5GMARK

# BAROMETER REPORT FOR MOBILE

CAMBODIA 2020

MOZARK

## Abstract

The year 2020 saw data usage volumes reach new heights[1] as lock downs globally made people to resort to digital channels for most needs that required them to leave their houses. Mobile operators throughout the world played a pivotal role in enabling individuals and enterprises to continue uninterrupted work while letting educational institutions conduct classes remotely. 2020 also saw a surge in OTT usage[1] as they became the go-to source of entertainment as cinemas got shut in light of social distancing. And how can we forget the new entrants of high data consumption – online gaming and video conferencing – who changed the way people socialized.

Even though each mobile operator stepped up to fulfil the growing network requirements, the QoE deliver by each operator varied. It was worth exploring how individual operators behaved in Cambodia by analysing more than just regular speed test results and monitoring overall network experience. This study was based on data collected on 5GMARK, which has curated a methodology for un-biased calculations based on aggregation of all tests made by mobile customers in the year 2020.

Using 5GMARK, app users made 1,155,921 tests worldwide and we aggregated each test, be it a one-time user, who made only one measurement throughout the year or a string of tests performed by the same user. 5GMARK's methodology takes care of frauds, excludes any suspicious measurements that may exist within the results, and is strictly neutral in that it doesn't favour any single operator. 5GMARK respects state-of-the-art of Regulators' survey and is the chosen mode for regulators to benchmark network experience of operators throughout the world.

So as the tumultuous year drawing to a close, we take a closer look at how different operators in Cambodia performed throughout last year and evaluate which operator delivered the best Quality of Experience (QoE) in 2020 using 5GMARK.

[1] - https://www.forbes.com/sites/markbeech/2020/03/25/covid-19-pushes-up-internet-use-70-streaming-more-than-12-first-figures-reveal/?sh=2a7c6c793104

## Benchmark Award: 2020

Highest Download Speed
**Cellcard**

Highest Upload Speed
**Cellcard**

Best Website Browsing Experience
**Cellcard**

Best Video Streaming Experience
**Cellcard**

## Methodology

From the aggregates of 5GMARK test results over the last year, we pull out the distributions of device OS that is most frequently used to test network experience. As seen in Figure 1, Android platform is popular among 5GMARK users compared to IOS for performing network experience tests.

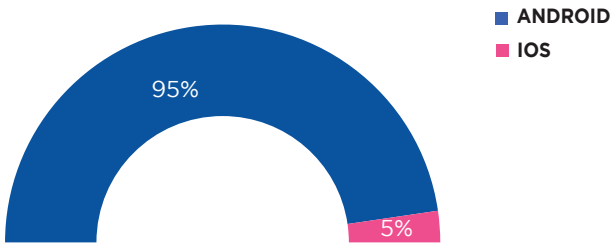



**Figure 1 – Mobile device OS distribution as measured on 5GMARK**

The same data set is used to see how the mobile customers are divided among the different operators. We observe that Metfone has the highest subscriber base at 48% among the active operators followed by Smart (44%) and Cellcard (8%).

Figure 2 shows the overall percentage distribution of mobile network subscribers for the year 2020

