

F R O S T & S U L L I V A N

2024 ENABLING TECHNOLOGY LEADER

*IN THE GLOBAL
AUTOMOTIVE
TELEOPERATIONS
INDUSTRY*

F R O S T & S U L L I V A N

2024
BEST
PRACTICES
AWARD

ottopia

Best Practices Criteria for World-Class Performance

Frost & Sullivan applies a rigorous analytical process to evaluate multiple nominees for each award category before determining the final award recipient. The process involves a detailed evaluation of best practices criteria across two dimensions for each nominated company. Ottopia excels in many of the criteria in the Global Automotive Teleoperations Industry.

AWARD CRITERIA	
<i>Technology Leverage</i>	<i>Customer Impact</i>
Commitment to Innovation	Price/Performance Value
Commitment to Creativity	Customer Purchase Experience
Stage Gate Efficiency	Customer Ownership Experience
Commercialization Success	Customer Service Experience
Application Diversity	Brand Equity

Autonomous Driving: Challenges, Innovations, and the Rise of Teleoperations

The autonomous driving (AD) sector stands as a key frontier in contemporary transportation, showcasing a paradigm shift in terms of mobility and safety. Defined by the National Highway Traffic Safety Administration as vehicles capable of operating without direct human input, autonomous vehicles (AVs) represent a culmination of advanced technologies poised to redefine the traditional driver-vehicle relationship.¹ Currently, the AV technology space is witnessing rapid maturation, with numerous driverless fleet operators gearing towards scaling and commercialization.

Despite the opportunities provided by AV technologies, significant challenges still highlight the multifaceted complexities found in AD systems. From navigating legal and regulatory frameworks to addressing the intricate nuances of real-world driving scenarios, industry stakeholders grapple with several hurdles. These challenges range from resolving conflicts between traffic statutes and dynamic road conditions to enhancing the interpretability of ambiguous road markings and optimizing interactions with law enforcement entities. Likewise, human-centric challenges such as distraction latency during emergency interventions and the human propensity for overreaction necessitate alternative approaches. Automotive original equipment manufacturers and suppliers, recognizing the imperatives of such systems, fervently dedicate resources towards developing comprehensive, advanced driver assistance system (ADAS) platforms. These platforms, characterized by their synthesis of diverse features and capabilities, strive to achieve an optimal equilibrium between performance metrics and cost-effectiveness while integrating high-performance sensors and precise environmental modeling.

¹ <https://content.naic.org/cipr-topics/autonomous-vehicles>, accessed February 2024

“Ottopia’s creative endeavors extend to high levels of safety and reliability. The company pioneers the development of ATAS™ and ensures that remote vehicle operations remain immune to human failings, safeguarding passengers, and surroundings.”

**- Thirumalai Narasimhan
Industry Analyst, Mobility**

Teleoperation technologies provide the comfort and convenience to car owners for situations like driving in traffic, parking, fueling, charging and many more, saving every consumer hundreds of hours every year. By empowering remote human operators to supervise and drive passenger vehicles as needed, teleoperations epitomize a synergistic fusion of artificial intelligence (AI) and human intelligence. This paradigm, facilitated by a sophisticated array of high-tech components encompassing existing Connected Car components such as cameras, modems, and centralized control stations, represents a

pivotal evolution in the way passenger vehicles are used and driven.

Critical to achieving successful tele-driving in vehicle systems is the development of robust communication and data transfer systems, enabling seamless real-time interaction between vehicles and remote operators. As a leading company in the teleoperation domain, Ottopia is renowned for its pioneering advancements in tele-driving technology, including 8 granted patents to date. Leveraging AI-based optimization techniques, dynamic video streaming capabilities, and seamless interoperability with third-party ecosystems, the company demonstrates excellence in teleoperations.

Redefining Passenger Vehicles with Innovative Tele-driving and Tele-assistance Solutions

Founded in 2018 and headquartered in Tel Aviv, Israel, Ottopia specializes in enabling teleoperations on public roads and networks by seamlessly connecting remote operators to passenger vehicles. The company’s patented software, integrated within the vehicle and at remote stations, fosters an immersive experience for operators, effectively bridging the gap between human oversight and AD capabilities. Through its Advanced Tele-driver Assistance System (ATAS), Ottopia empowers tele-drivers to navigate diverse and challenging environments with unparalleled safety and precision, irrespective of weather conditions or time of day. Ottopia's technology enables automotive OEMs to launch a new type of luxury service in millions of passenger vehicles - the "on demand remote driver". Instead of vehicle owners paying the salary of a private driver, this new type of personal, luxury service generates similar benefits to those of having your own private driver, but with two major differences: Reduction in costs, and the vehicle is driven by a remote driver.

