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accenture

VALUE OF DATA
SEEING
WHAT
MATTERS

A New Paradigm for
Public Safety Powered by
Responsible AI



A survey administered across 44 global cities in 2015 and 2017, found that residents of 23 cities (52 percent) felt less safe over that period of time.¹ 45% of Americans also worry about being a victim of a mass shooting.²

The unpredictability of crime is increasing as more of it occurs in areas typically deemed safe: from schools to nightclubs to concerts to churches.³ Should we allow this to be the new normal?

It doesn't have to be. Imagine a future where the entire city is monitored by responsible AI, providing law enforcement with the tools and intelligence to stop atrocities and virtually all crime in real time. Cameras could detect people running, falling, or fighting; unattended items; other hazards (e.g., flame, smoke, vibration, non-standard noise)⁴ and potentially suspicious activities such as a person carrying suitcases repeatedly or groups of masked people continually gathering at night. The system alerts police who react in real-time—for instance, recognizing an offender's face before any crime is committed and automatically activating alarm systems or contacting emergency services.⁵

These cameras of the future are an extension of what is used today—the pervasive closed-circuit television (CCTV) cameras (see box), which are one of the most popular tools for stemming crime. An analysis of 13 European and North American cities and towns that use CCTVs found that these cameras reduced crime (i.e. burglary, theft, homicides) by 1% to 75%.⁶

Closed-circuit television (CCTV) monitors transmit video camera footage and often have recording capabilities. CCTVs are used for security and most do not include analytics features today.⁷

The vast difference in effectiveness is due to the public's perception of whether or not the CCTVs are properly monitored. Take, for instance, an Urban Institute study,⁸ which looked at the deployment of public safety cameras in two Chicago neighborhoods: Humboldt Park and West Garfield Park. Humboldt Park's crime rate dropped 20 percent the month after the cameras were installed and remained low; in contrast, West Garfield Park's crime rates did not budge. Why the difference? Researchers found that West Garfield Park residents did not believe police regularly monitored the cameras, a perception that made the cameras far less effective as deterrents. Ultimately, by implementing these systems, the city realized net savings of more than \$600,000 per month from criminal justice costs and victims' financial and emotional costs.⁹ However, the city could have saved much more if West Garfield Park residents believed real time monitoring occurred.

Given the video surveillance industry's expected 2.5X growth, less than 1% of video footage is likely to be analyzed by 2020.

Integrating artificial intelligence and analytics with public safety's current closed-circuit televisions can transform the ecosystem from reactive to proactive, reducing US crimes by about 81.7 million by 2040 and shielding approximately 76,000 mass shooting victims by 2040.

AN ANALOG SURVEILLANCE INDUSTRY

What is interesting is that West Garfield Park residents' belief was not far from the truth. According to Accenture analysis, most video footage from public safety cameras today are only used for forensic or evidential purposes after criminal activity has occurred. For instance, Beijing is the world surveillance leader with 470,000 CCTV cameras, followed by London with 420,000, and Washington, D.C. with 30,000.¹⁰ Yet, on average only 2% of video footage is seen¹¹ and even less is analyzed in real time today. This means that 98% of security video footage is “dark” data (see box).

Gartner defines dark data as information collected, processed, and stored during regular business activity, but not meaningfully utilized or analyzed.¹² IDC has stated that up to 90% of big data is dark data.¹³ Given 2% of video footage is seen today, 98% is “dark.” However, the surveillance industry is expected to grow 2.5X, which means less than 1% of footage will be analyzed by 2020.

Source: <https://www.gartner.com/it-glossary/dark-data/> <https://www.techopedia.com/definition/29373/dark-data>

And the surveillance industry is only growing, expected to reach approximately \$76 billion in revenue in 2020¹⁴—up from \$30 billion in 2016 (16.4% CAGR)—with China alone expected to install 450 million new CCTVs by 2020.¹⁵ This means that even more video will need to be monitored—mostly over the internet. In fact, traffic from video surveillance transmitted over the internet is expected to increase sevenfold between 2016 and 2021.¹⁶ A big part of this increase will come from the availability of high-quality, affordable cloud-based do-it-yourself video solutions that households are embracing to obstruct crime. For example, 35 million Americans currently own a home security system, which represents a 6 percent growth from 2008 to 2017.¹⁷

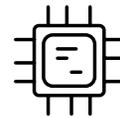
Yet, more cameras do not equate to lower crime. Today, most police officers' time is dedicated to safeguarding streets while the rest is reserved for administrative work. Not many precincts have dedicated video analytics professionals. As a result, most video footage is left unwatched. That needs to change. Society needs to think about better allocating safety and security investment dollars—and emerging technologies can help. Integrating artificial intelligence (AI) and analytics with public safety's current CCTVs can transform the security industry from reactive to proactive—thus, allowing law enforcement to more effectively combat crime and mass shootings.