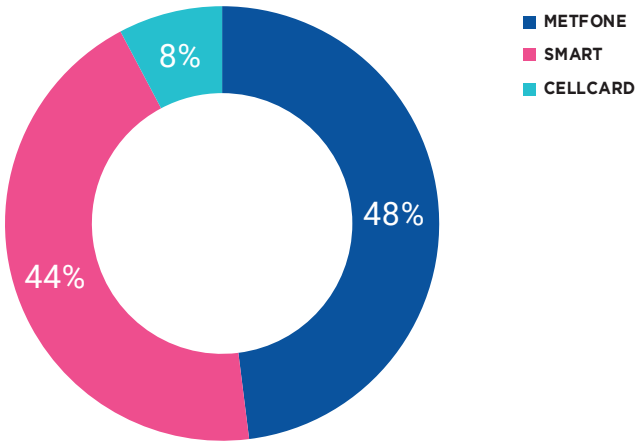



**Figure 2 – Active subscriber base distribution as measured on 5GMARK**

## 5GMARK Score: Benchmarking QoE

In the year 2020, Cellcard ranked first in terms of 5GMARK Score in the Cambodia telco market. Cellcard had a 37% higher 5GMARK Score than Smart and 40% higher score than Metfone over the past one year. The score is calculated using a proprietary methodology that gauges performance across speed and quality metrics and normalizes them under a standard scale such that Quality of Experience (QoE) becomes quantifiable.

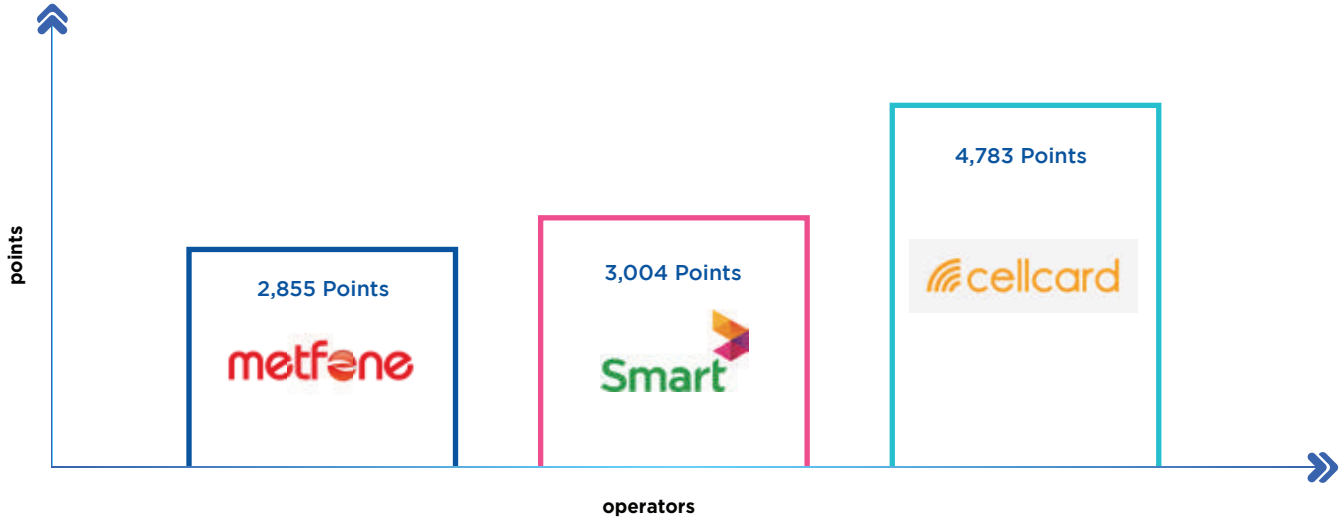



**Figure 3 – 5GMARK score comparison across operators**

## Throughput Experience: Measure of Speeds

Throughput tests or speed tests reproduce the activity of downloading and uploading non-compressible, standard files that are hosted at a neutral host. The file is downloaded from an available test server, which is chosen randomly and thus, has an equal probability of selection among all servers available. By not following a best peering or latency-based selection, we aim to provide real experience as majority of the connections made to the general internet are not based on best peering or latency-based selections.

The bandwidth for data transmission is measured as the ratio of the data volume exchanged (the actual part of the file transmitted) to the total time taken (including initializing time). This is the most reliable methodology available from a crowdsourcing speed testing tool.

1. Cellcard had the highest average download speed of about 7.9 Mbps in 2020.
2. In terms of Upload Speed, Cellcard also led the pack with an average upload speed of about 7.1 Mbps.

