KPMG

Open opportunity

A global benchmark of Toll Operator efficiency

KPMG International

Infrastructure

Dear reader,

You have undoubtedly noticed that the way people travel is changing. So, too, is the way they interact with their infrastructure. The opportunity for toll road operators is enormous.

In this report, we offer toll operators a unique view into the competitive landscape around the world. We look at technology investments and labor costs. We explore leakage levels and enforcement options. We share some of the risks and challenges at the top of the toll operator agenda.

Most importantly, however, this report serves as a benchmark for toll operator cost efficiency. Indeed, in our 2015 report, we noted that efforts to improve efficiency in the industry were being hampered by a lack of reliable benchmarks. This report aims to fill that gap.

Based on a survey of 65 toll operators, representing a total of 184 facilities around the world, our analysis digs into the data at an extraordinarily granular level, allowing us to draw informed conclusions and unexpected insights about how operators are responding to the changing industry dynamic.

What we found was that there are a number of toll road operators who see opportunity in the new status quo. They are implementing new toll collection systems, updating their payment systems, rebalancing their employee mix and taking an aggressive stand on leakage. And they are seeing massive returns, not just in operating margins and revenues, but also in operational efficiency and customer satisfaction.

It is not difficult to see what separates the leaders from the rest of the pack: it's technology. The leaders in our report are the ones that continuously invest into new technologies, upgrade existing technologies and explore new ideas. They are the ones with deep insight into how technology influences their operational performance measures. They have a vision for the future and they are open to entering into partnerships with tech firms in order to achieve it.

While this report may serve as a wake-up call for many toll operators, it also provides clear advice and practical insights to help toll operators start to improve their efficiency and prepare for the changing environment.

On behalf of KPMG's Global Infrastructure practice, we would like to thank all of those organizations that took part in our study. Your transparency and support were instrumental in creating this new benchmark.

If you have not yet benchmarked your efficiency against global competitors, it is not too late. Indeed, we encourage you to contact your local KPMG member firm, or one of us, to participate in our toll road benchmarking survey or to learn more about the topics raised in this report.

Sincerely,

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Cesar Diaz-Plaza Perez,
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What you need to **know**

Cost efficiency

85.4%	Average Operating Margin
US$0.32	Average TCC per transaction (adjusted)
US$0.50	Average TCC per transaction for manual roadside cash collection (adjusted)
90%	Best 5 Average Operating Margin
US$0.24	Best 5 Average TCC per transaction
US$0.18	Best 5 Average TCC per transaction through a transponder/OBU

Labor

55%
Average labor costs as a total of TCC

50%
Average roadside toll collection labor costs as a total of TCC

16%
Average proportion of employees engaged in call center or CSC role as a total of TCC

48%
Best 5 average labor costs as a total of TCC

44%
Best 5 average roadside toll collection labor costs as a total of TCC

16%
Best 5 average proportion of employees engaged in call center or CSC role as a total of TCC

Leakage

What's driving leakage?

32%
Insufficient or inaccurate vehicle data

31%
Lax regulations covering the evasion of tolls

29%
High cost of collection

US$8 million
Average revenue loss due to leakage

Technology
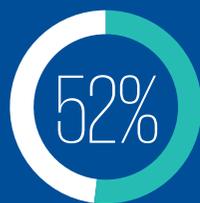
52%
of operator toll collection systems are more than 5 years old

19%
of operators plan to conduct a major system upgrade within the year

Most disruptive technologies for the tolling industry?

01 Fully autonomous toll collection

02 Autonomous vehicles

03 Predictive analytics

About
the report

This report is based on the results of a global survey of 65 public and private toll operators conducted by KPMG International in 2018.

The report builds upon our 2015 survey which was the first to provide a common comparison of the cost structure of toll collection around the world.

Our key measure — the Total Cost to Collect (or TCC) — is based on extensive industry experience and significant data analysis. By collecting data at this very granular level, our research team was able to calculate the TCC uniformly across public and private operators and across various geographies.

The resulting report provides not only an in-depth analysis of toll operator costs, it also offers data and insights into other key topics such as labor force composition, leakage and violation enforcement and technology investment.

This report serves as a benchmarking tool for toll operators as they look to drive continued efficiency improvements, to support contract negotiations and investment requests or to underpin feasibility analyses.

To learn more about the demographics and methodology of our survey, please see page 35.

Viewpoint:

At the nexus of **disruption** and **efficiency**

The entire 'mobility' ecosystem is being disrupted. Toll operators will need to embrace change in order to survive. But getting through the transformation will require unprecedented levels of efficiency.

The toll industry is certainly not immune to the impacts of digital and social disruption. Indeed, as a key component of today's mobility ecosystem, toll road operators play an important role in helping to fund, deliver and manage key mobility infrastructure. The big question is what role they will play in the future.

Our view is that toll road operators have an amazing opportunity to establish themselves at the center of the mobility ecosystem. But they will need to move quickly and decisively. The alternative, unfortunately, is extinction.

To start with, the payment process will be disrupted. New digital payment methods and options will make paying a toll no different than buying a coffee with your phone at Starbucks; payments themselves will be centralized and revenues shared appropriately at the back end.

At the same time, the environment around toll roads will change. Some pundits suggest that autonomous vehicles will unlock unprecedented road efficiency — unblocking gridlock in many cities (potentially reducing the appeal of urban toll roads) and freeing up massive capacity on existing toll lanes. Others think that the non-stop circling of autonomous cars as they wait for 'the next ride' will cause even more congestion on the roads. Regardless, keeping these fleets of autonomous cars moving will almost certainly require new technologies and interoperability with different transit authorities and modes.

Ultimately, we can picture a world where regional entities start to control access to road networks (similar to the way track access is managed in the rail sector) and, eventually, start to serve as the integration layer across all modes of transport (as mass transit becomes more intermodal and personal transit becomes more centrally managed). Toll operators can either play a central role in creating that future, or they can wait until other players disintermediate them from the customer relationship.

Our survey suggests that toll road operators understand that the environment is changing. One-in-five respondents say they expect the introduction of fully automated toll collection and fully automated vehicles to have an impact on tolling in the future (Figure 1). Many point to

Figure 1: Fast-developing technologies most likely to have an impact on tolling

Fully automated Toll collection, including routine back-office tasks performed by computers
20%

Autonomous vehicles
20%

The ability to predict road usage and better adapt pricing policy based on the ability of analyze huge amounts of data
16%

The advent of more-powerful mobile devices, such as smart phones
16%

New payment systems, such as blockchain technology
12%

Automatic identification of car passengers
8%

Governments able to charge vehicles continuously for road usage
7%

Electric vehicles
3%

Other
0%

Source: Toll Benchmarking Survey, KPMG International, 2018

the enablers of a digital environment — things like more powerful mobile devices and payment systems like blockchain — as major trends they are watching.

Rightfully so. The introduction of more powerful mobile devices and new payment options will allow toll agencies to connect directly to people's bank accounts, essentially enabling them to draw the funds as soon as the total cost is calculated. This will not only reduce the need for many back office functions, it will also remove the potential for fraud and reduce the need for manual intervention as cash is taken out of the system. First movers may even find an opportunity to outsource their back office processes to other players (thereby further enabling regional and multi-jurisdictional integration).

Our survey indicates that many of the most efficient operators are already starting to move in that direction. More than one-in-three respondents said that more interoperability agreements will be key to driving greater cost efficiency. Only slightly fewer said they expect cost efficiency to be improved by expanding the number of payment options available to users (Figure 2).

To be sure, the most efficient toll operators will find that investments into expanded payment options and interoperability agreements will deliver long-term cost savings. They will also lead to more sustainable improvements in user satisfaction. With the right investments, these players could be placing themselves at the center of an integrated mobility platform.

Those currently struggling to improve their efficiency, on the other hand, may struggle. Low margins will strangle efforts to reinvest, outdated technologies will undermine interoperability agreements; the inability to forecast and interact with autonomous vehicles will reduce demand.

The future, in our view, will be ruled by those toll operators that deliver the most efficient, the most seamless and the most integrated experiences to their customers. As this report clearly demonstrates, some toll operators will need to apply serious effort if they hope to remain relevant in the mobility ecosystem of the future.