Ottopia adopts and creates cutting-edge solutions that redefine the boundaries of teleoperations for vehicles. In the tele-assistance space, the company’s approach transcends conventional models, enabling remote operators to monitor, assist, and drive vehicles seamlessly. Addressing network reliability and operator oversight concerns, Ottopia meticulously abides by four principles to ensure 100% safety in tele-assistance operations. By harnessing vehicle-side calculations, leveraging system capabilities, implementing algorithm hierarchy, and adhering to operational design domain-specific safety protocols, the company’s tele-assistance solution exemplifies a paradigm shift in remote autonomous vehicle operations.

On the other hand, Ottopia’s foray into tele-driving of many millions of consumer vehicles, demonstrates

its commitment to innovation. Collaborating with leading carmakers and truck manufacturers, the company embeds tele-driving capabilities into new vehicle models to enable completely new experiences for consumers. For example, a remote driver can drive the car in traffic, park the car, bring it back from the parking lot, charge the car, take it for maintenance, and anything of the consumer might require. These new types of services will save every consumer hundreds of hours per year, free up meaningful time and create a novel luxury experience. Overcoming public trust issues surrounding latency and reliability, Ottopia's advanced communication techniques, including network bonding and dynamic streaming, optimize multiple cellular networks to enable safe tele-driving. By leveraging built-in car hardware in tandem with advanced tele-driving software, the company achieves unprecedented levels of performance and reliability, setting new benchmarks for tele-driving solutions.

Ottopia's commitment to creativity is a cornerstone of its transformative impact on the passenger vehicle landscape. Its innovative acumen extends beyond technological innovation to encompass the holistic user experience. Through its intuitive user interface and ergonomic tele-driving station, Ottopia immerses operators in a seamless digital environment that mirrors the sensation of being behind the wheel. By tailoring cognitive load management strategies to individual use cases and continuously monitoring operator engagement levels, Ottopia ensures that tele-drivers remain focused, engaged, and primed for peak performance.

The addressable market for automotive teleoperations focuses on two segments:

Segment I - "Fractional chauffeur" for premium passenger vehicles. In this segment, teleoperations can eliminate many unpleasant aspects of driving, such as looking for urban parking, taking the car for a wash or service, or driving through city traffic. In the next five years, teleoperations will remain in the premium segment. In this segment, vehicles already have the advanced safety features and camera systems required to support teleoperations, so there is no change needed in car hardware. This segment is also the one with demonstrated customer willingness to pay for new subscription services.

Segment II - Autonomous vehicles. In this segment, teleoperations can expand the operational design domain in which the autonomous vehicle can operate. Whether robotaxis, trucks, or shuttles, all autonomous vehicles have operational limits. Teleoperations enables a human to connect remotely and fill in those operational gaps, thus enabling uninterrupted service.

The OEM focus on new subscription services beyond the vehicle itself will accelerate initial adoption of teleoperations, as will the OEM desire to leverage the camera and safety systems that are already in place in high-end vehicles. We expect mass-produced cars with teleoperations to reach the market in 2026, and adoption will ramp quickly due to the intense competitive dynamics between OEMs. Approximately 12 million premium vehicles are sold each year, and luxury is the fastest-growing portion of the automotive market. Given proxies such as Tesla's full self-driving as well as surveys on consumer desire for driverless experiences, Ottopia estimates that 15% of premium car buyers would pay over \$6,000 a year for a fractional chauffeur, yielding a new market opportunity of at least \$11 Billion in the near-term, and much higher in the longer term as adoption grows.

Every autonomous vehicle on the road today can be adapted to use teleoperations, and we expect that to remain true for the foreseeable future. With improvement in autonomous technology, teleoperation

technology will also improve, and human teleoperators will retain their role in smooth operation of autonomous vehicles in challenging conditions across many different industries and environments.

Crucially, Ottopia's creative endeavors extend to high levels of safety and reliability. The company pioneers the development of ATAS™ and ensures that remote vehicle operations remain immune to human failings, safeguarding passengers, and surroundings. Through the integration of dynamic trajectory computations and bespoke automated braking algorithms, Ottopia's ATAS sets new standards for safety and efficacy in teleoperation software.