HOW TECHNOLOGY ENABLERS CAN HELP FIGHT CRIME

AI is an ideal solution to augment current public safety systems. AI enables machines to interact naturally with people, data, and the environment, creating more intuitive interactions and extending what either humans or machines can do on their own.

AI technologies, such as machine learning and deep learning, can handle computational-heavy and monotonous monitoring that no human can possibly do in an equivalent amount of time.¹⁸ Effectively they become smart eyes and ears that can alert, in real time, security guards and police to take action that can prevent crime.

In a public safety setting, AI capabilities—programmed by humans and trained over time—could analyze thousands of video feeds to track and alert authorities of anomalies. Current video feeds AI could analyze include those from CCTV, do-it-yourself video cameras, security services, badges, and smart locks. In the future, these could be joined by new data sources such as personal devices (e.g., cell phone and iPad cameras, dash cams) connected cars, drones, and robots. If enabled, cities could crowdsource commercial and residential security system data, thus breaking down the silos across those systems and analyzing the data in an aggregated way to get a real-time picture of potential criminal activity.



Artificial Intelligence is defined as applications that can sense, comprehend, act and learn leveraging machine learning, natural language processing and computer vision to automate and augment human activities.

Riding the prevailing technology wave, some public safety industry players – like China, Singapore, and startups globally – are already upgrading their capabilities. They're leveraging robotics, computer vision, big data, and analytics to anticipate and prevent crimes in real time. As startups and established technology companies begin partnering, they can tap into each other's expertise and continue to develop these technologies faster and more affordably. And when these technologies come together, they can transform cameras from an illusion of protection to a real-time vigilant protector, thereby, accomplishing the unthinkable: detecting crime in just one second.¹⁹

PHYSICAL ROBOTS DO THE LEGWORK

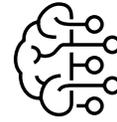
One of the biggest challenges for police and security forces is manpower: there are only 800,000 police officers and 1.1 million security guards in the US²⁰ to cover a population of 327 million.²¹ In other words, there's simply not enough police and security forces to be everywhere they are needed. Enter robots, such as those from Silicon Valley's Knightscope, which track blind spots and provide location-based data. Knightscope offers a fleet of autonomous, mobile robots that patrol offices, parking lots, malls, and streets to serve as security forces' smart eyes and ears. As they gather data, the robots spot anomalies, in real time – in any type of environmental condition – and alert security officials. The robots can detect concealed weapons, and have helped security guards apprehend thieves as well as stop vandals. To date, Knightscope's robots have collectively covered more than 100,000 miles in 180,000 hours of operation. Yet, having too many robots in public spaces can intimidate the public. Hence, robots may serve as blind spots detectors, while AI serves as the real-time field of vision public safety counterpart.

AI'S COMPUTER VISION CAPABILITY SUPERCHARGES RESPONSE TIME

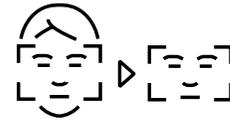
Emerging AI solutions illustrate what future public safety could look like—which, in many ways, is already here. Through facial and object recognition, AI's computer vision moves cameras from an illusion of protection to a vigilant partner in fighting crime.

One computer vision startup working on facial recognition is Alibaba-backed SenseTime.²² Its software matches crime scene offenders to criminal databases in seconds to remove threats off streets. Thus far, the tool has identified 2,000 suspects and “solved 100 cases” in Guangzhou, China.²³ The company is currently working on software that will “parse data from thousands of live camera feeds” and be used by police to “track everything from vice and accidents to suspects on blacklists.”²⁴ Meanwhile, One Smart Labs, is integrating AI into existing CCTV systems to identify subjects by matching faces with a database of millions of photos (including mug shots and driver's licenses).²⁵ Understandably, such a tool could raise fears among ordinary citizens of privacy invasion, which is why One Smart Labs and other companies with similar technologies continually test their tools' algorithms to identify false positives and matches and minimize bias. A subset of AI's machine learning, called deep learning (see box) is at the heart of a third solution. Using deep learning, a system called SkyNet can accurately identify people's faces from different angles, motion speeds, and lighting conditions. It claims to be up to 99.8 percent accurate.²⁶