Figure 2: Strategies to make toll collection more cost effective

Enter into Interoperability agreement(s): 35%
Increase number of payment options: 32%
Promotions to users to sign up for automatic payments: 25%
Go cashless with barrier: 22%
Introduce/expand Open-Road Tolling: 17%
Share back office functions with other Toll agency: 5%
Spread fixed costs over additional lane miles: 5%
Others: 29%
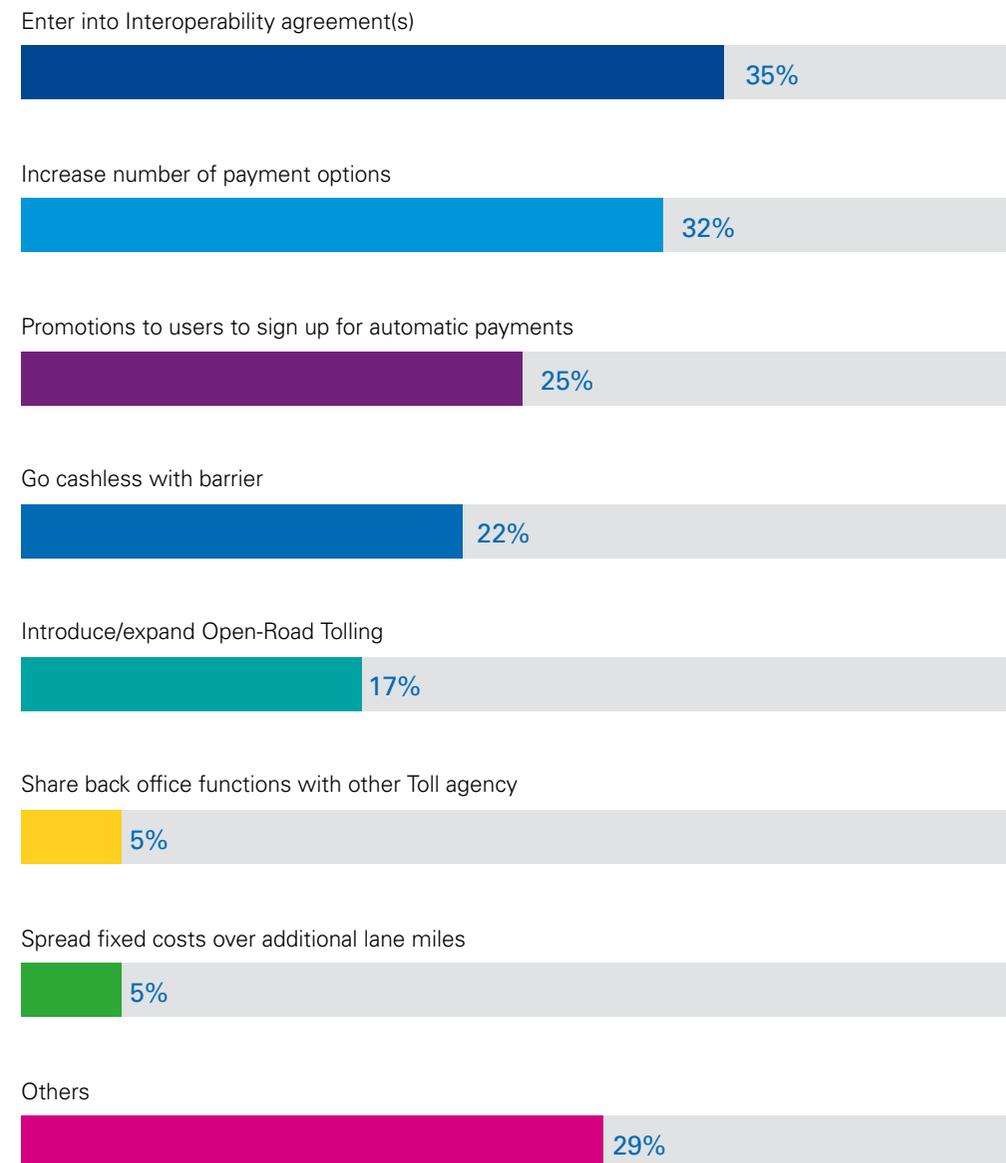
Source: Toll Benchmarking Survey, KPMG International, 2018

Viewpoint:

What makes a **leader?**

Across our data, a group of five toll operators consistently stood out. They are the leaders in the sector: they consistently demonstrated the highest levels of efficiency across multiple categories and they reported some of the highest margins in the world.

How the best

5

Operators perform

The average
Toll Operating Margin

90%

The average
TCC per transaction

$0.24

The average TCC
per transaction
through a transponder

$0.18

Our research suggests there are **five key** reasons why these organizations rank best for cost efficiency:

They eschew cash. The best operators use Open Road Tolling (ORT) and Electronic Toll Collection (ETC).

01

They get their money. The best operators report leakage rates of less than 5 percent.

02

Their employees are productive. Average revenue collected per FTE is US$2.2 million for the leading private toll operators.

03

Their technology is modern. The leaders have updated their toll collection systems within the past 5 years.

04

They use data and analytics. The leading operators are predicting everything from traffic flow through to future trends.

05

The leading toll operators are keenly focused on driving efficiency across every aspect of their business. They are investing into newer technologies, rethinking their operating models and repositioning themselves for a digital world. They didn't become the most efficient by cutting costs; they became the most efficient by focusing on excellence.

Cesar Diaz-Plaza Perez
Director, Infrastructure Advisory, KPMG in the US and Global Roads Sector Lead, KPMG International

Measuring efficiency:
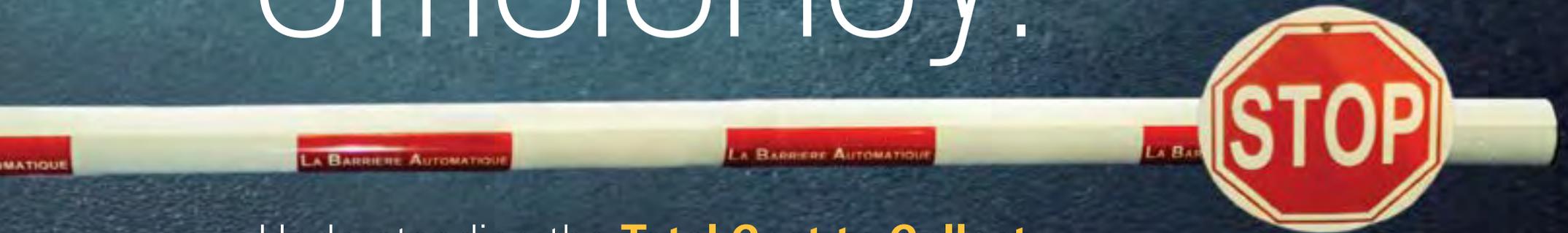
Understanding the **Total Cost to Collect**

Benchmarks require consistent and consistently applied metrics. That is why, for this survey, we collected data on 35 very specific cost categories. We then combined these numbers to come up with a consistent Total Cost to Collect (TCC) measure.

We believe this TCC — particularly when analyzed across different cost categories and operator models — provides a unique view into the efficiency of individual players and the sector overall. For a *full list of the 35 categories, see page 35*.

The data allows us to assess cost efficiency in granular detail. When combined in aggregate, it also offers an interesting view into average cost allocations across the sector.

Figure 3: Average cost by category
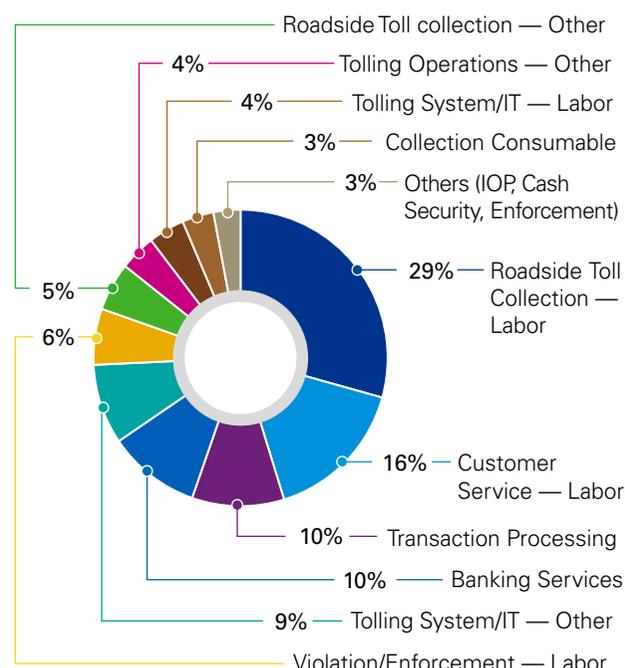
Source: Toll Benchmarking Survey, KPMG International, 2018

In depth: Toll operating margins

One of the more traditional ways to compare efficiency is to look at toll operating margins. To do this, we calculated the Total Cost to Collect (TCC) as a share of revenue for each respondent.

Figure 4: Toll operating margin (total %)

Operator 1	96.8982
Operator 2	96.5413
Operator 3	96.2532
Operator 4	95.8357
Operator 5	95.7804
Operator 6	95.2676
Operator 7	94.7145
75th percentile	94.0219
Operator 9	94.0219
Operator 10	93.7062
Operator 11	92.1051
Operator 12	91.8665
Operator 13	90.4363
Operator 14	89.3716
Operator 15	88.6804
Median	88.2726
Operator 17	88.2726
Operator 18	87.3568
Operator 19	85.9852
Operator 20	85.8716
Average	85.3852
Operator 22	84.8595
Operator 23	84.6053
Operator 24	83.4568
25th percentile	83.4548

Source: Toll Benchmarking Survey, KPMG International, 2018

What we found was a wide disparity between the industry's highest margins — at 97 percent — and its lowest at 53 percent (Figure 4). Those with the highest margins (in the top 25th percentile) were overwhelmingly those operators leveraging either advanced technologies or cheap labor to optimize resources. Those with the lowest margins tended to be those with low transaction volumes, poor violation enforcement or those operating under a lump-sum contract.

