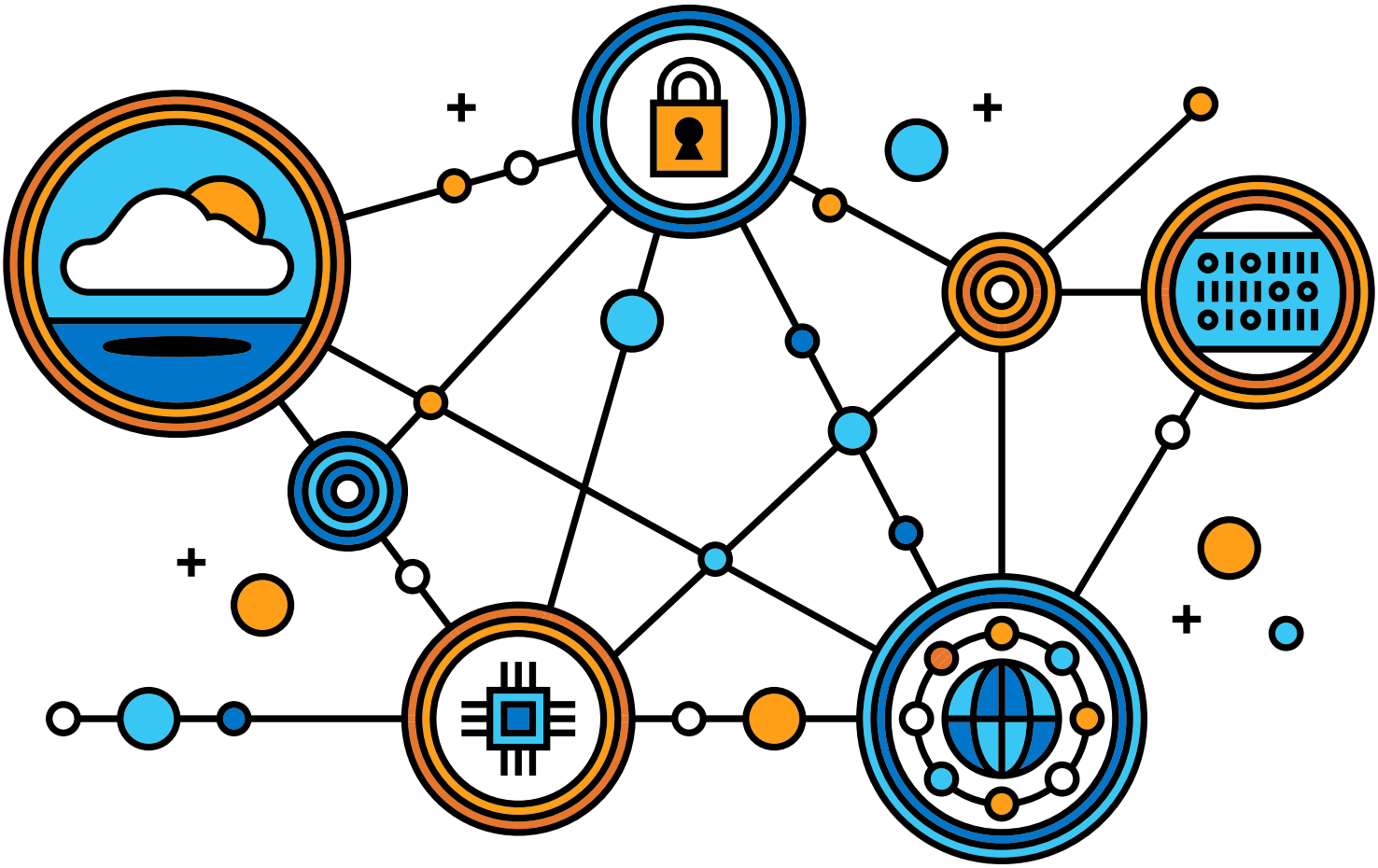
WHITE PAPER

Global Trend Report:

How the 4th Industrial Revolution is Changing IT, Business and the World



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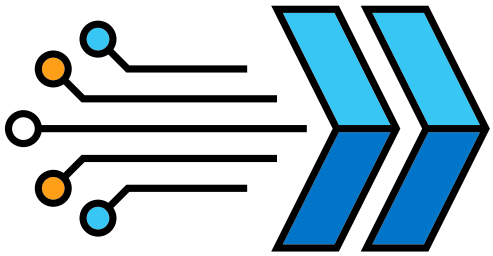
The 4th Industrial Revolution will change the world

The 4th Industrial Revolution is the 21st century convergence of digital, physical and bio technologies driving an unrelenting acceleration of human progress. According to the July 2020 "Global Poll: Impact of the 4th Industrial Revolution" by Quadrant Strategies,* four in five senior IT decision makers worldwide say a century's worth of technological advancements will take place in the next five years (Figure 1).



Global ITDMs: Tech will advance at warp speed over the next five years

Most C-suite leaders and IT decision makers at large and medium-sized organizations around the world agree that the 4th Industrial Revolution will have a substantial impact on both society and the future of business (Figure 2).

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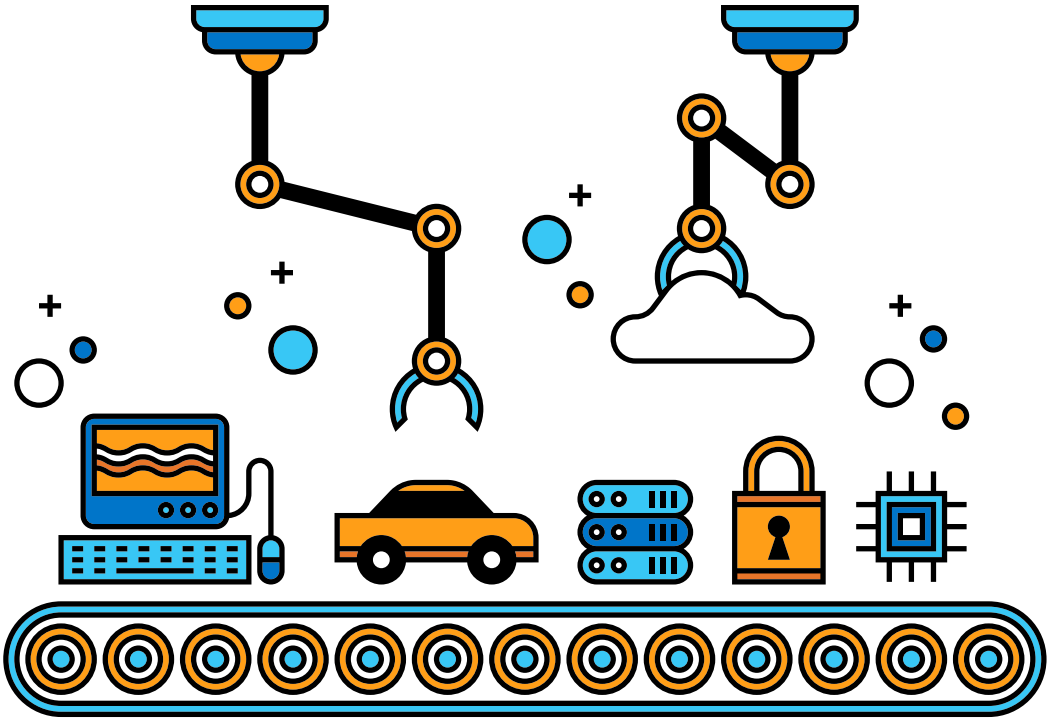


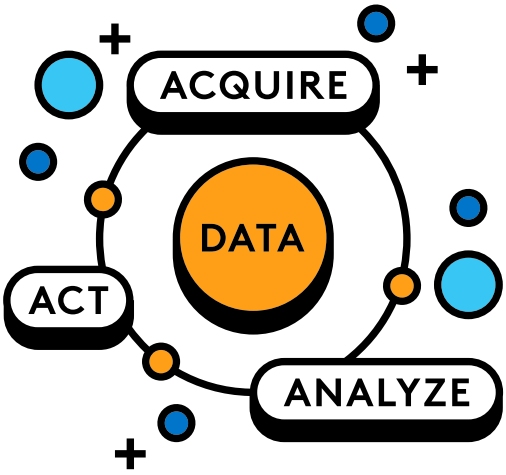
The 4th Industrial Revolution presents an opportunity for sustainable competitive advantage. Businesses can take advantage of new opportunities through next-generation applications such as predictive analytics, smart factories, telemedicine, retail customer self-service and more. These applications need a platform that delivers compute across multiple cloud environments, the metro edge and on-premises. Together, next-generation applications, adaptive network connectivity and connected security enable businesses to acquire, analyze and act on data to differentiate themselves with better products and services.