Likewise, deep-learning startup, Deep Science AI,²⁹ is working on object recognition within its analytics-powered platform. It supports remote monitoring of facilities such as offices and retail stores to detect threats including weapons, masks, intruders, and fire. A human analyst monitors feeds from the facilities' security cameras and immediately contacts the business and authorities when a threat emerges. Deep learning detects threats in fractions of a second, enabling an analyst to simultaneously monitor hundreds of feeds instead of a handful. And if the system generates a false positive, that data is kept to re-train the system.³⁰ By 2022, video and image analysis will comprise 30% of enterprise deep-learning deployments,³¹ meaning the technology will increasingly become smarter over time as it is fed more data.



Deep Learning is an AI function that imitates the human brain in processing data and creating patterns to make decisions. Its algorithms require massive data to provide the best outcome.²⁷



Within facial recognition, deep learning replicates images very closely to originals—one startup claims to be 99.8% accurate—while machine learning's images are blurry.²⁸

Sources: <https://www.investopedia.com/terms/d/deep-learning.asp>
<https://www.kairos.com/blog/the-best-explanation-machine-learning-vs-deep-learning>

By leveraging facial and object recognition with real-time action, the impact of the most mature level of AI surveillance could be monumental. The perpetrator of the deadliest mass shooting in American history brought more than 10 suitcases to his hotel room filled with weapons.³² Sophisticated AI-enabled analytics could have flagged the number of bags as anomalous behavior or robotics could have identified the weapons hidden in his luggage.

Increased public safety due to real-time monitoring has profound effects on violent and non-violent crime as our analysis demonstrates (“What’s the Value?” section below). However, the mass public safety ecosystem could also help countries combat another major issue—the rising incarceration rate.

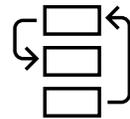
PUBLIC SAFETY ECOSYSTEM DUAL-PURPOSE: “PROPERTY CRIME” PAROLE PROGRAM

In 2017, the US had a nationwide incarceration rate of 860 inmates for every 100,000 adults—which equates to 2.2 million people of the country’s 327 million population behind bars.³³ The cost of this incarceration is more than \$80 billion a year to support federal, state, and local corrections agencies.³⁴

More sophisticated public safety technology could reduce that spend significantly. For instance, a large number of inmates are serving time for non-violent “property crimes” (i.e. burglary, larceny-theft, or motor vehicle theft). While in prison, these inmates are non-contributing members of society. However, many of them could be eligible for parole if “supervised” by technology. AI’s tools and solutions could track these individuals in real time after their release and ensure they do not pose any threat to society—and allow governments to reduce their corrections footprint.³⁵ An additional upside benefit: If released on parole, non-violent inmates can get jobs, thereby contributing to GDP.³⁶



Computer vision tracks and identifies crime suspects based on data it is fed. It has identified **2,000 suspects** for one police district.



Deep learning processes massive data and creates patterns for decision-making. It will become smarter over time: by 2022 video analysis will comprise **30%** of enterprise deep-learning deployments.



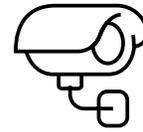
Robots patrol public spaces, detecting concealed weapons. One startup’s robots have covered **100,000 miles** while identifying thieves and vandals.

AN EAGLE EYE FOR SECURITY

Enabling the future vision of public safety depicted above, the video surveillance industry is set to boom over the next decade. With over 450 million CCTV cameras currently installed worldwide,³⁷ the market is set to explode driven by the ambitions of the largest market – China.³⁸ By 2020, China expects its installed base to reach 626 million cameras.³⁹ With 29 percent of new shipments recording 4K resolution,⁴⁰ the approximate 400 million cameras that China aims to install in the next two years would generate roughly 6.4 exabytes of video per day,⁴¹ equivalent to 1.4 billion DVD's. This amount of DVDs stacked equates to two round trips to the moon. Clearly, it is impossible to dissect all this information without AI.

As staggering as this number is, it involves only the growth in the Chinese market and only a single technology – CCTV cameras. Additional sources such as body-worn cameras, drones and dashcams make China's 1.4 billion DVD's of content per day a drop in an ocean of potential data sources which will need to be proactively monitored to ensure safety.”