Ownership structure also seems to matter. On average, private toll operators delivered significantly better operating margins than the public operators in our survey. In fact, private operators reported an average operating margin of 92 percent, as compared to public toll operators at 79 percent.

It is also interesting to consider what it costs toll operators to generate a dollar of revenue (a slightly different way to look at the same operating margin data). This gives us a better perspective on the relative costs across the survey sample (Figure 5).

Are high operating margins the same as high efficiency?

No; not necessarily. The reality is that while operating margins are a great comparative metric for profitability, they are a rather poor measure of efficiency. The problem is that operating margins tend to be heavily influenced by pricing power.

For example, many of the operators with the highest margins are those with average revenue per transaction of more than US$4 for a two-axle vehicle; three of the best seven operate at bridges (which tend to have greater pricing power). At the other end of the spectrum, many of those with the lowest margins are public operators under pressure to keep rates low (Figure 4).

Simply put, an inefficient operator can report high margins if they enjoy superior pricing power; a highly efficient operator may be forced to report low margins if their rates are kept artificially low. A better way to assess efficiency, therefore, would be to eliminate the impact of pricing power — in other words, to examine the Total Cost to Collect per transaction rather than per revenue dollar.

Figure 5: Total cost to collect per dollar generated (US$)

Operator	Value
Operator 1	0.0310
Operator 2	0.0346
Operator 3	0.0375
Operator 4	0.0416
Operator 5	0.0422
Operator 6	0.0473
Operator 7	0.0529
Operator 9	0.0598
25th Percentile	0.0598
Operator 10	0.0629
Operator 34	0.0655
Operator 11	0.0789
Operator 12	0.0813
Operator 13	0.0956
Operator 14	0.1063
Operator 15	0.1132
Median	0.1132
Operator 17	0.1173
Operator 18	0.1264
Operator 19	0.1401
Operator 20	0.1413
Average	0.1413
Operator 22	0.1514
Operator 23	0.1539
Operator 24	0.1654
75th Percentile	0.1654
Operator 26	0.1655
Operator 27	0.1780
Operator 29	0.2440
Operator 30	0.3155
Operator 31	0.3622
Operator 32	0.4131
Operator 33	0.4737

US$ | 0.00 0.05 0.10 0.15 0.20 0.25 0.30 0.35 0.40 0.45 0.50

Source: Toll Benchmarking Survey, KPMG International, 2018

In depth: Total Cost to Collect by transaction

Our survey finds that there is a wide gap between the operators with the lowest TCC per transaction (at 9 cents) and those with the highest (at US$1). Based on the raw data, average cost to collect per transaction sits at 36 cents (Figure 6).

However, further analysis suggests the top and bottom three results may be outliers: those at the very top of the chart either outsource their tolling process to a larger operator or enjoy substantially lower labor costs than others; those at the very bottom either operate at low volume, use highly manual roadside collection or pay significantly more for violation enforcement.

Removing these outliers (and normalizing the sample) suggests a more realistic average cost per transaction of around 32 cents (11 percent lower). Those at the very top of the (adjusted) scale tended to be labor intensive and suffered higher-than-normal violation enforcement costs.

"

Our data suggests that more than US$90 million in savings could be generated if the worst-performing quartile were able to operate at the efficiency of the best-performing quartile. That's money that could be put into a lot of new roads and technologies. "

Michael Benouaich
Director, Infrastructure Advisory,
KPMG in the US

Figure 6: Total Cost to Collect per transaction (US$)

Operator	US$
Operator 2	0.1359
Operator 6	0.1427
Operator 22	0.1612
Operator 18	0.1745
Operator 5	0.1810
25th Percentile	0.1810
Operator 20	0.1837
Operator 7	0.1845
Operator 15	0.1853
Operator 28	0.1948
Operator 12	0.2389
Operator 3	0.2465
Operator 26	0.2672
Median	0.2672
Operator 11	0.2682
Operator 13	0.2921
Average	0.3575
Operator 19	0.3602
Operator 31	0.3956
Operator 17	0.4168
Operator 27	0.4264
Operator 23	0.4577
75th Percentile	0.4577
Operator 9	0.4635
Operator 33	0.4697
Operator 32	0.6450
Operator 29	0.7575

Source: Toll Benchmarking Survey, KPMG International, 2018

In depth: Total Cost to Collect by technology type

Our data clearly reinforces the fact that technology plays a significant role in driving toll operator efficiency. To understand the exact relationship between toll system technology type and efficiency, we looked at the Total Cost to Collect by technology. Here's what we found.

Electronic Toll Collection (ETC) with Transponder/OBU

Boasting labor costs that are — on average — 32 percent lower than average, operators that employ ETC with Transponder systems report some of the lowest total costs by transaction (Figure 7).

After removing outliers and normalizing the data, our survey suggests **an average TCC per transaction of 22 cents.** Toll operators that use an AET system enjoy even lower TCC (at 20 cents per transaction), a third lower than industry average.

The most efficient ETC with Transponder operators tend to be those with high transponder penetration (around 90 percent) or those privately operated entities with strong cost controls.

Video Tolling

Due in large part to higher costs for violation enforcement and labor, video transactions tend to cost more than the overall average (Figure 8).

After removing outliers and normalizing the data, we found that operators with Video Tolling technology tended to have **an average TCC per transaction of 38 cents.**

Those that report the highest levels of efficiency with this technology are either those with violation enforcement costs of less than 4 percent or those with transponder penetration of 90 percent or more.

Figure 7: Total Cost to Collect per transaction — Electronic Toll Collection with transponder/OBU (US$)

Operator	US$
Operator 2	0.0600
Operator 22	0.1076
Operator 11	0.1361
Operator 18	0.1492
25th Percentile	0.1546
Operator 22	0.1563
Operator 28	0.1609
Operator 13	0.1705
Operator 9	0.2103
Operator 26	0.2159
Median	0.2178
Operator 3	0.2197
Average	0.2941
Operator 31	0.2977
Operator 23	0.3076
Operator 17	0.3230
Operator 19	0.3377
75th Percentile	0.3389
Operator 24	0.3423
Operator 27	0.3426
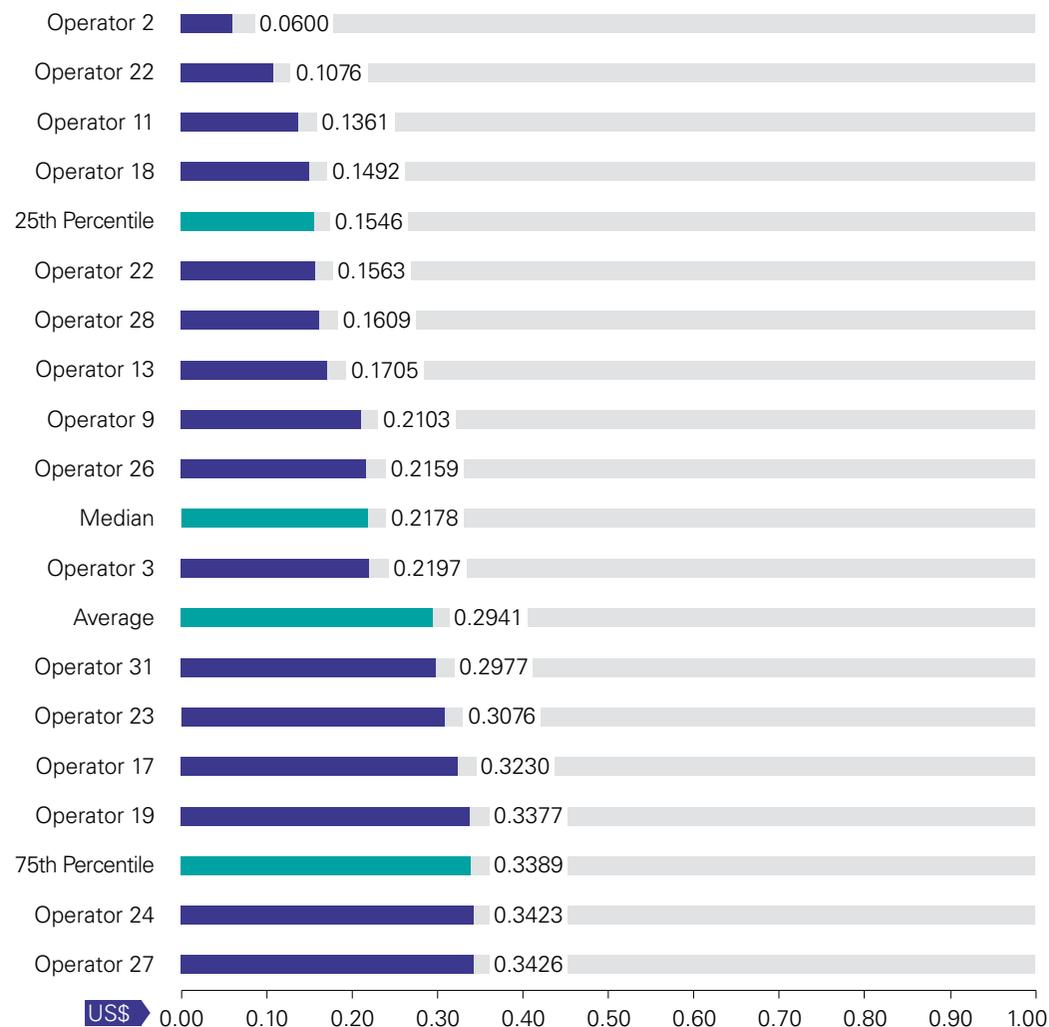
Source: Toll Benchmarking Survey, KPMG International, 2018