Future leaders will win with data

Data is the currency of the 4th Industrial Revolution, just as steam, electricity and silicon chips were for the prior industrial revolutions. Businesses can use next-generation applications to capitalize on real-time customer data as well as vast stores of relevant historical data.

Global IT decision makers agree: **91 percent** of IT decision makers surveyed in the U.S. believe that a business' ability to quickly acquire, analyze, and act on data will be a key factor in determining if they will be technology leaders in the future (Figure 3).

"91% of IT leaders believe a business' ability to quickly acquire, analyze and act on data will help determine future tech leaders."



We find compelling examples of technology leadership across industries: smart factories acquire sensor data from customer warehouses and use predictive analytics applications to manage output by dynamically operating robots on the factory floor; wearable computing, telemedicine and personalized healthcare applications generate, acquire and analyze medical data for early detection, better planning and faster cures; online retail experiences incorporate data-driven processes targeting custom products to select audiences with tailored promotions; and smart cities use weather data to predict power demand and real-time traffic data to optimize the commuter experience and manage incident response.

Make your IT Infrastructure ready for the 4th Industrial Revolution

While they know that next-generation applications are vital to business success, **the vast majority** of global IT decision makers believe their current infrastructures aren't ready to harness the power of the 4th Industrial Revolution. **Nearly three in four** say current IT infrastructures are not prepared to support coming increases in users, data volumes and application performance requirements (Figure 4).

Although many spent the last several years moving to "the cloud," most global IT decision makers agree that the cloud is not sufficient. **Four in five** say that a centralized cloud model cannot support their workload demands (Figure 5).

Drive success and innovation with emerging technologies

Modernize your IT infrastructure

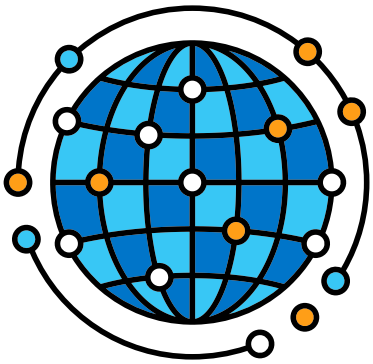
Harnessing the power of the 4th Industrial Revolution requires modernizing your IT infrastructure to securely deliver and orchestrate distributed applications and data. A modern infrastructure enables IT to achieve an optimal level of connectivity proficiency and compute efficacy to maximize value to the business.

A digital business gets value from enterprise data. It's a continuous cycle of acquiring, analyzing and acting on data that requires secure connectivity across the different sources where data acquisition, analysis and business action occurs. It also requires managed services to orchestrate solutions across these elements. When these managed services are exposed to customers, they can creatively add applications to deliver unique value in their markets.

Emerging 4th Industrial Revolution applications require high-bandwidth and ultra-low-latency network performance. By moving critical applications, workloads and data closer to where they are processed, businesses can differentiate themselves and reap a sustainable competitive advantage by redefining their customers' experiences.

Lumen offers the critical elements necessary to build a flexible platform with Connected Security that bridges network, data center, cloud and Edge Computing with managed services. Businesses on the cusp of modernizing their IT can leverage infrastructure and services across all layers of the hybrid IT stack to build connected systems across domains with a platform that matches workloads to the best execution venue.

“Nine in 10 global C-suite leaders say that fiber infrastructure is essential to connect to a distributed cloud network.”



Connect and manage distributed applications and data with fiber

Optical fiber technology is the medium of choice for securely connecting and managing distributed applications and data. **Nine in 10** global C-suite leaders say that fiber infrastructure is essential to connect to a distributed cloud network (Figure 6).

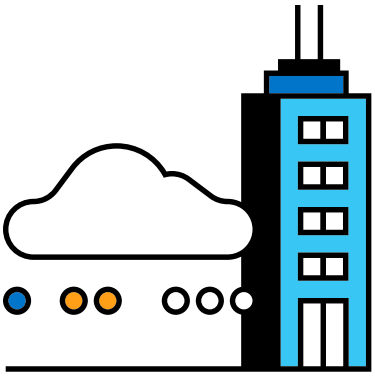
The Lumen network offers global connections to top cloud providers, providing organizations the ability to scale bandwidth up to three times current capacity when needed. Most global IT decision makers agree that having control of an underlying network layer is essential to multi-cloud infrastructure management (Figure 7).

Bring critical applications and data closer with edge compute

IT infrastructures must incorporate high-performance global network capabilities to realize the true business value of emerging applications and technologies. These capabilities include high bandwidth to support massive volumes of data together with ultra-low latency to support near real-time response to market challenges and opportunities. With a high-performance global network, your business can redefine customer experiences, leveraging fiber-connected edge computing to move critical applications, data and workloads closer to where they are processed. In addition to increasing your ability to innovate and grow, you also can optimize network costs and security by prioritizing where workloads are distributed, from your premises to the edge to the cloud.

In a distributed environment, edge compute brings critical applications and data closer to where they are processed. The vast majority* of global IT decision makers say that edge compute is vital to their future—for example, more than **90 percent** anticipate implementing edge compute services to keep pace with the expansion of the Internet of Things (IoT) in the coming years (Figure 8).

“60% of global IT leaders require a latency of <10ms for their apps.”



In addition, **60 percent** of global IT decision makers require a latency of 10 milliseconds or less for their applications, and one in five require 5 milliseconds or less (Figure 9).

These factors make edge compute seem like an obvious choice for many workloads; so why are many enterprise IT infrastructures still focused so heavily on-premises and/or in a centralized cloud? Market availability appears to be the only thing holding edge compute back: **90 percent** of global IT decision makers say they would move their organization’s applications from on-premises to edge compute if it was available today (Figure 10).

The Lumen Platform will deliver IT agility with edge compute capabilities for high-performance, low-latency data and application experiences. Designed to deliver 5ms or better latency via numerous edge market nodes, organizations using the Lumen Platform have broad capabilities to deploy next-generation technologies and applications.

Edge compute is a critical enabler for 5G

Although many people think of 5G when they think of “the edge,” **nearly three in four** global IT decision makers agree that 5G needs edge compute more than edge compute needs 5G (Figure 11).

Edge compute is the secret weapon enabling 5G according to **82 percent** of global IT decision makers. They say 5G needs edge compute to deliver the performance and experience necessary for their business to succeed (Figure 12).

However, not all global IT decision makers are excited about 5G. Nearly **30 percent** of global IT decision makers and **33 percent** of U.S. IT decision makers say they are skeptical about their company using 5G networks (Figure 13).

Although 5G does bring some excitement, a majority of global IT decision makers have significant security concerns when it comes to relying on 5G networks (Figure 14).

“81% of of global IT leaders say perimeter-based security is no longer sufficient.”

Make security your top IT priority

The global threat landscape is constantly adapting, evolving and growing, prompting **nine in 10** global IT decision makers to say that application and data security is their top IT concern (Figure 15).

When combined with the increasing complexities of business IT environments using emerging applications and technologies, traditional perimeter-based security approaches have become obsolete. **81 percent** of global IT decision makers and **85 percent** in the US say perimeter-based security is no longer sufficient for their business (Figure 16).

Maintaining data security can be daunting, especially when you’re preparing for the 4th Industrial Revolution: **68 percent** of C-suite leaders globally say that’s what keeps them up at night (Figure 17).

In addition, global IT decision makers expect data security and connectivity to become more critical as a result of the current global pandemic: **three in five** say security will become much more important in the wake of COVID-19, and more than half say that about data connectivity, as well (Figure 18).

To address ever-increasing security threats, the Lumen Platform includes Connected Security built-in. It empowers your business to tailor your own security policies based on individual risk assessments.

Reinforced with intelligent, high-fidelity, automated threat detection and response to safeguard data and applications, the Lumen Platform proactively helps to detect and block malicious traffic. Lumen delivers comprehensive visibility into the threat landscape using a unique combination of vast network assets. By leveraging our Black Lotus Labs in-house threat intelligence group, Lumen analyzes 190 billion NetFlow sessions and actively monitors 28,000 command & control (C2) threats daily.