Frost & Sullivan commends Ottopia for its groundbreaking tele-driving and tele-assistance solutions, which leverage real-time data optimization to redefine the possibilities of remote vehicle operations, setting new benchmarks for innovation in the mobility sector and soon creating entire new experience for billions of consumers around the world.

Enabling Versatility in Diverse Driving Environments

With a keen understanding of modern consumers' various needs and challenges, Ottopia develops and integrates teleoperation technology that serves multiple applications and environments, catering to unique use cases with remarkable innovation and adaptability. For consumers seeking luxury, comfort, and time-saving solutions, the company's teleoperation capabilities enable seamless execution of tasks such as spot searching, parking management, periodic check-ups, repairs, refueling/recharging, and cleaning, all orchestrated remotely by teleoperators. By enabling global operators and system integrators to offer these services remotely, Ottopia empowers consumers to enjoy the benefits of self-driving technology without concerning themselves with the intricacies of its implementation, thereby enhancing convenience and efficiency in their daily lives.

"With eight patents already granted and a large pipeline of pending patents, Ottopia's tele-driving product suite epitomizes value-driven innovation. The company's solutions seamlessly blend functionality for diverse stakeholders, including consumers, tele-drivers, tele-managers, and system administrators."

***- Rabin Dhakal
Best Practices Research Analyst***

Moreover, Ottopia's teleoperation software serves as a game-changer in densely populated urban environments, where traffic congestion and parking shortages pose significant challenges to traditional transportation systems. By offering last-mile connectivity and on-demand mobility services, the company's teleoperation solutions provide commuters with convenient and efficient transportation options, alleviating the strains of urban mobility. Given the increasing interest and demand for urban autonomy solutions, Ottopia's tele-driving capabilities enable seamless mobility in applications such as logistics from highways to hubs, bridging the gap between autonomous highway operations and urban

mobility challenges.

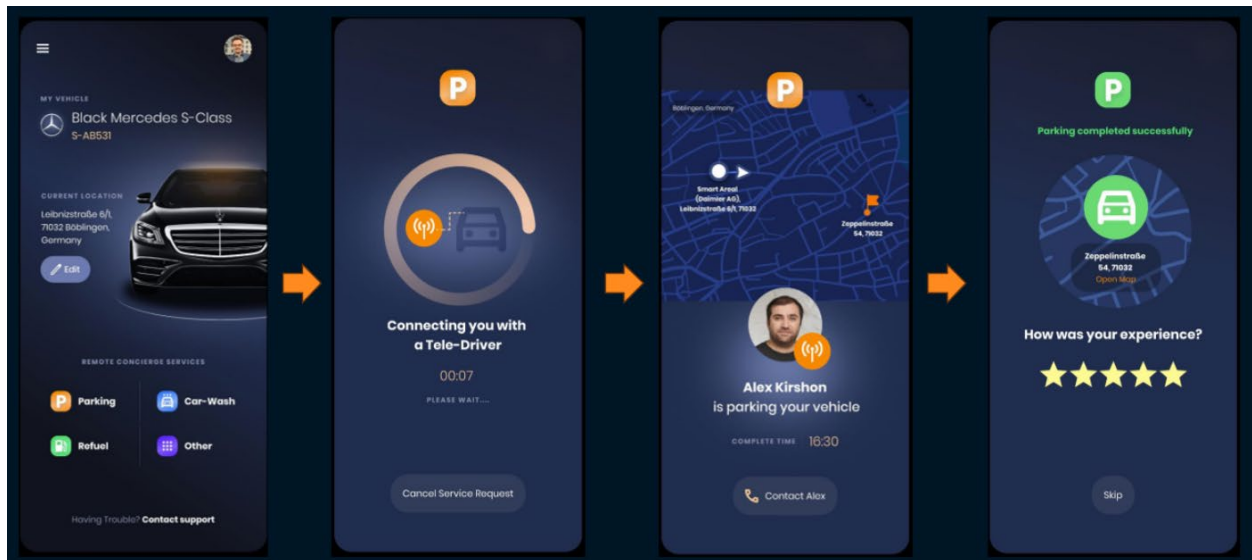
Frost & Sullivan applauds Ottopia's commitment to application diversity. By leveraging technology to enable convenience, efficiency, and innovation in the mobility ecosystem, the company's ability to address the diverse needs of consumers and stakeholders is commendable.