Figure 8: Total Cost to Collect per transaction — Video Tolling (US$)

Operator	Value
Operator 18	0.2447
Operator 20	0.2630
25th Percentile	0.3069
Operator 17	0.3215
Operator 28	0.3494
Median	0.3829
Operator 19	0.4165
Average	0.4445
Operator 31	0.4824
75th Percentile	0.5002
Operator 26	0.5537
Operator 29	0.9250

US$ 0.00 0.20 0.40 0.60 0.80 1.00

Source: Toll Benchmarking Survey, KPMG International, 2018

Figure 9: Manual roadside CASH collection (US$)

Operator	Value
Operator 4	0.0636
Operator 10	0.1091
Operator 7	0.1192
Operator 5	0.1249
Operator 2	0.2487
25th Percentile	0.2902
Operator 3	0.3317
Operator 22	0.3331
Operator 11	0.3854
Operator 18	0.4636
Operator 33	0.4697
Median	0.4697
Operator 27	0.4743
Operator 26	0.5424
Operator 9	0.5655
Average	0.6119
Operator 20	0.6238
75th Percentile	0.6846
Operator 15	0.7453
Operator 1	0.7732
Operator 17	1.6302
Operator 24	1.7770
Operator 23	1.8463

US$ 0.00 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00

Source: Toll Benchmarking Survey, KPMG International, 2018

Manual Roadside Cash Collection

Our data suggests that — with labor making up around two-thirds of total costs — manual roadside cash collection operators report the lowest levels of cost efficiency (Figure 9).

As can be expected, there are a number of outliers in this segment — those who operate in jurisdictions where labor costs are either unusually low or unusually high. Removing these outliers, our data indicates **an average TCC per transaction of 50 cents.**

Among this normalized group, the most efficient operators are private entities that use advanced technologies to optimize resources and reduce staffing.

A closer look:

Labor costs and composition

No matter what technology toll operators use, labor costs continue to make up the vast majority of an operator's TCC. In fact, according to our survey, fully 55 percent of the average cost of tolling operations is currently allocated to labor. Half of that amount is made up of roadside toll collection costs (Figure 10).

Figure 10: Labor cost (%)

Operator	Value
Operator 26	19.1995
Operator 28	24.8999
Operator 31	28.7982
Operator 3	32.7715
Operator 20	37.9738
Operator 19	39.2434
25th Percentile	39.6519
Operator 32	40.0604
Operator 1	40.3232
Operator 23	41.6982
Operator 13	46.3206
Operator 2	48.8536
Operator 11	49.8866
Median	49.8866
Operator 17	51.4916
Average	55.3113
Operator 18	58.1873
Operator 9	69.5818
Operator 15	73.9773
Operator 24	74.1624
75th Percentile	76.5374
Operator 10	78.9123
Operator 5	79.4831
Operator 4	80.4107
Operator 22	81.0849
Operator 7	83.5299
Operator 27	91.3092

Source: Toll Benchmarking Survey, KPMG International, 2018

Clearly, in markets where labor is comparatively cheap, a high percentage of labor costs (as a proportion of total costs) may not be a sign of inefficiency.

Some of the operators with the highest percentage labor costs are located in jurisdictions where average labor costs are around US$4.20 per hour; these operators boast operating margins of 94 percent or higher. Others with high percentages of labor costs, however, are located where labor costs are above US$22 per hour; these operators report margins of just 83 percent.

What does the average labor force look like? And how are the most efficient operators balancing their workforce to maximize productivity and results?

Our research suggests that – while most operators make some use of contracted labor — contractors make up around 28 percent of the total labor force (Figure 11). Perhaps not surprisingly, the in-house team is largely made up of operations, engineering, back office operations, call center and IT staff (Figure 12). Contracted employees tend to be used mostly in revenue collection (Figure 13).

Our survey also shows that most toll operator employees are non-unionized; those that are unionized, however, report an average cost per FTE that is 54 percent higher than non-unionized employees (Figure 14).

There are subtle yet important differences in the workforce composition of the five most efficient operators. For one, labor costs make up a lower proportion of overall costs — 48 percent versus 55 percent for the average.

The most efficient operators also have fewer employees in revenue collection (25 percent versus 33 percent) and almost three times as many contracted employees in a call center or customer care role, suggesting they are focusing their internal resources on the automation of transaction processing and enhancing technological capabilities.

Figure 11: Labor force

28% Contracted

72% Agency

Source: Toll Benchmarking Survey, KPMG International, 2018

Figure 12: Functions of staff employees

Function	%
Operations/engineering	26%
Revenue collection	17%
Back Office Operations	11%
Call center/Customer Service Center	10%
Marketing	7%
Systems/information technology	7%
Violation Enforcement/enforcement mechanism	3%
Video image review	2%
Tag or transponder distribution	1%
Other	15%
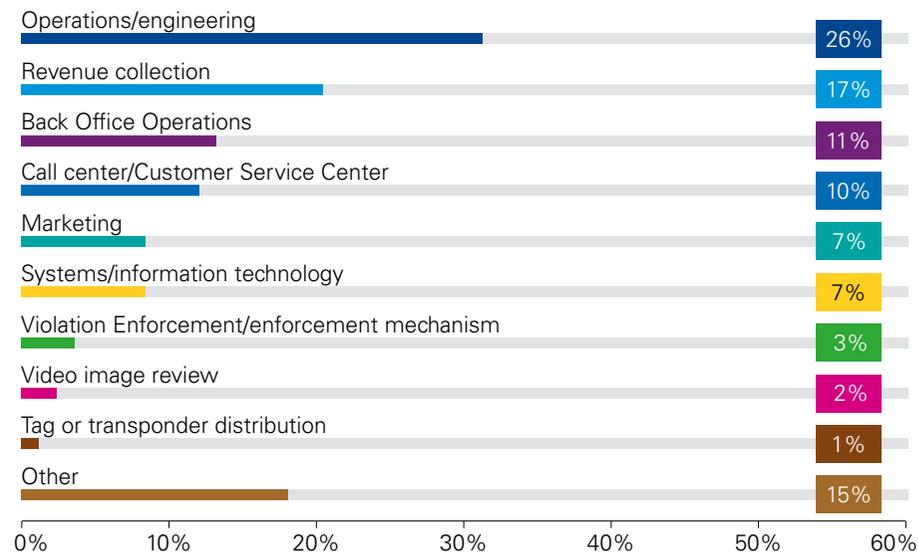
Source: Toll Benchmarking Survey, KPMG International, 2018

Figure 13: Functions of contracted employees

Function	%
Revenue collection	33%
Back Office Operations	14%
Violation Enforcement/enforcement mechanism	13%
Call center/Customer Service Center	11%
Operations/engineering	8%
Video image review	6%
Systems/information technology	3%
Tag or transponder distribution	1%
Marketing	0%
Other	10%
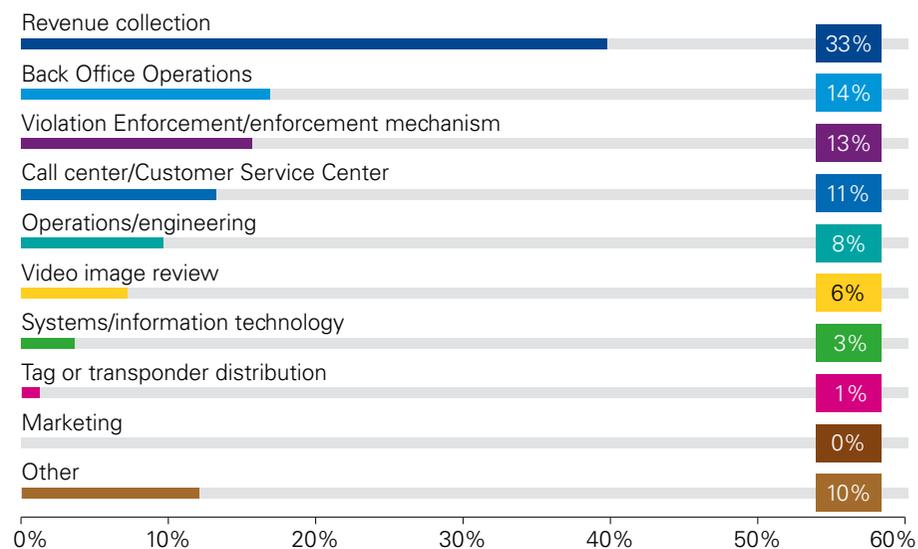
Source: Toll Benchmarking Survey, KPMG International, 2018

It is also interesting to note that — when it comes to employee productivity — it is often the mid-sized operators that get the most from their people. Many of the most efficient operators in our research were those that used data and analytics and other cost control mechanisms to control labor costs. Those with the lowest revenue per FTE were often either highly unionized or highly manual shops. Public entities tended to fall into the large organization category while the mid-sized category was comprised of mostly private toll operators.