That enables the Lumen Platform to block upstream threats—we currently mitigate more than 120 distributed denial of service (DDoS) attacks per day and proactively take down more than 60 C2s per month.

With this peace-of-mind, your business can readily leverage the Lumen Platform for next-generation technologies, knowing your critical data and applications are secure.

Seamlessly integrate applications and your network

Orchestration ties applications together with other applications, with the data being moved and with the compute, storage and network infrastructure underneath. Orchestration technology is evolving rapidly to use APIs to connect applications and data with network services. Software-defined networking (SDN) enables the orchestration layer to issue calls to the network, turning up new connections on the fly to wherever data needs to go, and then turning the connection back down again once that data gets there. That helps save money, makes the process work more efficiently and enables greater flexibility.

The goal of the network is to connect to the needs of applications and workloads without manual intervention. **Nine in 10** global IT decision makers say that the seamless integration of applications and their network is a top priority (Figure 19).

The Lumen Platform is grounded in a fiber-based, global Adaptive Network that intelligently adjusts to real-time capacity needs to deliver scalable, high-bandwidth connectivity for data and applications. The network is a flexible, on-demand foundation that allows full-service control and automated performance response. By having a high-performance adaptive network, your business can offer customers unique and trusted experiences. Ultimately, more efficient management of critical application data enables your business to identify market trends faster and respond more quickly with the key decisions and innovations that will drive future growth.

Leverage new skill sets, jobs and capabilities

Drive intelligent production and digital transformation

The increasing creation and consumption of data is driving intelligent production and digital transformation that stands to significantly redefine the ways we live and work. That is one reason why technology leaders in businesses around the world see a very different job market emerging. **A large majority** of global IT decision makers say the 4th Industrial Revolution will make many current jobs obsolete (Figure 20) and will completely change the types of jobs that are available today (including their own).

As the 4th Industrial Revolution brings about rapid changes in technology, global IT decision makers worry about keeping up: **three in four** are concerned about keeping pace with technological advances during the 4th Industrial Revolution (Figure 24).

The nature of the IT profession is changing from managing operations to defining and enabling distributed application solutions and experiences that differentiate their businesses from competitors. To keep up, outsourced managed services are becoming imperative.

Most global IT decision makers agree that in the face of these changes, their businesses require the modern skills and capabilities of a global network provider: **seven in 10** say that having a global network provider is necessary to meet modern business needs (Figure 25).

In addition, **91 percent** of global IT decision makers say they trust technology partners with expansive global networks to help them quickly acquire, analyze, and act on data (Figure 26).

Keep pace with the “new normal” as you transform your business

Remote work is becoming the “new normal” in the wake of COVID-19 according to **83 percent** of global IT decision makers (Figure 21).

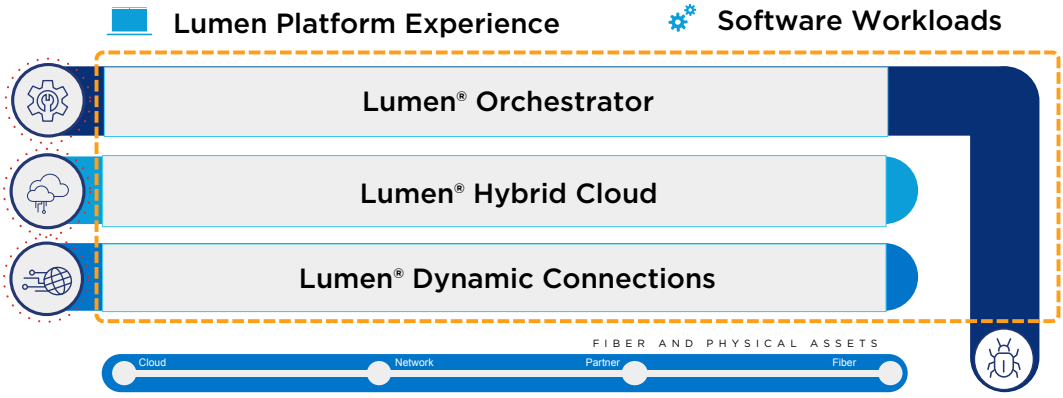
They don’t see employees returning to physical offices anytime soon: **three in four** global IT decision makers say the transition to remote work will either continue for years or become permanen. (Figure 22).

Changes in business operations brought on by COVID-19 are here to stay: **two in three** global IT decision makers believe the changes to business operations brought on by the COVID-19 pandemic will remain and represent a long-term shift in business strategy (Figure 23).

With these rapid changes, the vast majority* of global IT decision makers expect that COVID-19 will put their businesses to the test. Nearly **nine in 10** global IT decision makers believe that the COVID-19 pandemic is a business disruptor—they agree that businesses that can’t keep pace are going to shut down (Figure 27).

Navigate the challenges and harness the benefits of the 4th Industrial Revolution

For businesses facing the challenges and opportunities of rapidly modernizing their IT systems, Lumen offers a flexible, managed platform that bridges network, data center, cloud, managed services and Edge Computing with Connected Security. Businesses can leverage IT infrastructure and services across all layers of the hybrid IT stack to build connected systems across multiple cloud platforms and the edge to match workloads to the best execution venue.



The Lumen Platform enables IT to achieve an optimal level of connectivity proficiency and compute efficacy to maximize value to the business. Whether you serve customers in manufacturing, healthcare, retail, smart cities or other vertical markets, Lumen can enable your organization to use technology to further human progress.

Take advantage of the Lumen Platform to drive next-generation connectivity, productivity and security for your applications and data, and reap the many benefits of harnessing the 4th Industrial Revolution.

Learn more at lumen.com/platform

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Appendix: Quadrant Strategies Poll Data

A July 2020 poll of nearly 1,200 IT pros in 10 countries conducted by Quadrant Strategies.

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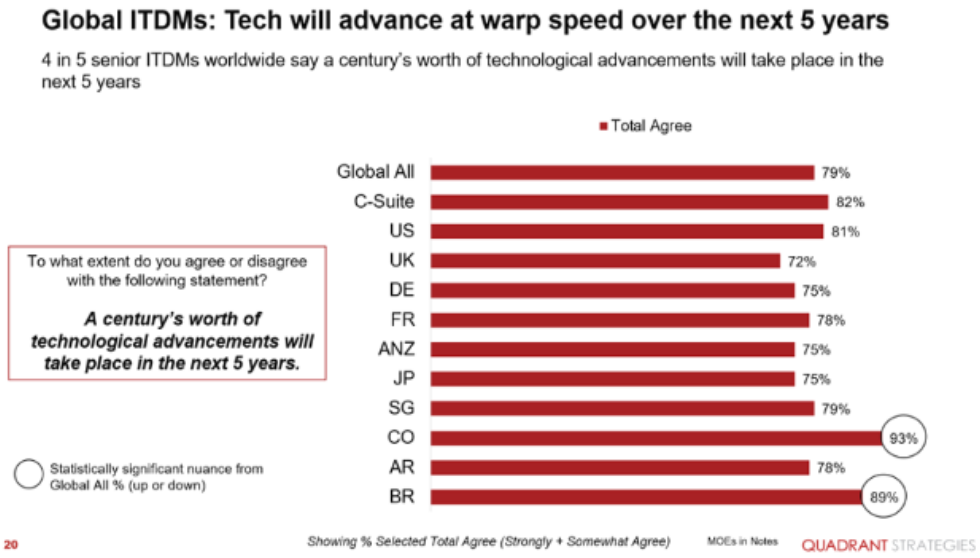
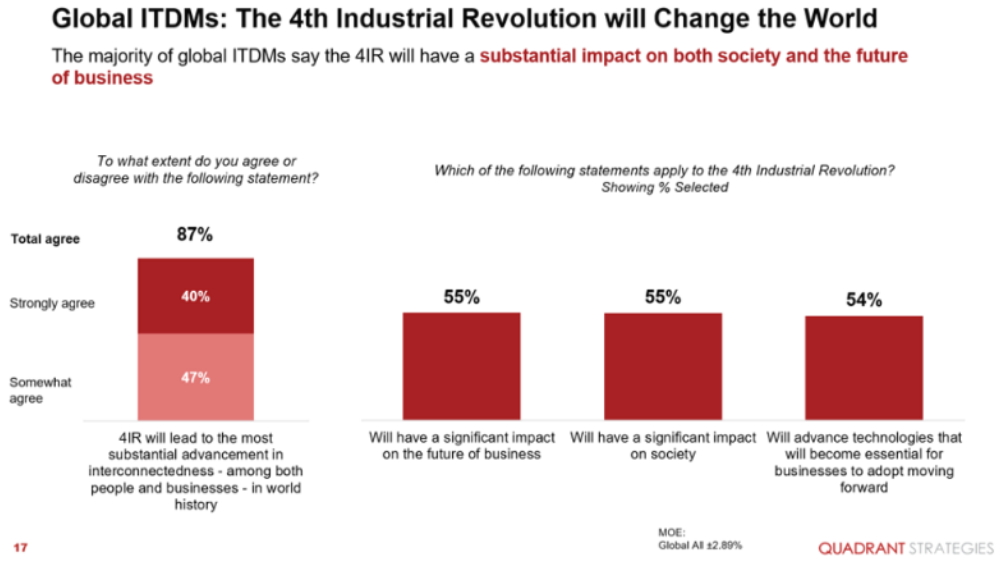
F1
Source: Quadrant Strategies, July 2020