As shown in figure 4, Cellcard ranks higher in Download and Upload speeds. Cellcard's average download speed, measured throughout last year, was 25% more than Smart, 33% more than Metfone. When it comes to the Upload speed, Cellcard's average upload speed was 31% more than Metfone and 37% more than Smart respectively.

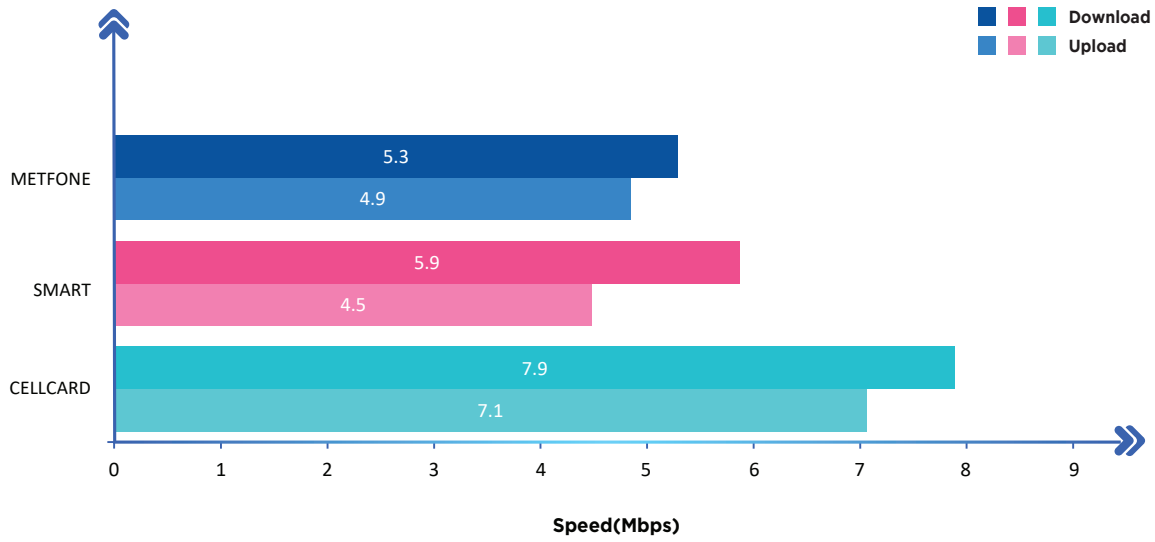



**Figure 4 – 5GMARK Speed comparison across operators**

## 4G Availability: Penetration of 4G in Cambodia

All carriers in Cambodia provide services under different technologies with 4G being the most prevalent in 2020. 5GMARK measures the technology on which the test was conducted. And the share of tests conducted on 4G (LTE) show the penetration of the technology for the given operator in the current market.

As shown in Figure 5, Cellcard with a 4G availability of 84%, has the highest 4G penetration among telecom operators in Cambodia. It is followed by Smart which has an availability of 76%. While, Metfone's 4G availability is at 70%.