Figure 14: Unionized versus non-unionized employees

29% Union

71% Non-union

Source: Toll Benchmarking Survey, KPMG International, 2018

Figure 15: Number of full-time employees and revenue

Toll operators with annual revenues < US$100 million

184 FTE

US$186,000

Toll operators with annual revenues between US$100 million and US$250 million

245 FTE

US$865,000

Toll operators with annual revenues greater than US$250 million

1,306 FTE

US$453,000

Average number of FTEs (staff and subcontracted) | Average generated revenue per FTE

Source: Toll Benchmarking Survey, KPMG International, 2018

A closer look:

Leakage and enforcement

Leakage levels have a significant impact on a toll operator's efficiency and profitability. Leakage doesn't just reduce revenues; it can also increase the cost and complexity of enforcement. And, while there is no standard definition of leakage (this report is based on operator-provided data which uses a range of methods and definitions of leakage), it is clear that leakage remains a significant drain on efficiency for many operators.

Figure 16: Leakage percentage (%)

Operator	Value
Operator 22	20.0000
Operator 31	15.0000
Operator 19	14.0000
Operator 35	10.0000
Operator 14	9.0000
Operator 18	6.5000
Operator 7	6.3300
Operator 26	5.7000
Operator 4	5.5000
75th Percentile	4.3800
Operator 30	4.0000
Average	3.5700
Operator 34	3.1800
Operator 36	3.0000
Operator 29	2.7000
Operator 37	2.5000
Operator 33	2.1000
Operator 24	2.0000
Operator 10	2.0000
Median	2.0000
Operator 12	2.0000
Operator 38	2.0000
Operator 5	1.6000
Operator 13	1.2100
Operator 39	1.0000
Operator 27	1.0000
Operator 17	1.0000
Operator 40	1.0000
Operator 41	1.0000
Operator 42	0.9000
25th Percentile	0.9000
Operator 20	0.9000
Operator 43	0.5000
Operator 23	0.3400
Operator 3	0.2000
Operator 44	0.1000
Operator 9	0.0890
Operator 6	0.0500
Operator 2	0.3500
Operator 1	0.0180

Source: Toll Benchmarking Survey, KPMG International, 2018

AET operators

How much is being lost?

Based on our data, the scale of the issue varies widely — there are a significant number of operators who report leakage levels of just 1 percent or lower. There are also a handful of operators who (self-admittedly) report leakage levels of 10 percent or more (Figure 16).

In real dollars, that translates into an average loss of around US$8 million (some operators are losing as much as US$30 million per year) or the equivalent of around 5 percent of margins (on average). If an average operator were to achieve a 50 percent cut in leakage rates, they could generate enough capital to fund a new US$65 million capacity investment.

What's influencing the leakage rates?

The operators reporting the highest rates of leakage in our survey tended to be influenced by two main factors: either they are AET systems that receive a high volume of out-of-jurisdiction users and lack the ability to charge or prosecute these users, or they have made the decision not to prosecute violators at all.

It is interesting to note that more than half of the operators in our survey have made the decision not to prosecute violators (Figure 17). Most (60 percent) prosecute violators in their home jurisdiction (Figure 18). But almost two-thirds do not enforce their authority outside of home jurisdictions (Figure 19).

Figure 17: Prosecute violators

49% Yes
51% No

Source: Toll Benchmarking Survey, KPMG International, 2018

Figure 18: In-home jurisdiction

60% Yes
40% No

Source: Toll Benchmarking Survey, KPMG International, 2018

Figure 19: Outside home jurisdiction

37% Yes
67% No

Source: Toll Benchmarking Survey, KPMG International, 2018

> Deciding to prosecute violators — even just at home — would cost little financially and could return valuable revenues. But these decisions are often very politically charged and can be unpopular in jurisdictions with a culture of evading tolls.

Stephen Beatty
Chairman (Non-Exec), Global Infrastructure and Head of the Global Cities Center of Excellence, KPMG International

The entities reporting the lowest levels of leakage, on the other hand, tended to be private operators that either employ physical barriers, or those with contracts that guaranteed a certain level of revenue.

Can operators stop the leaks?

According to our survey, toll operators certainly believe they are fairly effective at preventing leakage. In fact, almost three-quarters (72 percent) of our respondents rated themselves as being either effective or very effective at stopping leakage (Figure 20).

Figure 20: Leakage effectiveness

Very effective — 29%

Effective — 43%

Slightly effective — 12%

Ineffective — 14%

Very ineffective — 2%

(0% 10% 20% 30% 40% 50% 60%)
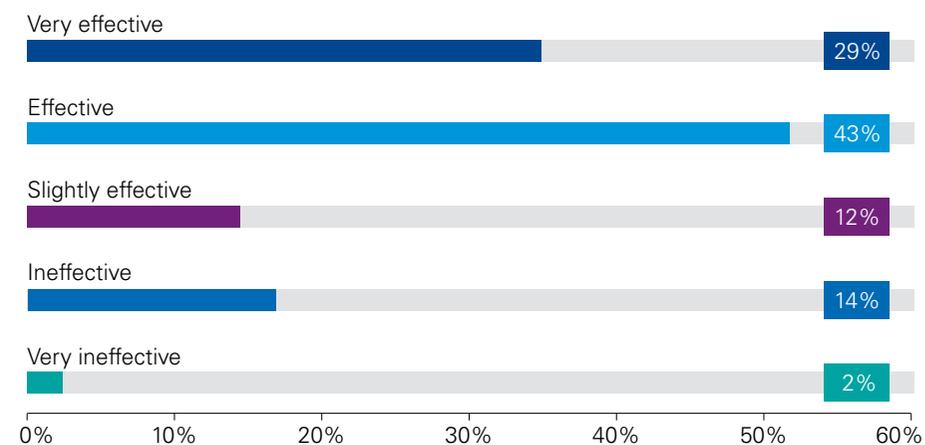
Source: Toll Benchmarking Survey, KPMG International, 2018

Figure 21: Major challenges in collecting tolls
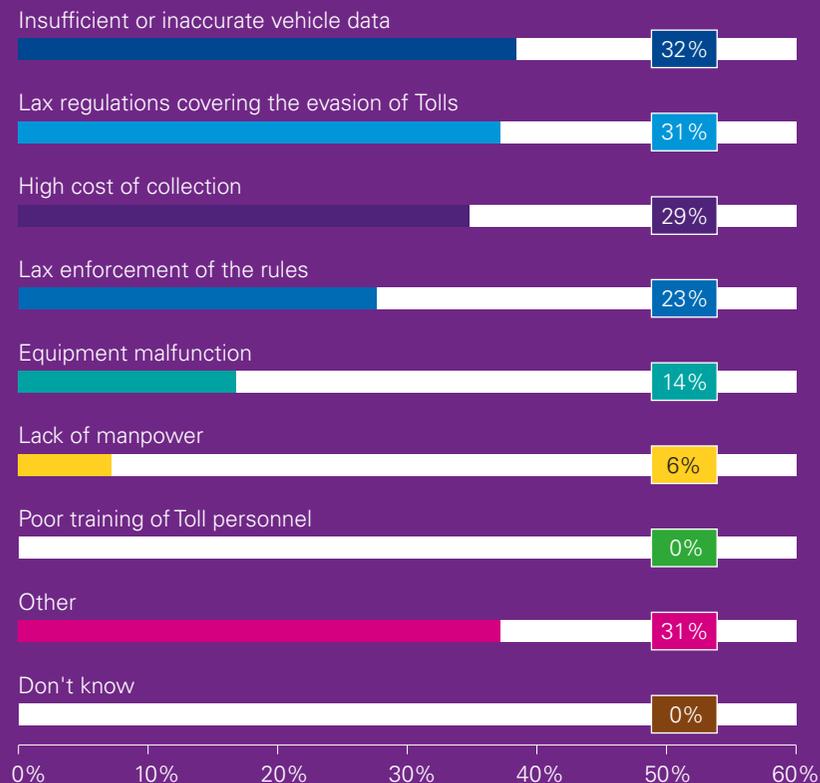
Insufficient or inaccurate vehicle data
32%

Lax regulations covering the evasion of Tolls
31%

High cost of collection
29%

Lax enforcement of the rules
23%

Equipment malfunction
14%

Lack of manpower
6%

Poor training of Toll personnel
0%

Other
31%

Don't know
0%

0% 10% 20% 30% 40% 50% 60%

Respondents could select up to three options for this question.