Driving Value Through Enterprise-grade Teleoperation Solutions

Ottopia delivers unparalleled value in teleoperation technology by offering enterprise-grade tele-driving solutions. Enabling ultra-low latency and vehicle-agnostic teleoperations, the company provides advanced tele-driving solutions accessible to a range of industries and applications without compromising quality or affordability.

With eight patents already granted and a pipeline of pending patents, Ottopia’s tele-driving product suite epitomizes value-driven innovation. The company’s solutions seamlessly blend functionality for diverse stakeholders, including consumers, tele-drivers, tele-managers, and system administrators. Consumers benefit from a user-friendly application that connects them with teleoperators and tele-drivers for various services, from parking assistance to car washing and refueling.

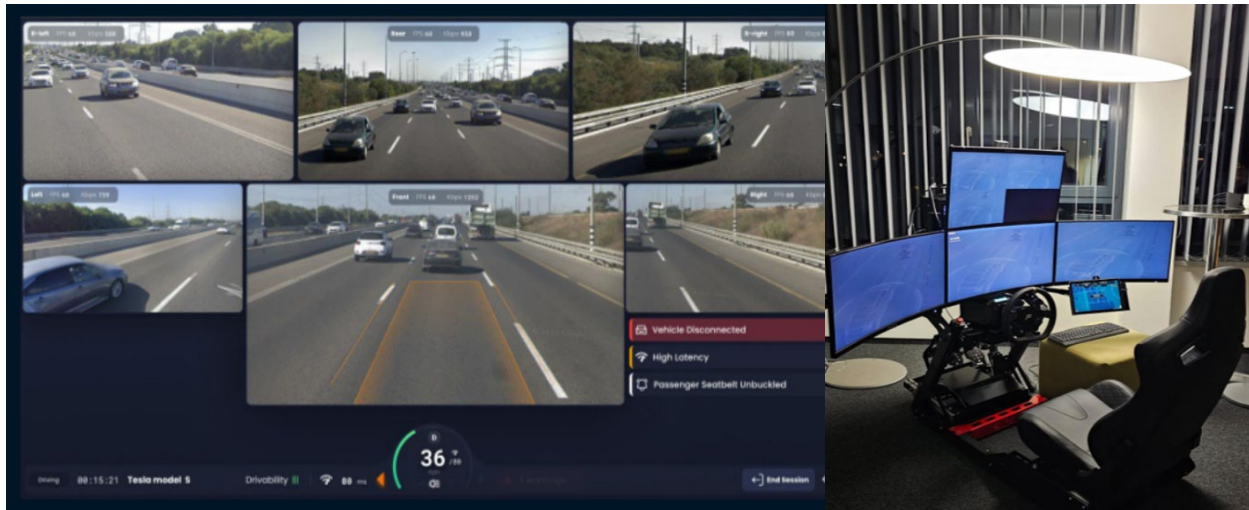
Ottopia’s User-friendly Consumer Application



Source: Ottopia

Tele-drivers, equipped with advanced multi-screen tele-driving consoles, enjoy a superior teleoperation experience, with real-time video feeds and network optimization ensuring smooth and efficient operations. Meanwhile, tele-managers benefit from comprehensive fleet management tools, including real-time vehicle tracking and video feeds, empowering them to optimize fleet performance and control.

Single Screen and Multi-screen Tele-driving Console Setup



Source: Ottopia

Furthermore, Ottopia redefines customer experience through strategic partnerships and collaborations, elevating the journey from inquiry to implementation. By forging alliances with industry leaders across multiple sectors, customers can access cutting-edge teleoperation technology backed by the expertise and support of industry pioneers. For instance, Motional leverages Ottopia's teleoperation technology to conduct remote vehicle assistance for its fully driverless Level 4 AVs, already active in multiple cities, providing customers with confidence in the reliability and performance of its solutions.²

Similarly, Ottopia's collaboration with Magna delivers a novel last-mile delivery solution powered by teleoperation software, offering customers unprecedented flexibility and efficiency in urban logistics. The company empowers businesses to optimize operations and deliver exceptional value to customers for applications such as warehouse automation, shuttle services, and ground support at airports. Likewise, by integrating its teleoperation software with NVIDIA's DRIVE AGX platform, Ottopia ensures customers can access a safe and secure remote teleoperation solution, enhancing their purchase experience by providing a robust development and deployment platform.³

Frost & Sullivan lauds Ottopia for its innovative, value-driven teleoperation solutions and collaborative partnerships. The company ensures each customer interaction is a seamless and rewarding journey, marked by quality, reliability, and personalized service.