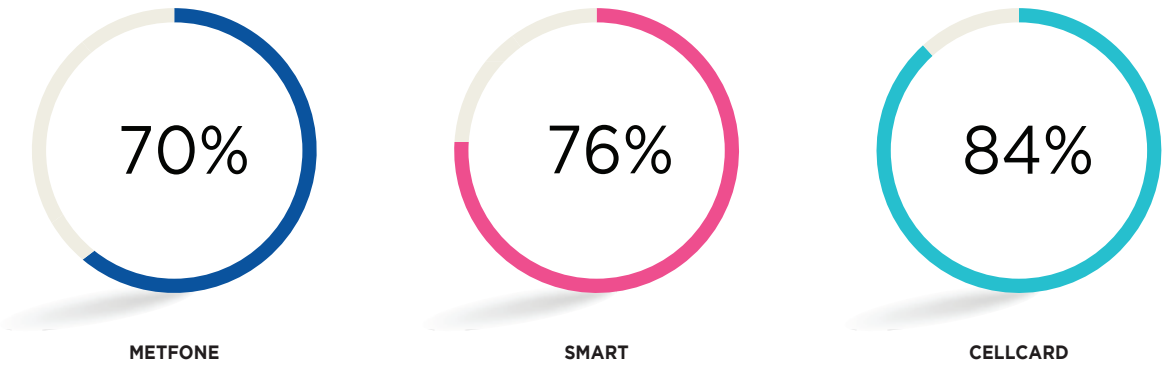



**Figure 5 – 4G Availability across operators as measured on 5GMARK.**

## Browsing Experience: Percentage of the Web pages loaded within 10 sec

Web browsing and using Apps contributes to a large chunk of data usage on mobile networks. While measuring experience on Apps is tricky and lengthy (more on that in Further Read), 5GMARK helps measure website browsing experience by testing how quickly the top websites load.

To draw this particular insight, we analyzed the website performance data crowdsourced through the 5GMARK app to calculate percentage of tests where the popular websites load within 10s. This indicates the quality of website browsing on the respective operators and is a part of the overall 5GMARK score.

As seen in figure 6, websites load within 10s in 77% of the tests conducted on Cellcard. While, Metfone is 7% and Smart is 8% short than Cellcard's benchmark.

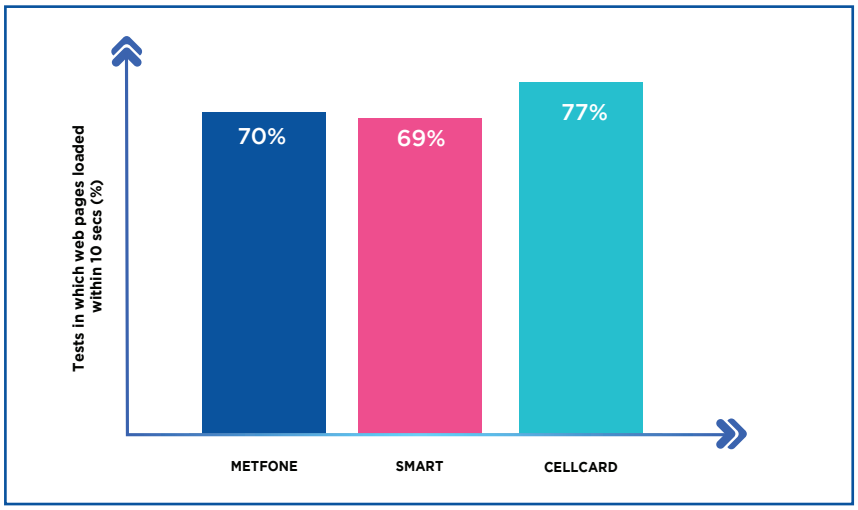
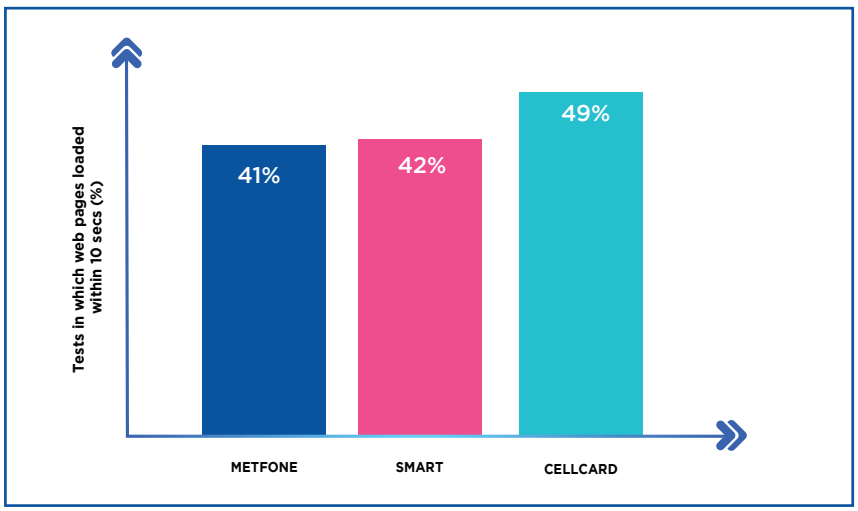