Source: Toll Benchmarking Survey, KPMG International, 2018

However, our respondents also noted a number of major challenges in reducing leakage and collecting tolls (Figure 21 and 22). The vast majority of the challenges relate to **four key** areas:

01 **Data and technology:** With almost a third of respondents citing challenges related to data and 14 percent noting problems with equipment, it seems some of the biggest challenges relate to technology. For obvious reasons, leakage levels tend to be higher with AET systems than systems that include a barrier.

02 **Legislation and enforcement:** The majority of respondents suggest they are being hampered by either inadequate legislation or lax enforcement. Fines tended to be the most common form of legal recourse available to toll operators in our survey. Those AET systems with the lowest levels of leakage tended to be the ones that used fines and vehicle registration suspensions as enforcement tools

03 **Cost:** Interestingly, many respondents cite the high cost of collecting tolls as a reason for not collecting at all. Many operators also seem to suggest that enforcement costs may outweigh the benefits. To assess the validity of this perception, we compared three different operators: one with low leakage levels and average enforcement costs; one with high leakage and no enforcement; and one with average leakage and high enforcement costs. What we found was that operating margins tended to remain the same in the first two instances but drop significantly in the third. So while there may be a point where the costs outweigh the benefits of pursuing every violator, it is clear there is also a point of balance that will allow toll operators to cost-effectively maximize revenues.

Figure 22: Different approaches to control leakages

	Total Cost to Collect	Leakage Level	Toll Operating margin	Violation enforcement Cost as % of the Total Tolling Cost
Toll Operator 20	$0.18	1%	86%	4%
Toll Operator 19	$0.36	14%	86%	0%
Toll Operator 30	$0.91	4%	68%	25%

Source: Toll Benchmarking Survey, KPMG International, 2018

04 **Administrative:** Respondents also noted a range of other, more administrative challenges with collecting tolls including a lack of interoperability between systems, insufficient reciprocity agreements with other jurisdictions (particularly around user data) and other back office challenges.

A closer look:

Technology and innovation

When it comes to driving efficiency, technology is key. Time and time again, our data shows that the greatest efficiencies are being achieved by those toll operators who invest into the best technologies at the front-end (in roadside collection) and at the back-end (in payment processing). Technology is a critical enabler of cost efficiency: it drives customer satisfaction; and it helps reduce leakage. Clearly, technology matters.

Given our view of the future, it is also becoming increasingly clear that toll operators will need to invest into new technologies in order to keep up with the pace of technological change around them. Building a successful value proposition from new payment options, new vehicle technologies, new mobile phone capabilities and new mobility alternatives requires operators to think about new technology.

Unfortunately, our survey indicates that a good proportion (39 percent) of toll operators are currently operating toll collection systems that are more than 5 years old. Just 7 percent of operators can boast new systems (Figure 23).

While a quarter had performed an update on their toll collection system within the last year, more than three-quarters had not. And at least a quarter of respondents admitted they had not conducted a major update to their collection system in the last 5 years (Figure 24).

For the most part, recent technology upgrades and updates have been focused on software, back office systems and payment systems. Upgrading roadside toll collection equipment seems to have been a third-place investment priority (Figure 25).

Looking ahead, however, our survey suggests that roadside toll collection equipment will become a high-level investment priority. Still equally important (if not more so) will be a continued focus on software and back office system upgrades (Figure 26).

Our data also indicates that the pace of investment will pick up soon. Three-quarters of our respondents say they plan to conduct a major upgrade within the next 5 years; around one in five say they plan their next major upgrade within the year (Figure 27).

Figure 23: Toll collection system age

Less than 1 year old — 7%
1–5 years — 41%
6–10 years — 39%
11 years or more — 14%
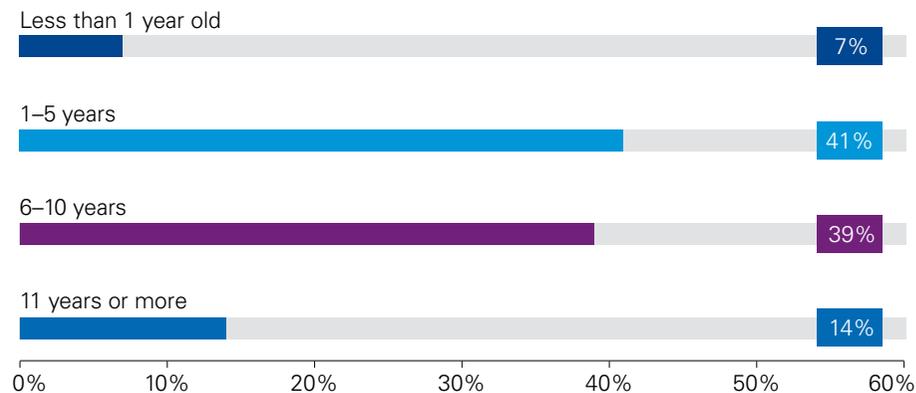
Source: Toll Benchmarking Survey, KPMG International, 2018

Figure 24: Last major update

Less than 1 year ago — 25%
1–5 years — 38%
6–10 years — 27%
11 years or more — 11%
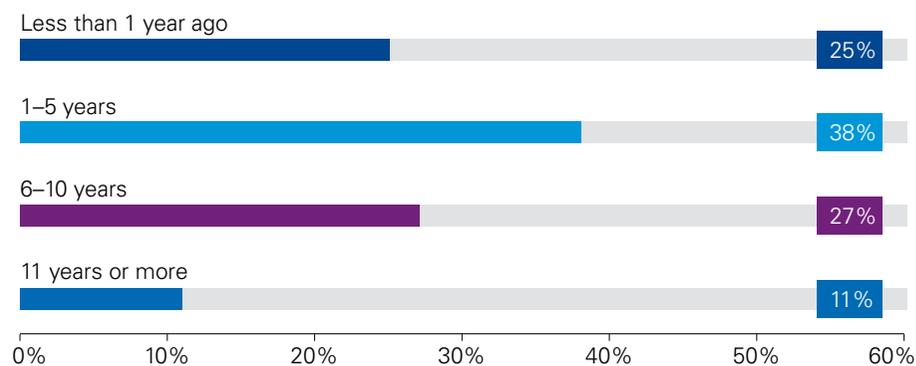
Source: Toll Benchmarking Survey, KPMG International, 2018

Figure 25: Type of recent upgrade

Technology/software
26%

Upgrade of back office system
22%

Upgrade of roadside Toll collection equipment
20%

Upgrade of payment system (e.g. credit card acceptance)
11%

Change to All Electronic Tolling
10%

Change to ORT
0%

Other
9%

We did not do a major upgrade
1%

0% 10% 20% 30% 40% 50% 60%
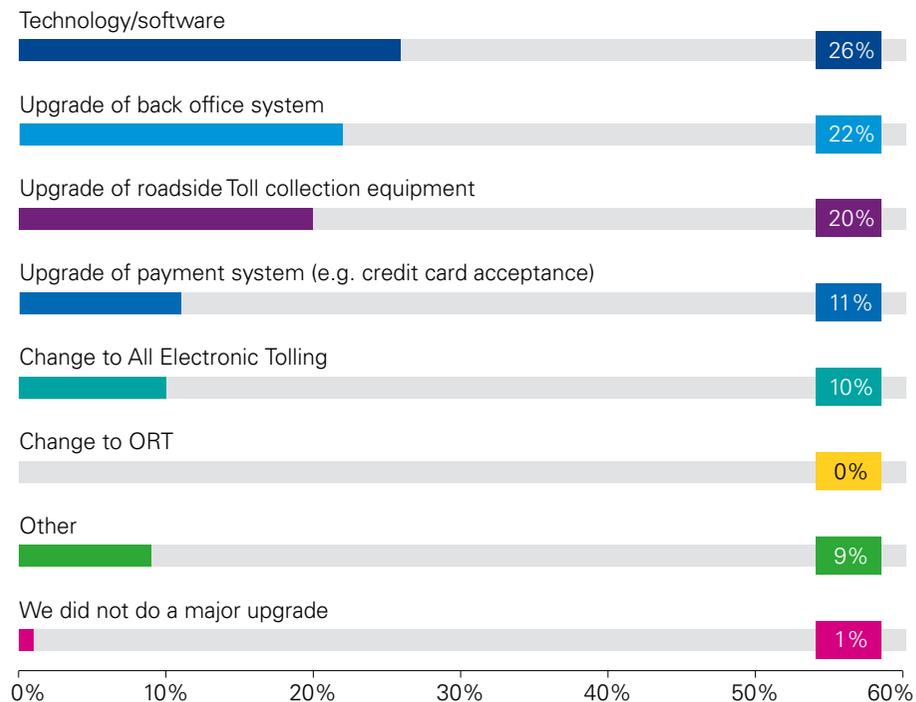
Source: Toll Benchmarking Survey, KPMG International, 2018