F2
Source: Quadrant Strategies, July 2020



F3
Source: Quadrant Strategies, July 2020

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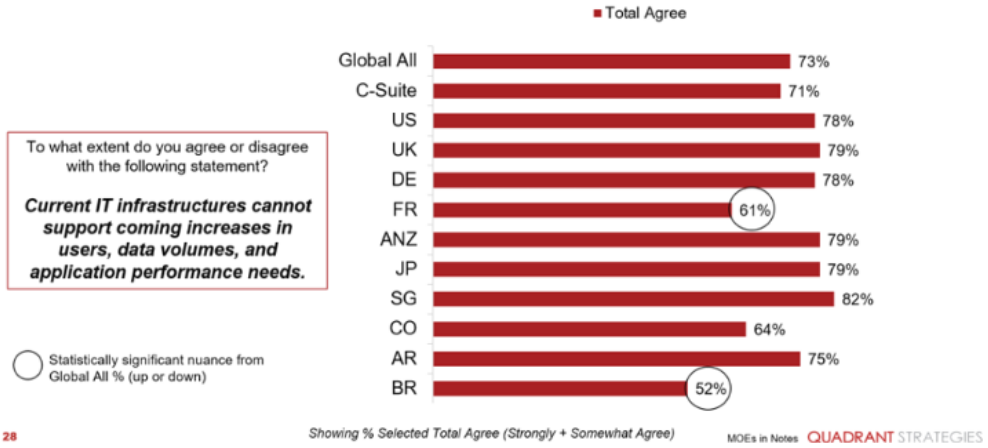
F4
Source: Quadrant Strategies, July 2020

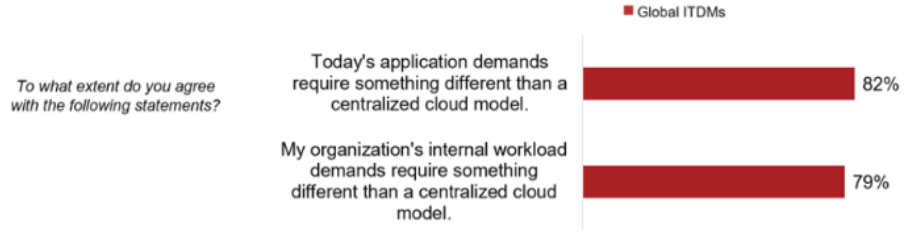
A majority of global ITDMs say that current IT infrastructures are not prepared to support coming increases in data and performance needs



28 Showing % Selected Total Agree (Strongly + Somewhat Agree) MOEs in Notes QUADRANT STRATEGIES

F5
Source: Quadrant Strategies, July 2020

4 in 5 global ITDMs say that a centralized cloud model cannot support their current workload or application demands

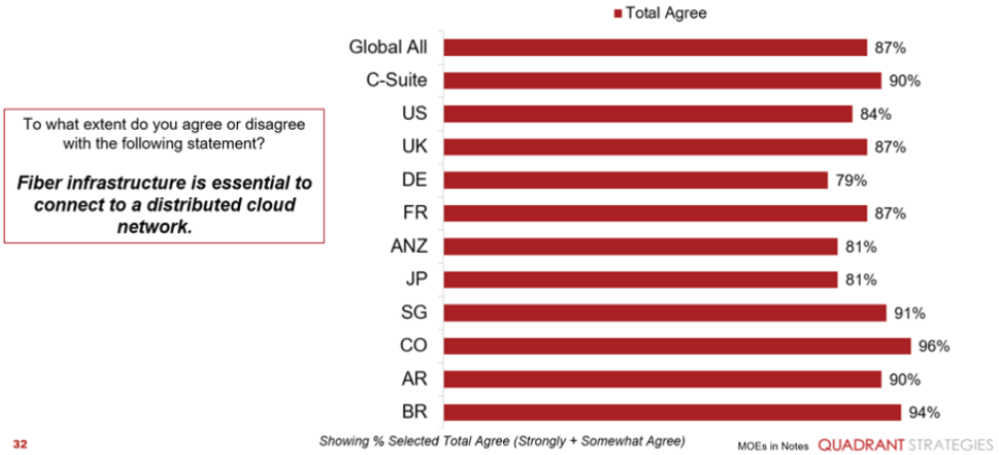


Showing % Selected Strongly + Somewhat Agree	C-Suite	US	UK	DE	FR	ANZ	JP	SG	CO	AR	BR
Today's application demands require something other than a centralized cloud model.	85%	79%	82%	75%	82%	85%	76%	84%	98%	80%	82%
My organization's internal workload demands require something different than a centralized cloud model.	81%	78%	73%	79%	82%	71%	79%	84%	88%	76%	84%

37 Statistically significant nuance from Global All % (up or down) MOEs in Notes QUADRANT STRATEGIES

F6
Source: Quadrant Strategies, July 2020

9 in 10 global IT C-Suite say fiber infrastructure is essential to connect to a distributed cloud network



32 Showing % Selected Total Agree (Strongly + Somewhat Agree) MOEs in Notes QUADRANT STRATEGIES

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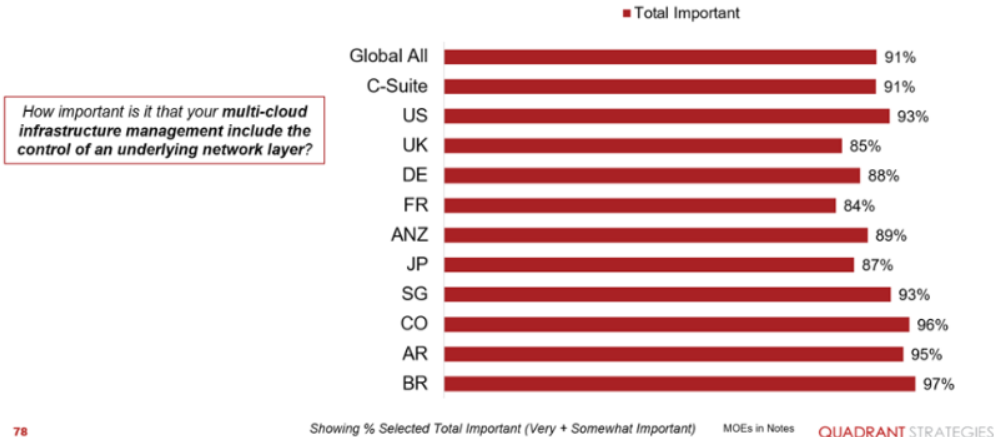
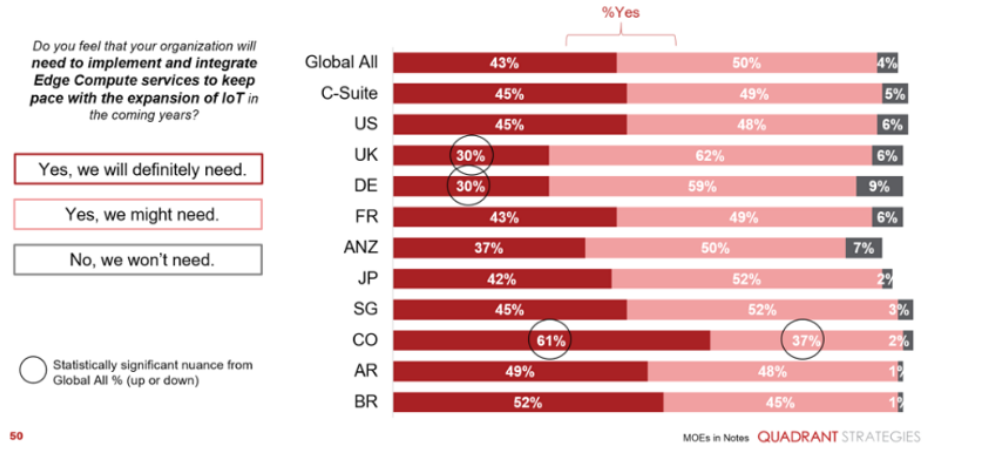
F7
Source: Quadrant Strategies, July 2020