**Figure 6 – Comparison of percentage of tests where website loaded within 10sec**

## YouTube Streaming Experience: Percentage of the videos streamed with less than 12s of inactivity

In 2020, the volume of data consumed in streaming videos over mobile data touched new heights as video streaming continued to remain the highest data consuming service globally. While video streaming experience is as much dependent on the App experience as on Network Experience, 5GMARK measures the individual network's performance in providing a video streaming service. We choose YouTube as the standard app as out of all available video streaming and OTT services, the highest content was consumed on YouTube globally. Thus, analyzing performance of YouTube streaming acts as a clear indicator of the experience delivered by network operators.




In the YouTube streaming test, the 5GMARK app plays a standard video from the YouTube servers according to the playback quality chosen. The following key metrics are measured during playback:

- Time to launch the video sequence
- Time to load the video
- Number of bufferin pauses,and
- Total waiting time during the sequence

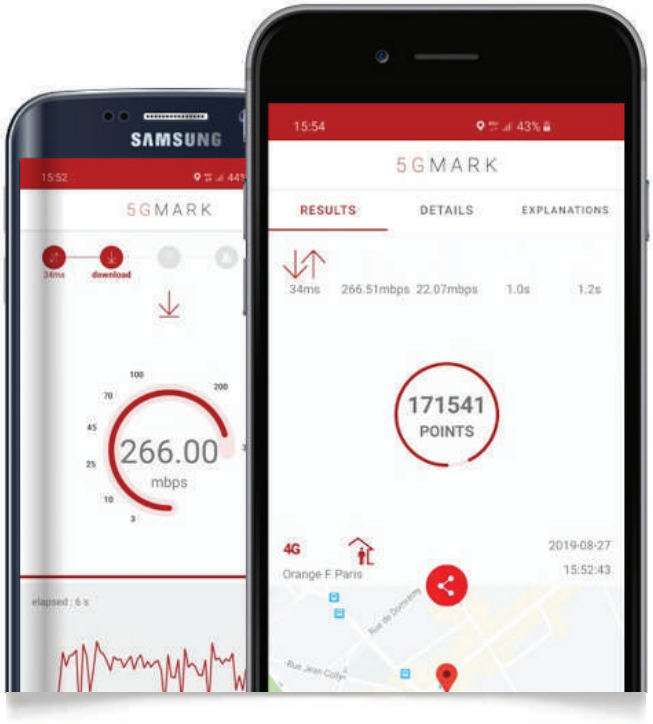
**Figure 7 – Comparison of percentage of videos that streamed in less than 12sec of inactivity**

To benchmark operators, we calculate the percentage of tests that streamed the video in less than 12sec of inactivity.

As shown in Figure 7, Cellcard provides the best streaming experience as almost 49% of the tests done on its network play the standard video in less than 12sec followed by SMART, which is 7% short of Cellcard's benchmark, and then by Metfone that is a high, 8% away from Cellcard.

## Difference in 5GMARK results as compared to other Speed Test Apps

**The network experience tests performed on 5GMARK may yield different results because of the following reasons:-**




### ● Test Server Location

At the start of each test, a secure connection is established between the client (subscriber mobile) and a neutral host to measure performance of the established link. The distance between the two is important in understanding the results of a given test.

The neutral hosts are hosted over 3rd party Content Delivery Networks (CDNs) like Azure, AWS, Akamai, etc. to provide actual experience as would be perceived. If the host is within the subscriber's Internet Service Provider's (ISP) own network, the speed results are often higher since the distance travelled is shorter as compared to connecting to a neutral-host that involves inter-network connections (connections between networks) and is hosted on 3rd party CDNs. The latter reflects the full experience of using the internet, which almost always involves using inter-network connections to access content and services that are generally hosted outside the subscriber's ISP's network.