Figure 26: Type of future upgrade

Technology/software
26%

Upgrade of back office system
26%

Upgrade of roadside Toll collection equipment
24%

Upgrade of payment system (e.g. credit card acceptance)
9%

Change to All Electronic Tolling
6%

Change to ORT
4%

Other
3%

We did not do a major upgrade
2%

0% 10% 20% 30% 40% 50% 60%
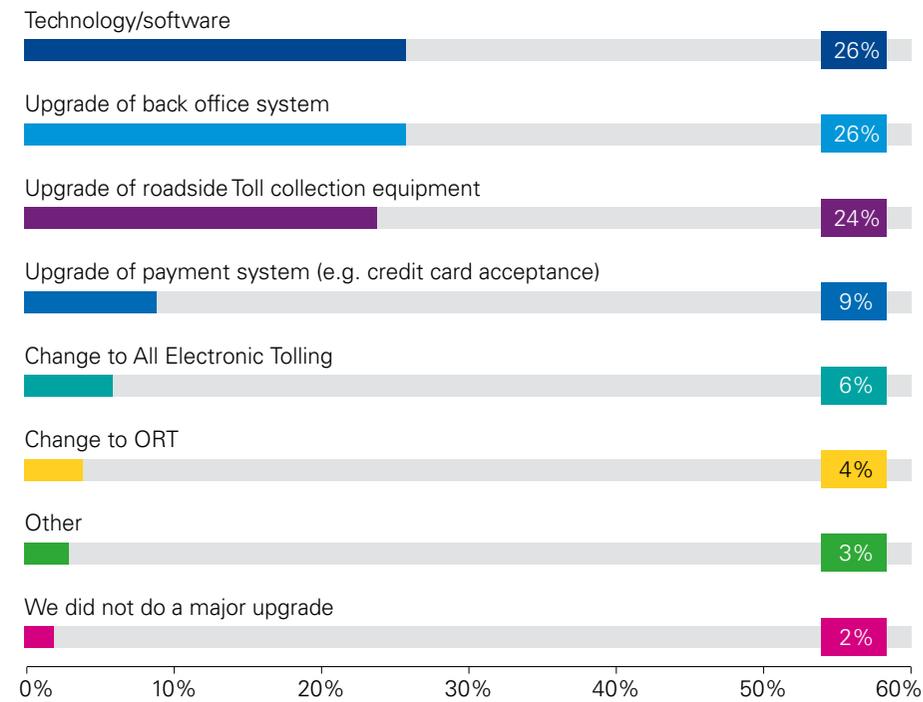
Source: Toll Benchmarking Survey, KPMG International, 2018

Averages are interesting, but the real value of our survey comes from understanding what the most efficient toll organizations are doing to drive efficiency through technology. And our survey suggests they are taking a coherent approach to technology investment.

The most efficient organizations in our survey are capitalizing on rapidly evolving technological advancements. They are using state-of-the-art systems — most often ORT and ETC systems — and are renewing and upgrading their collection systems at least once every 5 years.

For example, our survey shows that many of the most efficient operators recently upgraded their back office systems or completed a move to an AET system. And they plan to conduct another upgrade to their software and back office systems within the next 5 years.

Put simply, the leaders in our survey are those that tirelessly pursue the technological advantage. Like most toll operators, they recognize that innovation can unlock new operational efficiencies and drive cost savings that lead to sustainable revenue growth. They also understand that customer expectations are changing: customers now expect conveniences they experience in one part of their life to be available in everything they do — online payment capabilities and mobile payment systems are quickly becoming table stakes (Figure 28).

So, what is stopping toll operators from investing into new technologies and upgrades? Our survey suggests that most feel their efforts to innovate are being hampered by government policies and regulation (Figure 29). For government-owned entities, this is perhaps not a surprising finding; many public toll agencies have been starved of funds for years and have often faced unrealistic expectations for return on investment for technology spend in the past.

Figure 27: Next major upgrade

Less than 1 year from now — 19%
1–5 years — 56%
6–10 years — 20%
11 years or more — 6%
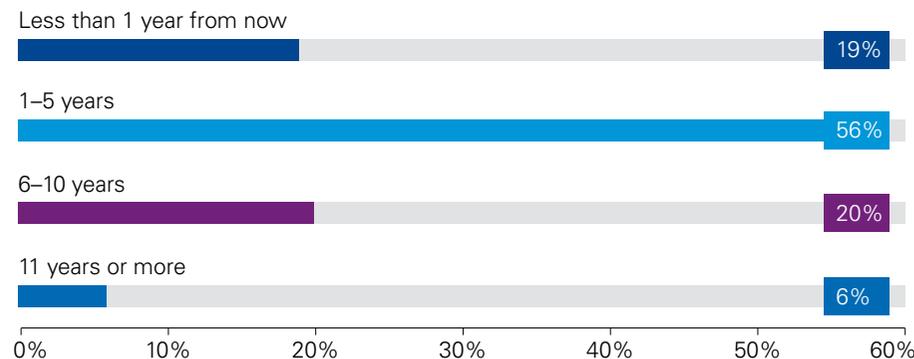
Source: Toll Benchmarking Survey, KPMG International, 2018

Figure 28: Factors driving innovation
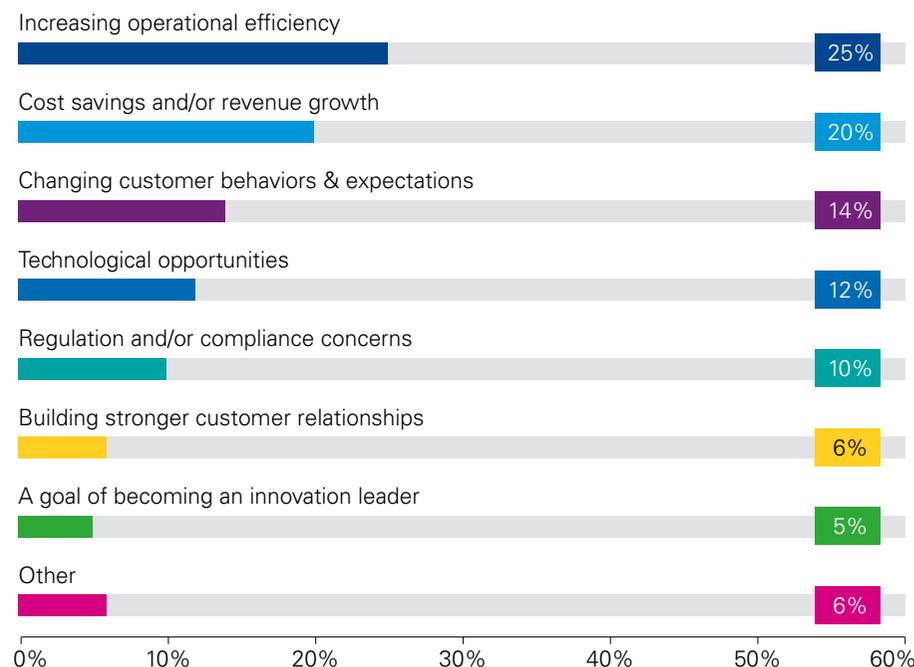
Increasing operational efficiency — 25%
Cost savings and/or revenue growth — 20%
Changing customer behaviors & expectations — 14%
Technological opportunities — 12%
Regulation and/or compliance concerns — 10%
Building stronger customer relationships — 6%
A goal of becoming an innovation leader — 5%
Other — 6%

Respondents could select up to three options for this question.

Source: Toll Benchmarking Survey, KPMG International, 2018

However, even with a supportive legislative framework, many toll operators remain concerned about the pace of technological change — predicting the future is becoming increasingly difficult. And that means there is always the potential for toll operators to invest into a 'dying' technology.

While nobody can truly forecast the future with any accuracy, what is clear is that the most efficient toll operators today tend to be those that rely primarily on ORT and ETC systems with on-board units or transponders. More than just reducing friction in the user experience and removing cash, these technologies help establish the type of account-based payment systems that are required to compete in the new mobility environment.

"

Valuable opportunities to drive new efficiency and effectiveness measures, reduce leakage and evolve with customer expectations will be lost if toll agencies remain encumbered by regulatory barriers to innovation. "

Michael Benouaich
Director, Infrastructure Advisory
KPMG in the US

Figure 29: Main challenges to innovation

Challenge	%
Government policies and regulations that make it difficult to innovate	24%
Uncertainty about the pace and direction of technological change	22%
The right priorities, but a lack of funding overall	13%
Not enough skilled people to implement a strategy to digitize	6%
Resistance to change among management	6%
Lack of leadership vision	5%
Resistance to change among employees	3%
Inadequate training in how to use digital technologies	2%
The wrong priorities and a lack of funding overall	1%
Other	10%
Don't know/not applicable	7%

Respondents could select up to three options for this question.