More than 90% of global ITDMs believe that the control of an underlying network layer is essential to multi-cloud infrastructure management



F8
Source: Quadrant Strategies, July 2020

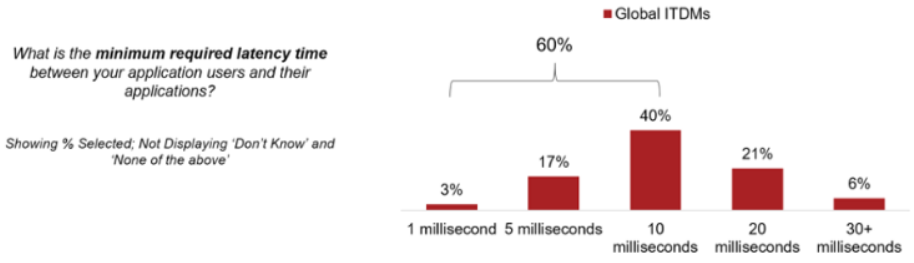
More than 90% of global ITDMs anticipate implementing Edge Compute services to keep pace with the expansion of IoT in the coming years



F9
Source: Quadrant Strategies, July 2020

60% of global ITDMs require a latency time of 10 milliseconds or less for their applications

1 in 5 require 5 milliseconds or less



Showing % Selected	C-Suite	US	UK	DE	FR	ANZ	JP	SG	CO	AR	BR
1 millisecond	3%	1%	2%	5%	1%	2%	2%	1%	7%	2%	5%
5 milliseconds	18%	16%	11%	14%	8%	15%	12%	23%	25%	28%	23%
10 milliseconds	40%	38%	35%	40%	50%	36%	46%	47%	40%	34%	39%
20 milliseconds	22%	27%	22%	21%	23%	25%	22%	15%	16%	18%	22%
30+ milliseconds	7%	4%	10%	5%	5%	7%	7%	5%	4%	8%	5%

47
Statistically significant nuance from Global All % (up or down)
MOEs in Notes
QUADRANT STRATEGIES

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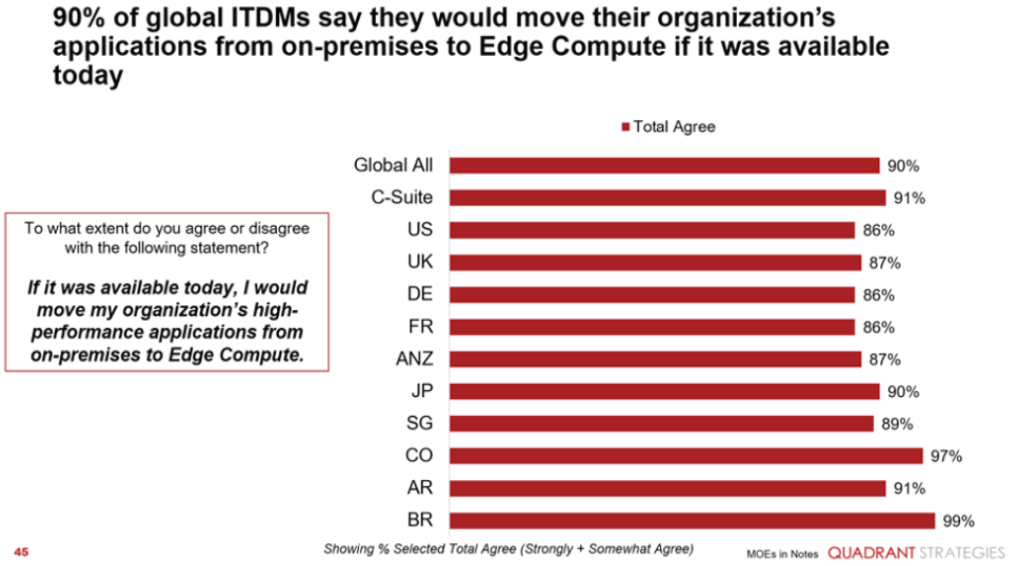
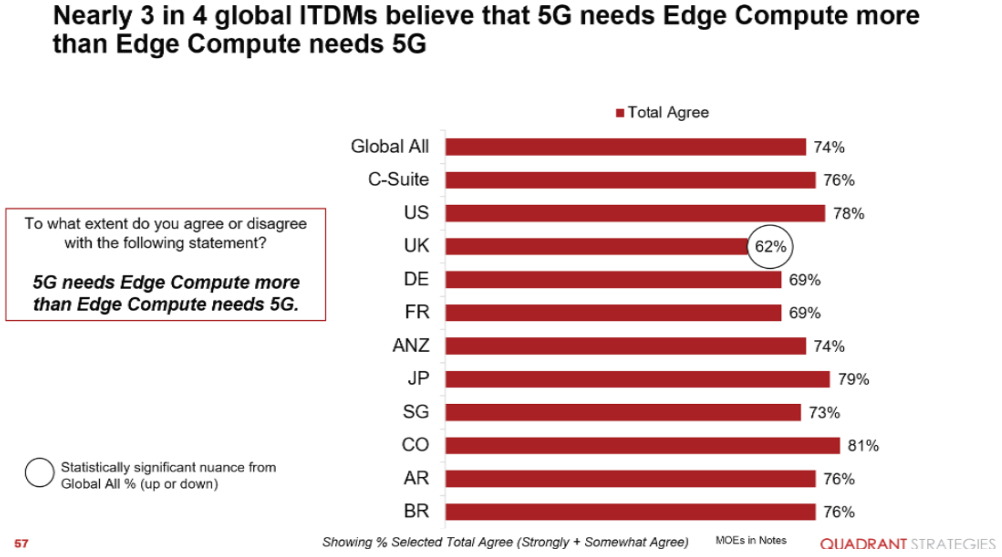
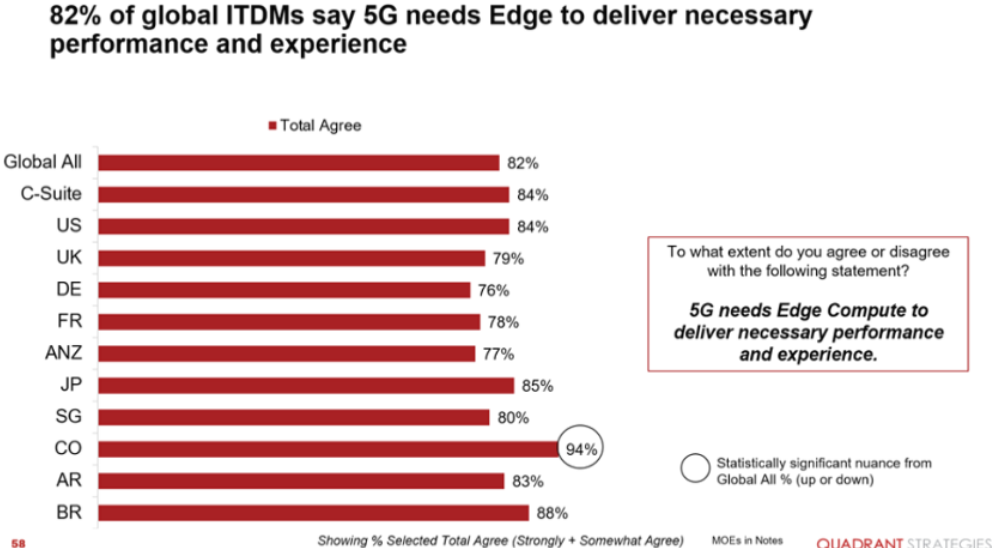
F10
Source: Quadrant Strategies, July 2020