Because 5GMARK tests are made with reference to a neutral-host, they provide an actual measure of the Quality of Experience (QoE), even though the reported speeds are generally lesser as compared to other apps.

### ● Varying Network Conditions

Network conditions are ever changing and that often gets reflected in test results. Test results can change every minute, especially if they are conducted in a state of vehicular or pedestal mobility. Results vary with the time of the day as a test conducted in the evening that coincides with network busy hours, may show a lower speed than tests conducted in the wee hours of the day. Network traffic at the time of testing plays a role in end-results of each test. The location from where the tests are done can also impact end-results. Tests done in crowded areas will yield very different results than those done from home, where there are lesser concurrent users connected to the network.

Thus, regular testing, carried out in defined intervals throughout the day to eliminate effects of network traffic and done for local or wider areas, is necessary to gauge the true performance of any network.

### ● Testing Methodology

Different network performance testing tools follow different methodology. Inside 5GMARK, a file is uploaded and downloaded using a single stream from an available test server, which is chosen randomly and has an equal probability of selection, and is not selected on a best peering, latency-based selection. This is a single-thread mode of speed measurement. The bandwidth for data transmission is measured as the ratio of the volume exchanged (the actual part of the file transmitted) to the total time taken (including initializing time).

### ● Mobile Device Type

Test results may vary depending on the type of mobile device used by the subscriber for testing the network performance. Each mobile belongs to a certain category, which in turn depends on the processor used. This determines the device's capability to reach a certain download and upload speed.

Test conducted using a high category phone e.g. CAT 16 may give higher speeds as compared to those conducted on CAT 4 or CAT 6 mobile phones.

## About

### 5GMARK

5GMARK, developed by QoSi (MOZARK), is one of the most trusted Quality of Experience (QoE) measurement engine. It is a free connection performance testing tool offered to the public on a mobile app and website. It helps you measuring real Quality of Experience (QoE) by testing performance of not just download and upload speeds but testing YouTube and Web streaming capabilities as well.

Deploy it in various ways such as crowdsourcing, active probing, professional walk or drive testing, or self-measurement kits. For more information, visit https://5gmark.mozark.ai/

### MOZARK

Today, the world has become more digitally empowered than ever. More and more use cases are going digital, thanks to the rise In digital enablers and the need of the modern era. And the rise In Digital has brought back the emphasis on Customer Experience. However, as technology evolves and business complexities arise, it becomes even harder to “guarantee” a certain Quality of Digital Experience to customers.

At MOZARK, we are passionate about ensuring that the right Digital Experience is delivered to end customers.

We are a Digital Experience Management Platform that helps you measure real experience by monitoring real devices, connected to real networks. Our artificial intelligence and machine learning (AI/ML) engine help you obtain Insights to make improvements and deliver a rich experience and provide the best care to customers.

We work with Digital Infrastructure providers, Digital Apps, and Digital Enterprises to enhance Digital Experience, thus ensuring alignment across the ecosystem. To learn more about MOZARK, visit: https://mozark.ai

## Further Read

### The 5GMARK Algorithm

The 5GMARK algorithm takes into account practical metrics that define true user experience like upload and download speed, video streaming, and web browsing. This approach allows us to go beyond the flow alone and measure real user experience. Also, thanks to this crowdsourcing tool, users get to view the performance of not only their own internet connections but also those shared, in a logic of general interest, by the user community.

- **Download and Upload Speed**

The Download and Upload speed indicators are the download and loading speed when data is transferred over a 10-second period. In case of failure, outage or off-grid, the speed is counted at 0. The measurements are carried out on different servers or CDNs  spread over the territory.