Clearly, as the amount of data generated from both existing and new sources increases dramatically, so will demand for places in which data can reside and be used. In other words, law enforcement agencies will need surveillance-optimized data storage management that allows them to capture, store, and analyze exponentially more data to generate real-time insights. Specialized surveillance equipment exists today and will continue to advance in features. This equipment can record continuously for years, works with deep learning, and is weather, vibration, and shock-proof.



From 2018 to 2020, China's increase in CCTVs will generate **6.4 exabytes of video per day**. This is equivalent to the data held in 1.4 billion DVDs. This amount of DVDs stacked equates to two round trips to the moon. Clearly, it is impossible to dissect all this information without AI.

A TIERED APPROACH TO ADOPTION

While the preceding technologies and data sources are just now emerging, broad adoption probably will not happen quickly given public concerns about privacy and the massive investment required.

Instead, global adoption will likely unfold across three tiers of maturity of mass public safety to allow society to gradually accept and advocate for it. However, given the rapid public safety momentum in places like Singapore and China, such locales may reach these tiers much more quickly.



TIER 1

Tier 1 is the current mass public safety ecosystem, which primarily features CCTV feeds used retroactively by security and police forces to understand “what happened.” Data is typically in silos, making it difficult to create a broader and more comprehensive picture of a particular situation. However, some cities – like those in China and Singapore – and startups begin to leverage emerging technologies to manage mundane public safety tasks.



TIER 2

Tier 2 takes the next step toward a mass real-time-oriented public safety ecosystem where through AI, police can see the unseeable. This tier is expected to arrive by 2025, by which smart cities become the norm⁴² and 88 municipalities are predicted to achieve “smart city” status.⁴³ In addition, by 2025, 70% of security surveillance cameras will ship with on-device real-time monitoring and analytics functions within the camera, compared with less than 5% in 2018.⁴⁴ As a result, governments and law enforcement can crowdsource video data from businesses and public institutions (such as schools and hospitals) to augment their current CCTV feeds and add AI capabilities that enable them to track and analyze footage in real time to identify anomalies and threats. Due to increased public safety coverage and a centralized AI-enabled analytics system, response times are improved dramatically. Federal regulators estimate that shaving a minute off response times could save as many as 10,000 lives a year.⁴⁵

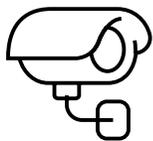
At Tier 3, the most mature predictive-oriented public safety ecosystem emerges by 2035, the date by which all devices are connected via the internet.⁴⁶ Data automatically knows where to go to be processed, allowing governments and law enforcement to add households to their crowdsourced data sources, focusing on those in high-crime areas. Some residents voluntarily donate their feed data, while others are encouraged to do so by tax-break incentives or nominal compensation (determined by the quality of camera generating the feed, the uniqueness of the view provided, the camera’s location, and the neighborhood’s crime rate). These transactions are facilitated through a data marketplace.



Tier 3 relies on a rapidly growing public safety ecosystem where data is pulled from disparate databases such as social media, driver’s licenses, police databases, and dark data. The more data, the better the systems perform as deep learning enables the system to become more knowledgeable and, as a result, more accurate.⁴⁷ With these new sources added to the mix, public safety covers virtually every inch of a city.

Such predictive analytics can stop crime and atrocities in real time. Utilizing FBI data, an analysis of mass shootings between 2009 to 2016, demonstrated that 42 percent of shooters exhibited “red flags” like acts, attempted acts, or threats of violence towards oneself or others; violations of protective orders; or evidence of ongoing substance abuse. In addition, 34 percent of shooters were prohibited from possessing firearms.⁴⁸ Within Tier 3, cities have full public safety access housed in a centralized AI-enabled analytics unit. Within the unit, police can view such anomalies in real time and interrupt a crime before it is committed such as by locking down facilities to respond to threats immediately.⁴⁹

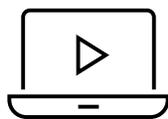
The mature predictive-oriented public safety ecosystem emerges



TIER 1

Current Public Safety

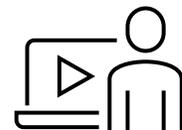
Ecosystem: CCTVs are used retroactively to understand “what happened.” Data is housed in siloes.