Source: Toll Benchmarking Survey, KPMG International, 2018

Conclusion:

What you should take away from this report

01 — **The landscape is fundamentally changing.** Toll road operators are increasingly competing against other modes of transport that are disrupting the mobility status quo.

02 — **Technology plays a significant role in toll operational efficiency.** Time and time again, our data shows that the most efficient operators are those who continuously invest into new technologies.

03 — **Toll agencies must make better use of available technologies.** That includes technologies to improve back office, payments, resource management and predictive analytics.

04 — **Toll operators have access to valuable sources of data.** They should be using that data to plan traffic flow, demand and investment and to support mobility ecosystem partners.

05 — **Significant opportunities for improvement still exist.** You can find many of them by analyzing your TCC, your workforce composition and your enforcement programs.

Make better-informed decisions

— Want to know how you measure up against your peers?

— Looking for new opportunities to improve cost efficiency?

— Need new ideas and best practices to enhance operations?

— Wonder how your leakage levels compare to industry?

— Trying to develop a business case for technology investment?

— Seeking to make more informed decisions and long-term plans?

To participate in our ongoing toll road operator benchmarking survey and find out exactly where you stand, contact your local KPMG representative or one of the contacts at the back of this report. All participants will receive a customized report showing exactly how your organization ranks based on an anonymized data set of your peers.

Contact your local KPMG member firm to find out how we can help you make better-informed decisions.

Demographics

This survey was conducted by KPMG International and its member firms in 2018. In total, confidential responses were collected from 65 public and private toll operators representing a total of 184 tolling facilities worldwide (Figure 30, Figure 31). Respondents represented organizations headquartered in 15 countries across the Americas, Europe and Asia (Figure 32).

All cost data was collected in 2018 and was based on the most recent financial results for each toll operator. Foreign currencies were converted to US dollars using the exchange rate as of the end of September 2018.

Figure 30: Toll operators by region

22% Europe

9% Asia/Pacific

14% Central/ South America

55% North America
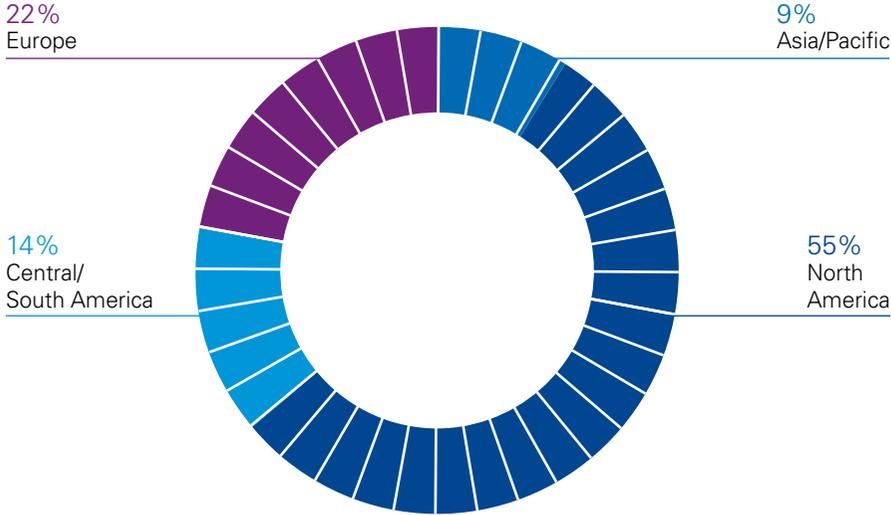
Source: Toll Benchmarking Survey, KPMG International, 2018

Figure 31: Ownership status type

48% Private

52% Public
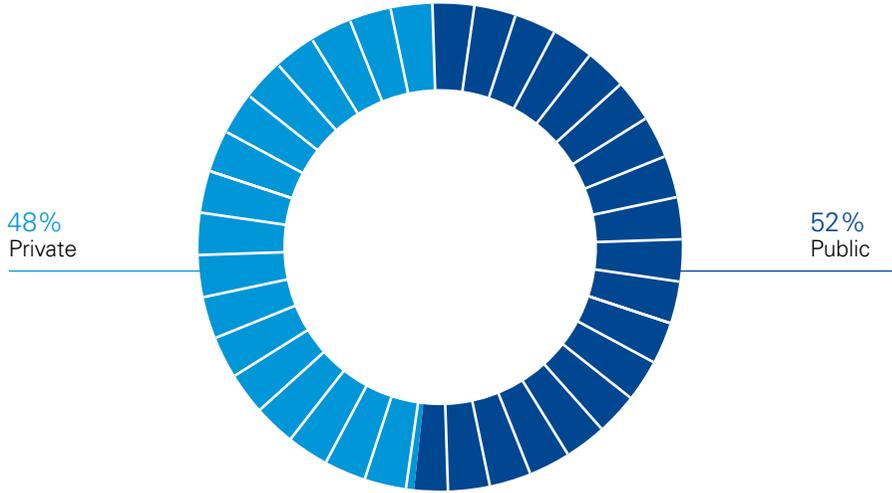
Source: Toll Benchmarking Survey, KPMG International, 2018

Figure 32: Operator headquarter location

36%
North America

14%
Europe

6%
Asia/Pacific

9%
Central/South America

Participating regions

Source: Toll Benchmarking Survey, KPMG International, 2018

Glossary:

Key terms used in this report

All Electronic Toll (AET): Technology that enables cashless toll collection, either through transponders and/or license plate readers, eliminating the necessity of stopping the vehicle to pay the toll. Also known as "cashless" tolling.

Electronic Toll Collection (ETC): The collection of tolls based on the automatic identification and classification of vehicles using electronic systems.

Interoperability: A cooperative arrangement established between public and/or commercial entities (transit authorities, parking lot operators, etc.) wherein tags issued by one entity will be accepted at facilities belonging to all other entities without degradation in service performance.

Leakage: Transactions where no revenue is collected, or revenue is not fully collected. (Does not include non-revenue or violation transactions wherein the vehicle is either not permitted to cross the barrier or where a violation image is taken.) Generally also includes transactions not being captured due to failure or malfunction of the toll collection system.

On-Board Unit (OBU): A receiver or transceiver permitting the operator's roadside unit to communicate with, identify, and conduct an electronic toll transaction; also called a 'transponder' or 'tag.'

Open Road Tolling (ORT): An electronic toll collection system without toll plazas, where drivers are charged the toll without having to stop, slow down, or stay in a given lane.

Operator: An entity that manages the functions of a tolled facility.

Toll: A fee charged by a toll facility operator in an amount set by the operator for the privilege of traveling on said toll facility.

Toll collection system: The combination of elements and components that constitute the means to collect a fee for use of a tolled facility.

Total Cost to Collect (TCC): A uniform methodology for calculating the total cost of collection.

Transaction: A time-framed event occurring in the toll lane representing either a cash or electronic toll. The transaction is identified by all or a combination of the following parameters: location, time, date, vehicle class, vehicle ID, toll amount, etc.

User: Any driver driving on a toll facility.

Video Billing or Video Tolling: A billing system capturing video images of a vehicle's license plate to identify the customer responsible for toll payment and using this information to bill the customer.

Violation: A record of an unpaid toll, which occurs when a customer does not pay the proper amount.

Source: IBttA (http://ibtta.org/resource-library/glossary) — some definitions have been slightly edited by KPMG

Appendix

Cost categories

Customer service labor

Roadside toll collection labor

Roadside toll collection other

Cash security transportation

Customer service facilities costs

Other costs

Total Tolling Operations

Transponder/OBU transaction fees

Video tolling transaction fees

License plate look-up fees

Other means of payment fees

Administrative fees

Violations paid pre-collections

Violations paid post-collections

Total Transaction Processing

System/IT maintenance labor

System/IT maintenance contracted services

System/IT maintenance other

Total Tolling System/IT

Regional Agencies/Other States/Other Countries Interoperability Fees

Total IOP Cost

Credit card fees

Bank fees

Total Banking Services

Postage and mailing supplies

Transponder and mounting strip costs

Transponder inventory costs

Transponder disposal costs

Total Collection Consumable

Violation/Enforcement labor

Collection Agency Costs

Court Fees

Professional Services

Total Violation Enforcement

Overhead labor

Mystery shopper/surveys

Marketing and communications

Other facilities costs

Insurance

Travel, conferences and entertainment

Professional services (not court representation)

Overhead non-labor

Total SG&A

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KPMG knows infrastructure. Every day, our network of more than 2,500 highly experienced professionals work shoulder-to-shoulder with infrastructure leaders across more than 150 countries and territories to share industry best practices and develop effective local strategies.

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