F11
Source: Quadrant Strategies, July 2020



F12
Source: Quadrant Strategies, July 2020



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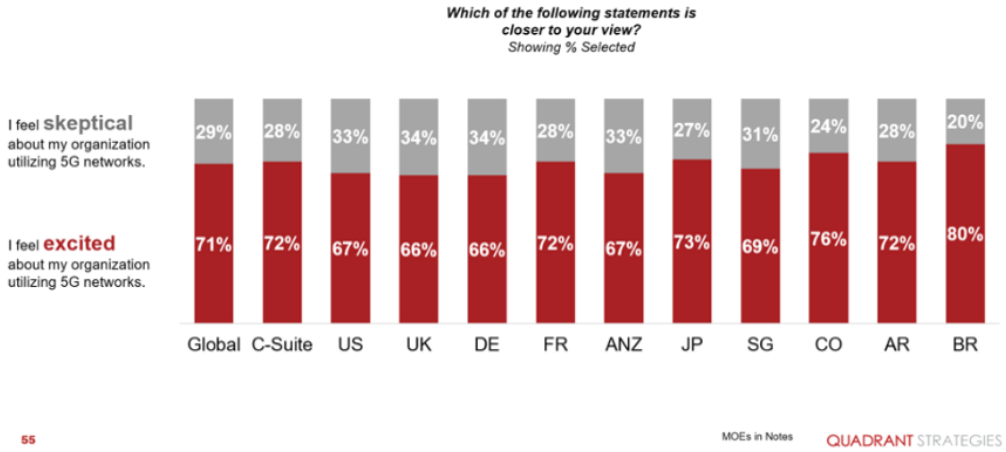
F13
Source: Quadrant Strategies, July 2020

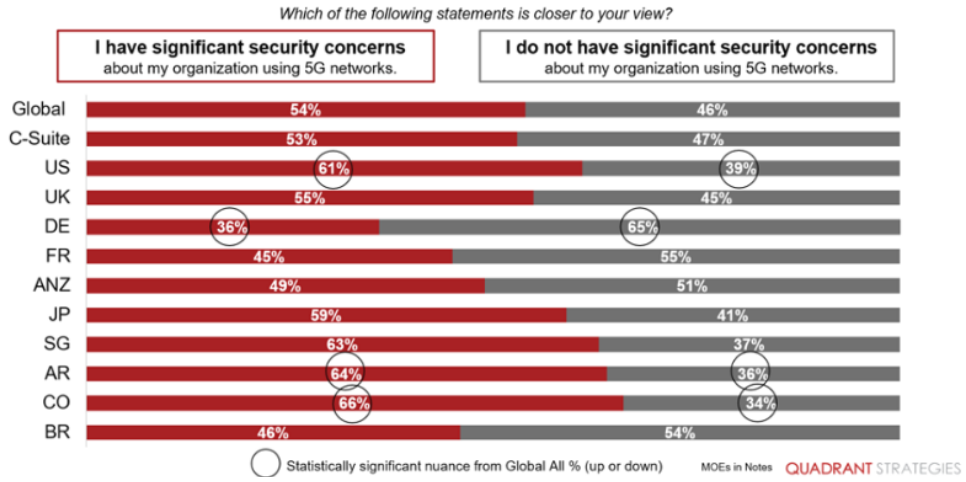
Nearly a third of global ITDMs are skeptical about their organization utilizing 5G



55 MOEs in Notes QUADRANT STRATEGIES

F14
Source: Quadrant Strategies, July 2020

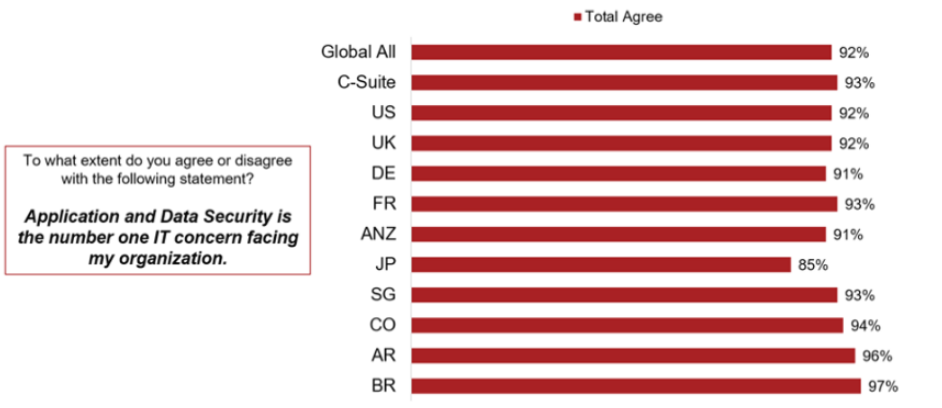
Global ITDMs have significant security concerns about their organizations using 5G



54 MOEs in Notes QUADRANT STRATEGIES

F15
Source: Quadrant Strategies, July 2020

9 in 10 global ITDMs say Application and Data Security is the number one IT concern



42 Showing % Selected Total Agree (Strongly + Somewhat Agree) MOEs in Notes QUADRANT STRATEGIES

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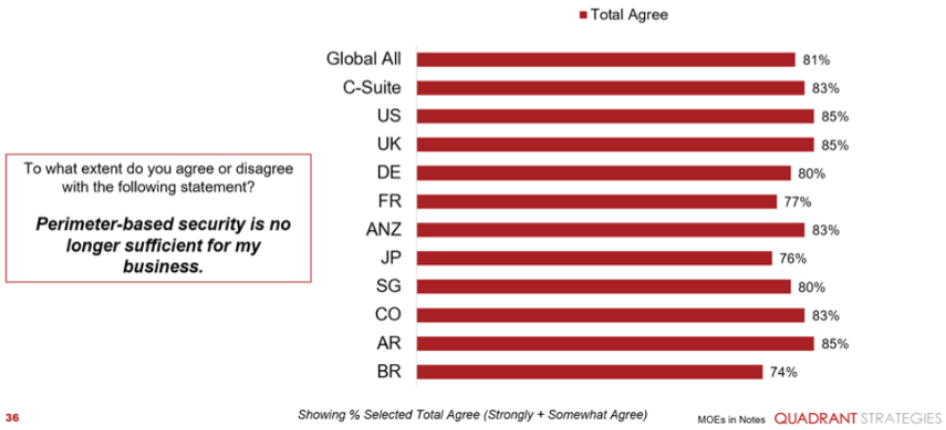
F16
Source: Quadrant Strategies, July 2020

Global ITDMs: Perimeter-based security is no longer sufficient

81% of senior ITDMs worldwide and 85% in the US say perimeter-based security is no longer sufficient for their business



36

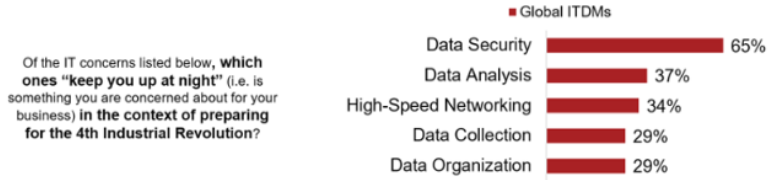
Showing % Selected Total Agree (Strongly + Somewhat Agree)

MOEs in Notes QUADRANT STRATEGIES

F17
Source: Quadrant Strategies, July 2020

68% of IT C-Suite globally say data security when preparing for the 4IR keeps them up at night

This nearly twice as much as other concerns.