TIER 2

2025 Public Safety

Ecosystem: Video data is crowdsourced from the private sector, augmenting CCTVs with AI capabilities and real-time analytics to identify anomalies.



TIER 3

2035 Public Safety

Ecosystem: Video data is crowdsourced from residents, and data is supplied from disparate sources, to predict crime in real time.

WHAT'S THE VALUE?

AI-enabled public safety can counter some of the most common types of crime: property crime (i.e. burglary, larceny-theft, motor vehicle theft, and arson) and violent crime (i.e. murder, robbery, and aggravated assault).⁵⁰

Implementing a comprehensive public safety system will clearly require significant investment, not to mention a sharp, ongoing focus on protecting citizens' privacy. But the payoff could be worth it many times over in lives saved, mass shooting victims shielded, violent and property crimes reduced, and economic impact.

SAVING LIVES

Our analysis shows an increasing number of homicides occur in public—which means they are typically visible to anyone or anything nearby. The problem is, the current retroactive-oriented Tier 1 public safety industry may only prevent one homicide per year.

Machine learning, deep learning, and cognitive analytics can track homicides and mass shootings in real time—alerting authorities and allowing them to respond more quickly and efficiently and, thus, saving lives. For instance, a Tier 2 public safety system may save under 3,700 lives in 2025 and over 8,000 in 2034. At Tier 3, homicides may be reduced by approximately 8,800 in 2035. All three tiers combined may result in nearly 115,000 lives being saved by 2040.

SHIELDING POTENTIAL VICTIMS

There's similar potential to protect potential victims—those injured or killed—from mass shootings. Today's public safety approaches may shield from harm over 30 mass shooting victims annually. At Tiers 2 and 3, the number jumps to approximately 4,500 in 2025 and 4,500 in 2035, respectively. All three tiers combined may result in about 76,000 mass shooting victims shielded by 2040.



Number of Crimes AI Public Safety May Prevent by 2040:

81.7 million

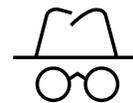


Lives that May Be Saved by AI Public Safety by 2040:

115,000



Mass Shooting Victims AI Public Safety May Shield by 2040: **76,000**



Economic Impact of "Property" Crime Parole Program by 2040: **\$191.8 billion**

REDUCING VIOLENT CRIMES AND PROPERTY CRIMES

When people are aware they are being watched, they are less likely to commit crimes of any type.⁵¹ If people choose to proceed regardless, real-time AI-detection of their activity would disrupt would-be criminals' attempts to carry out a crime.

By progressively applying new technologies to their approaches, public safety agencies could boost the number of violent and property crimes they prevent each year from approximately 2,100 today (Tier 1), to 4.2 million in 2025 (Tier 2), to 5.6 million in 2035 (Tier 3)—or 81.7 million by 2040 (all three tiers combined).

BOOSTING ECONOMIC IMPACT THROUGH “PROPERTY CRIME” PAROLE PROGRAM

As mentioned earlier, a mass public safety ecosystem could make possible the release, and tracking via AI solutions, of non-violent prisoners serving time for “property” crimes—allowing these individuals to become once again contributing members of society and eliminating their associated incarceration costs. The accompanying economic impact is dramatic. Because the mass public safety systems required to support this complex initiative are not currently available, this impact would not be felt until Tier 2, which could be roughly **\$21.5 billion** generated from the release of about 176,000 eligible parolees. At Tier 3, the number could rise to approximately \$21.8 billion from the 136,000 parolees. Combined, Tiers 2 and 3 could generate a massive \$191.8 billion in economic impact by 2040.

When people are aware they are being watched, they are less likely to commit crimes of any type. If people choose to proceed regardless, real-time AI-detection of their activity would disrupt would-be criminals' attempts to carry out a crime.

FORGING AHEAD TO A MORE TRANSPARENT AND RESPONSIBLE FUTURE

With so much data available today, it is understandable people are wary of proposals that suggest even greater data collection by government and law enforcement—knowing the potential exists for misuse of the data and, consequently, violations of privacy.

Plus, many people are inherently uncomfortable with the thought of constantly being monitored as they make their way through their days. But the tradeoffs in the form of crime prevention—saving lives and property—and positive economic impacts argue in favor of more expansive, and more intelligent, public safety.