- **Web Browsing**

Access to a website is considered successful when the site page is fully loaded within 10 seconds at the first attempt. This rate is calculated based on the total number of attempts to download web pages. The web pages selected for these tests correspond to mobile websites most frequented by global internet users.

- **Streaming**

Streaming test reproduces the playback behavior of a video launched from Youtube's servers. The quality of videos chosen to playback is fixed on smartphones while on the desktop browser-based tester, the video quality is automatically adapted by YouTube according to the performance of the connection. The loaded video is 30 seconds long and the maximum playback time is set at 45 seconds.

- **Score**

The final 5GMARK score is an aggregation of the performance of the four measurements that constitute the complete test. It allows you to quantitatively analyze the performance of your internet connection. The score is calculated from a speed base (2/3 weight to download, 1/3 to broadcast), and a percentage of quality (50% for accessibility for video streaming and 50% for accessibility of web browsing). The calculated quality percentage will be applied to the speed base. Thus a high speed that would not give good performance of accessibility to services would strongly impact results.

## 5GMARK Neutrality

In terms of measurement methodology, the application wishes to respect the standards of the Global Telecommunications Regulatory Authorities and their main principles both in the collection method and in the calculation method.

The application gives back many indicators to the general public, allowing to compare operators at different scales and according to different criteria. The main indicators require a powerful algorithm aimed at minimizing the biases inherent in crowdsourcing, including:

- The willingness of an individual or entity to favor or disadvantage another operator.
- The willingness of an individual or entity to technically biased tests.
- Non-control of smartphones including, for example, smartphones that are not 4G or 5G compatible.
- Non-control of packages including prepaid or plan bitrate limited.
- Non-control of the testing environment – outdoor vs deep indoor.
- The lack of geographical balance in the community's use of the telecom services.

It is important to note that it is impossible to control "collection." In other words, one or more individuals cannot be prevented from taking measurements with any of the 5GMARK data sources that feed the test results base. We can only regulate their impact using an algorithm. In order to make the indicators more reliable, the tests are grouped first by cities/towns/villages/municipalities and then to the strata of populations (e.g. large cities, medium or rural) that are weighted according to the weight in population they represent[2]. Thus, operators may present different test perimeters, but indicators will always be adjusted to express the population.

Further, a significant number of tests are filtered to remove questionable elements from the scope:

- Devices whose technical capacity does not allow them to connect in LTE/4G.
- Devices running dual sim that may impact results.
- Tests done on Wi-Fi.
- This list refers to all cases of "inadequate testing" mentioned below.
- Tests from which the SIM MCC-MNC comes from a full-MVNO even when it trades on the network of a benchmark MNO

This list refers to all cases of "inadequate testing" mentioned below.

[2] – For instance, in the event that users of an operator present 80% of the measures on the stratum of large cities, this stratum will weigh exactly its weight in the national index and not let a higher ratio of customers to a single operator swing results either way.

## Additional MOZARK Resources

As stated earlier, Application Experience plays an independent and integral role in controlling the overall Digital Experience. MOZARK specializes in measuring real Digital Experience. In our previously published studies, we have covered how top Apps behave in different conditions, how network and apps play an interconnected role, and how App experience can be measured. These can be accessed from the links below –

- State of Video Streaming Experience:
https://mozark.ai/whitepaper/state-of-video-streaming-experience-in-india/

- State of Network Experience:
https://mozark.ai/whitepaper/state-of-network-experience/

- State of Conferencing Experience:
https://mozark.ai/whitepaper/state-of-conferencing-experience/

### Disclaimer:

Purpose of the study is to highlight the differences in end user experience through a statistically relevant survey. It is not meant to endorse any one brand over another but purely a result of a deeply data driven external survey. None of the parties evaluated, paid for any component of the survey nor participated in any form during the tabulation of the results. Using or citing these findings for marketing or other purposes without the knowledge of MOZARK is strictly prohibited.

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