Showing % Selected	C-Suite	US	UK	DE	FR	ANZ	JP	SG	CO	AR	BR
Data Security	68%	67%	65%	61%	54%	69%	58%	65%	76%	63%	77%
Data Analysis	39%	38%	40%	32%	24%	40%	45%	49%	29%	36%	42%
High-Speed Networking	37%	35%	26%	35%	30%	30%	44%	37%	28%	42%	29%
Data Collection	31%	31%	28%	23%	27%	28%	31%	33%	23%	33%	37%
Data Organization	31%	30%	21%	30%	20%	34%	27%	39%	26%	33%	28%

27

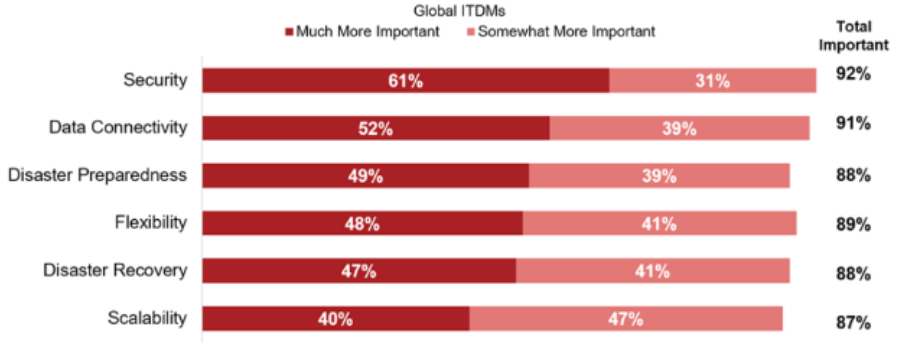
Statistically significant nuance from Global All % (up or down)

MOEs in Notes QUADRANT STRATEGIES

F18
Source: Quadrant Strategies, July 2020

ITDMs expect data security and connectivity to become more important in the wake of COVID-19

*In the wake of the COVID-19 pandemic, how will the **importance of each of the following organizational IT capabilities change**? Will it become…?*



67

MOE: Global All ±2.89%

QUADRANT STRATEGIES

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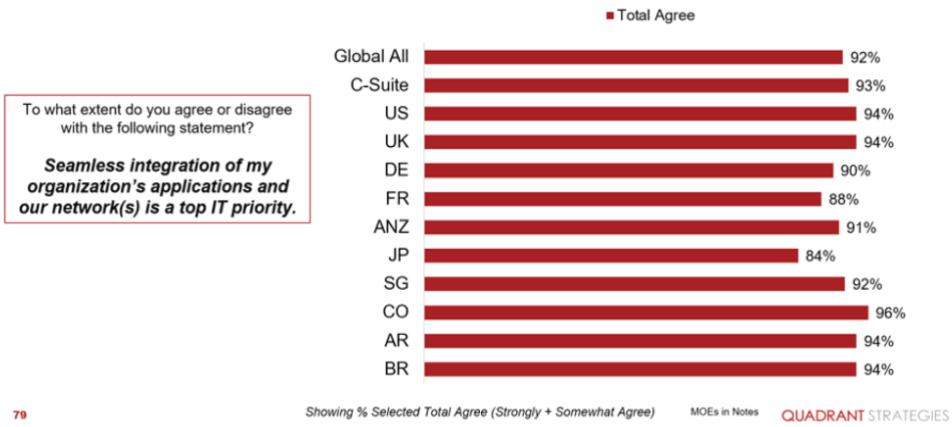
F19

Source: Quadrant Strategies, July 2020

9 in 10 ITDMs worldwide say that the seamless integration of applications and their network is a top IT priority



79

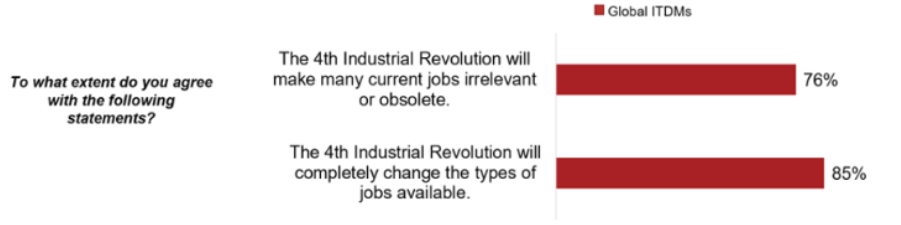
Showing % Selected Total Agree (Strongly + Somewhat Agree) MOEs in Notes QUADRANT STRATEGIES

F20

Source: Quadrant Strategies, July 2020

Tech business leaders see a very different job market emerging

- 3 in 4 Global ITDMs say the 4IR will make many current jobs irrelevant or obsolete
- 85% of global ITDMs say the 4IR will completely change the types of jobs that are available



Showing % Selected *Strongly + Somewhat Agree*	C-Suite	US	UK	DE	FR	ANZ	JP	SG	CO	AR	BR
The 4th Industrial Revolution will make many current jobs irrelevant or obsolete.	75%	73%	69%	75%	77%	77%	75%	78%	68%	84%	82%
The 4th Industrial Revolution will completely change the types of jobs available.	86%	81%	85%	79%	89%	79%	78%	83%	93%	87%	92%

24

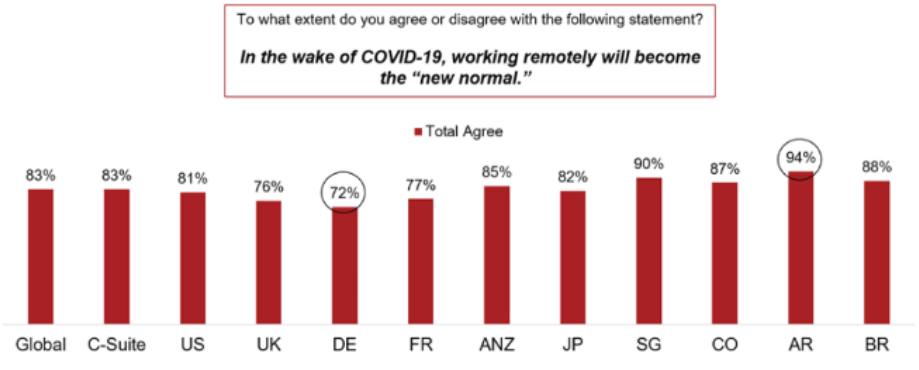
Showing % Selected Total Agree (Strongly + Somewhat Agree) MOEs in Notes QUADRANT STRATEGIES

F21

Source: Quadrant Strategies, July 2020

Global ITDMs: remote work is the "new normal"

4 in 5 global ITDMs say remote work brought on by COVID-19 will become the "new normal"



62

Showing % Selected Total Agree (Strongly + Somewhat Agree) ◯ Statistically significant nuance from Global All % (up or down) MOEs in Notes QUADRANT STRATEGIES

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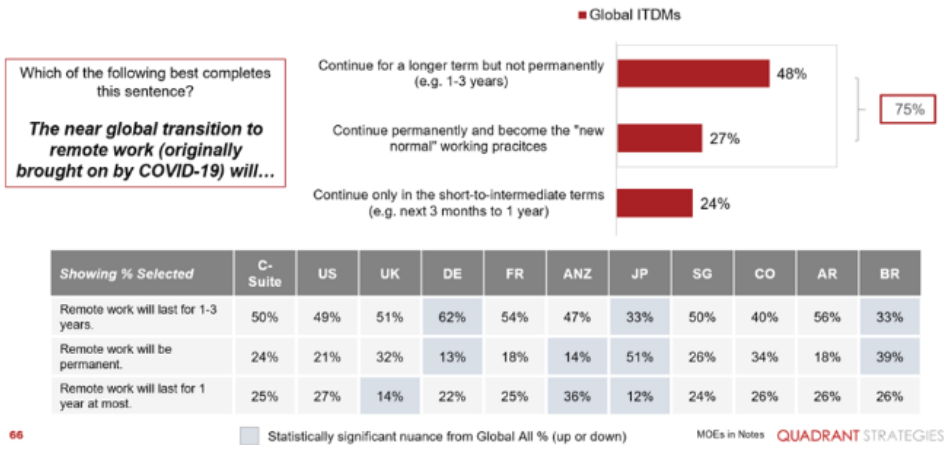
F22
Source: Quadrant Strategies, July 2020

Global ITDMs don't see employees returning to physical offices anytime soon

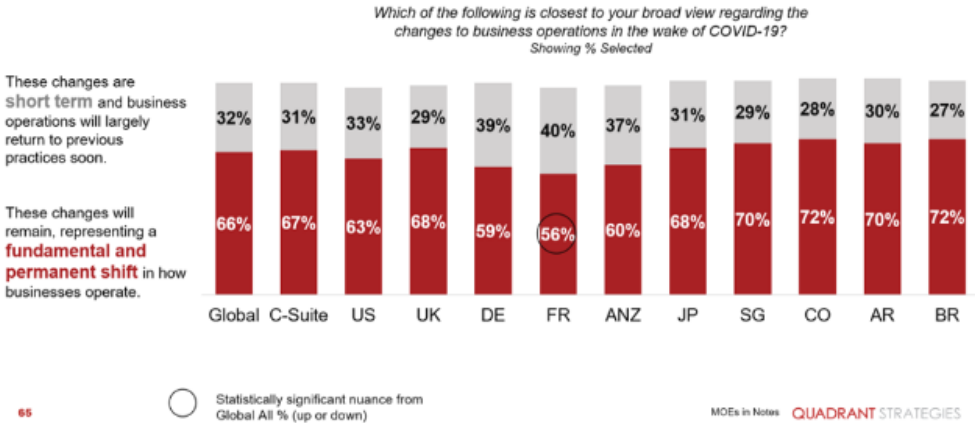


Showing % Selected	C-Suite	US	UK	DE	FR	ANZ	JP	SG	CO	AR	BR
Remote work will last for 1-3 years.	50%	49%	51%	62%	54%	47%	33%	50%	40%	56%	33%
Remote work will be permanent.	24%	21%	32%	13%	18%	14%	51%	26%	34%	18%	39%
Remote work will last for 1 year at most.	25%	27%	14%	22%	25%	36%	12%	24%	26%	26%	26%