Thus, going forward, a balance needs to be struck between data privacy and data responsibility. Public input and oversight are necessary to ensure that video public safety systems are designed to prevent misuse and abuse. Members of communities considering such a system should participate in the decision-making process to build trust and tailor public safety processes to the community's needs and circumstances. Such public forums also give officials a venue in which they can explain how the system's costs are far outweighed by the its immense benefits.⁵²

Indeed, some civilians aren't opposed to being tracked as long as the process is transparent and parameters are in place for the use of data⁵³—e.g., data is used solely for the purpose gathered, not sold, secured, and anonymized. Annual or bi-annual public safety audits could be completed by key public-sector entities to ensure parameters remain in place and are having the intended effect.

01 Public input and oversight of public safety systems is necessary

02 Data is used for only for the purpose for which it is gathered, is not sold, is anonymized, and is secured

03 GDPR serves as governance model for future of public safety ecosystem and is secured

The 2018 GDPR legislation in Europe could serve as an initial model for governing the public safety ecosystem.⁴³ GDPR rules specify that individuals “can contest ‘legal or similarly significant’ decisions made by algorithms and appeal for human intervention,” thereby getting an explanation of how an algorithm generated a particular outcome.⁵⁴ This could easily be applied to how public safety data is handled.

There’s no doubt people overwhelmingly want to feel safe and enjoy a high quality of life. Cities and countries can better equip themselves to fulfill those wishes by using more public safety data, and more-powerful tools to make sense of that data, to prevent crimes of all types before they happen.

APPENDIX A: THE VALUE OF AI IN PUBLIC SAFETY

ASSUMPTIONS

Violent Crime Seen on Camera Percentage

Based on “circumstances” analysis of crime, we estimate that currently 1% of crime is seen on camera, 41% with AI in 2025, and 74% with AI in 2035.

Crime Identified by AI Percentage

Utilized startups algorithm accuracy rate. For current, assumed 2% of crime is identified given 2% of video footage is seen.

Incidents Where Response Time Greater than Average Percentage

For given driver, excluded incidents above average response time as such incidents are currently accounted for with today’s public safety ecosystem.

Additional Impact by AI Percentage

Quantified impact of AI by ecosystem’s ability to reduce response time and thereby reduce crime

Loss Value to Society by Inmates Imprisoned

The summation of direct incarceration cost per inmate and loss in GDP per inmate

APPENDIX A: THE VALUE OF AI IN PUBLIC SAFETY

VALUATION APPROACH

Lives That May Be Saved with AI Surveillance

Number of students eligible for graduation
x % of victims murdered in public
x % of violent crimes identified by AI
x % of incidents where response time > average
x Expected % of additional lives saved by AI

Lives that may be saved by AI-surveillance

Victims Shielded from Mass Shootings

Mass shooting victims
x % of victims murdered in public
x % of violent crimes identified by AI
x % of incidents where response time > average
x Expected % of additional victims AI may shield

Victims that may be shielded by AI-surveillance

Reduction in Violent Crimes from AI-Surveillance

Number of violent and property crime victims
x % of violent/property crime in public
x % of violent/property crimes identified by AI
x % of incidents where response time > average
x Expected % of additional victims prevented by AI

Decreased victims by AI-surveillance

Economic Impact from AI in Law Enforcement

Prisoners serving for "Property" crimes
x Time served in prison
x Loss Values to Society by Inmates Imprisoned

Economic Impact of Inmates Getting Released to Parole

AUTHORS

WESTERN DIGITAL CORPORATION

David Tang

SVP, Corporate Marketing
dave.tang@wdc.com

Judy Fujii-Hwang

Corporate Brand and Thought Leadership
judy.fujii-hwang@wdc.com

Kris Rangarajan

Senior Manager, Corporate Marketing
and Social Media
kris.rangarajan@wdc.com

ACCENTURE STRATEGY

Esther Colwill

Managing Director, Communications,
Media, & Technology
esther.colwill@accenture.com

Shobit Arora

Senior Manager, CFO and Enterprise Value
shobit.arora@accenture.com

Alvaro Mendizabal

Senior Strategy Consultant,
Communications, Media & Technology
alvaro.mendizabal@accenture.com

Alireza Safi

Senior Strategy Consultant, Advanced
Customer Strategy
alireza.safi@accenture.com

Lincoln Lam

Strategy Consultant, Competitiveness
Center of Excellence
lincoln.lam@accenture.com

Fabio Jaime

Strategy Analyst
fabio.jaime@accenture.com

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