66 Statistically significant nuance from Global All % (up or down) MOEs in Notes QUADRANT STRATEGIES

F23
Source: Quadrant Strategies, July 2020

2 in 3 global ITDMs believe that the changes to business operations brought on by the COVID-19 pandemic will remain, representing a long-term shift in business strategy

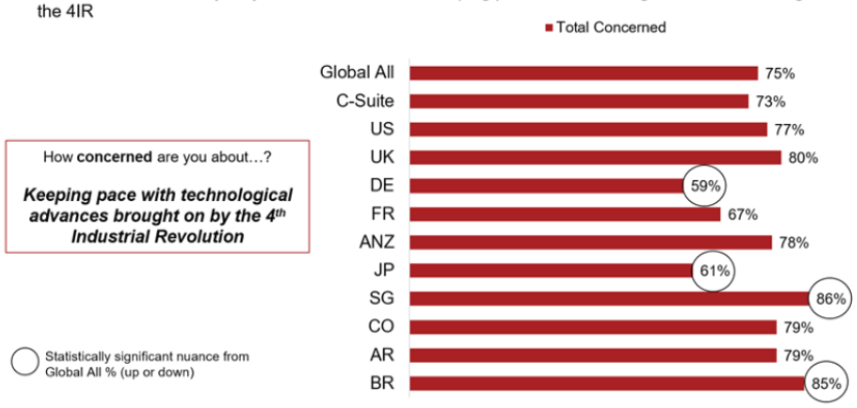


65 Statistically significant nuance from Global All % (up or down) MOEs in Notes QUADRANT STRATEGIES

F24
Source: Quadrant Strategies, July 2020

The 4IR is bringing about rapid changes in technology and global ITDMs are worried about keeping pace

3 in 4 Global ITDMs say they are concerned about keeping pace with technological advances brought on by the 4IR



23 Showing % Selected Total Concerned (Very + Somewhat Concerned) MOEs in Notes QUADRANT STRATEGIES

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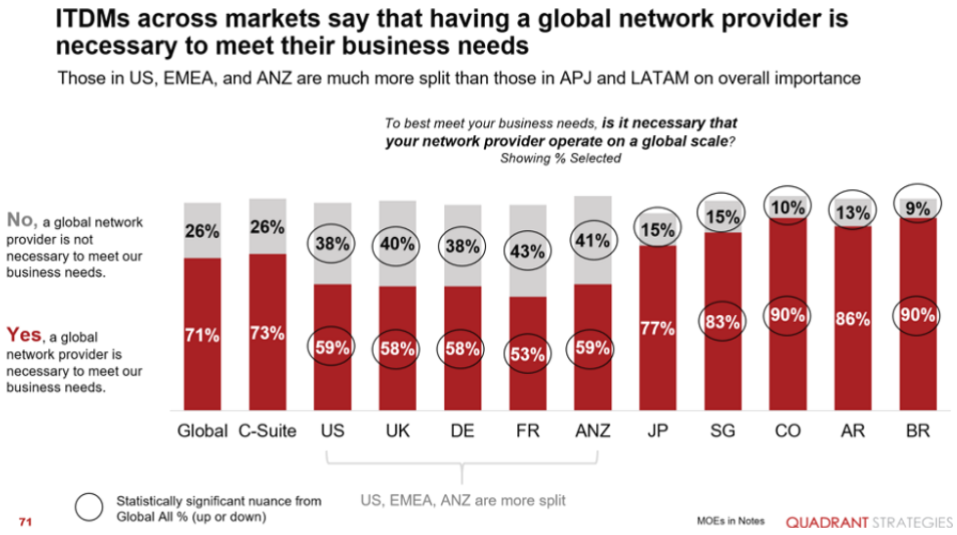
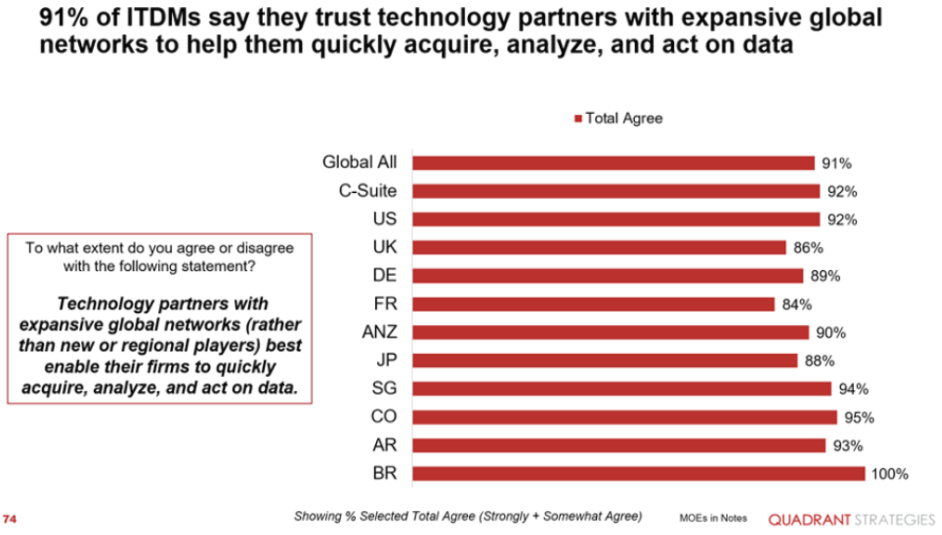
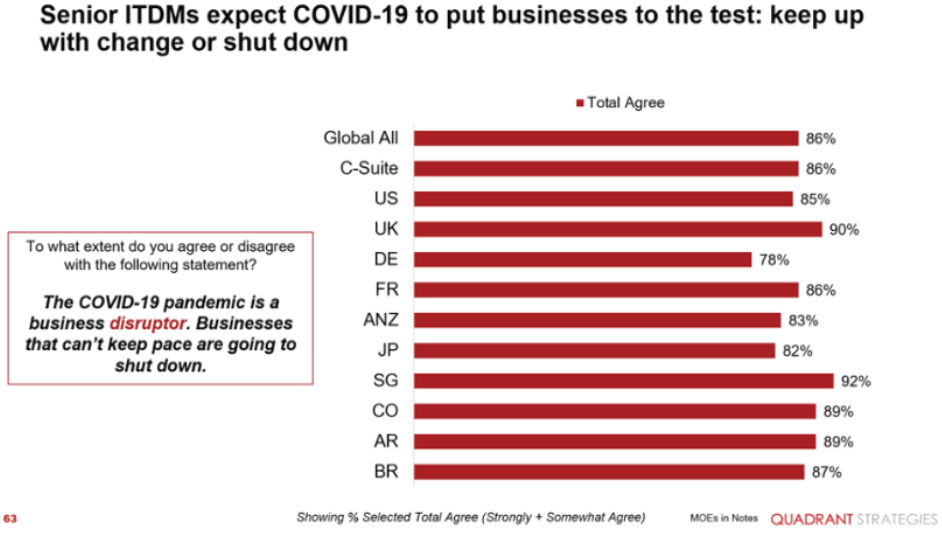
F25
Source: Quadrant Strategies, July 2020



F26
Source: Quadrant Strategies, July 2020



F27
Source: Quadrant Strategies, July 2020



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* In July 2020, Lumen sponsored the "Global Trend Report: How the 4th Industrial Revolution is Changing IT, Business and the World." It is based on a Quadrant Strategies online quantitative survey with 2,464 Senior IT Decision Makers and C-suite executives from large and midsize organizations in the US, UK, Germany, France, Australia, Argentina, Colombia, Brazil, Singapore and Japan. This report is the source for the statistics in this whitepaper.

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