Building Trust through Partnerships and Thought Leadership

As a major player in the teleoperations sector, Ottopia dedicates itself to advancing tele-driving through a relentless focus on safety, technology, and customer-centricity. Customers perceive the brand positively and exhibit unwavering loyalty, characterizing its brand equity. With a robust commitment to quality and reliability, the company prioritizes customer feedback and continuously iterates on its offerings. It ensures its solutions deliver maximum value and satisfaction to consumers, fostering strong industry relationships and driving significant growth in recent years.

² <https://www.ottopia.tech/trusted-by>, accessed February 2024

³ Ibid.

One notable example of Ottopia's brand equity is its partnership with automotive giant BMW. Selected as a preferred multi-SIM teleoperation technology provider, the company's teleoperation platform underwent rigorous testing on public roads, ultimately earning recognition as one of the most suitable solutions for integration into Level 4 AVs. This endorsement validates Ottopia's technological prowess and solidifies its position as a trusted partner in the tele-driving ecosystem.⁴

Moreover, Ottopia's unwavering commitment to security enhances its brand equity further. Rooted in CEO Amit Rosenzweig's professional background in cybersecurity, the company's platform boasts state-of-the-art encryption, authentication, and security features, ensuring the utmost protection of customer data and operations. Through rigorous testing and a secure-by-design mindset, Ottopia instills customer confidence, reinforcing its brand as synonymous with trust and reliability.

Furthermore, Ottopia actively cultivates thought leadership and industry influence through various channels, including conferences, publications, and online platforms. By driving conversations and shaping the narrative around key industry trends and challenges, the company elevates its brand profile and garners respect from peers, competitors, and stakeholders across the industry.

Frost & Sullivan praises Ottopia for its dedication to excellence, innovation, and customer-centricity, positioning it as a trusted leader in teleoperations with a reputation for delivering unparalleled value and reliability.

Conclusion

Leveraging the transformative power of technology in modern transportation, Ottopia's tele-driving software heralds a new era of mobility, luxury, convenience and safety. Ottopia is a significant innovator in the tele-driving sector, revolutionizing remote vehicle operations with its pioneering tele-driving technology. Through its advanced tele-driver assistance system, the company seamlessly blends artificial intelligence with human oversight, ensuring unparalleled safety and precision in navigating diverse environments. The company's tele-assistance solution sets a new standard for safety, leveraging vehicle-side calculations, system capabilities, algorithm hierarchy, and operational design domain-specific safety protocols. Its teleoperation platform's intuitive user interface and ergonomic tele-driving station immerses operators in a seamless digital environment, mirroring the sensation of being behind the wheel. By offering last-mile connectivity and on-demand mobility services, Ottopia's teleoperation solutions address urban mobility challenges, alleviating traffic congestion and parking shortages. The company extends its reach and influence through strategic partnerships and collaborations, offering customers access to state-of-the-art teleoperation technology backed by industry expertise. Ottopia's relentless pursuit of technological advancement and customer-centric innovation propels the tele-driving sector into a future defined by enhanced safety, convenience, and efficiency in transportation.

Ottopia earns Frost & Sullivan's 2024 Global Enabling Technology Leadership Award for its strong overall performance in the automotive teleoperations industry.

⁴ Ibid.

What You Need to Know about the Enabling Technology Leadership Recognition

Frost & Sullivan's Enabling Technology Leadership Award recognizes the company that applies its technology in new ways to improve existing products and services and elevate the customer experience.

Best Practices Award Analysis

For the Enabling Technology Leadership Award, Frost & Sullivan analysts independently evaluated the criteria listed below.

Technology Leverage

Commitment to Innovation: Continuous emerging technology adoption and creation enables new product development and enhances product performance

Commitment to Creativity: Company leverages technology advancements to push the limits of form and function in the pursuit of white space innovation

Stage Gate Efficiency: Technology adoption enhances the stage gate process for launching new products and solutions

Commercialization Success: Company displays a proven track record of taking new technologies to market with a high success rate

Application Diversity: Company develops and/or integrates technology that serves multiple applications and multiple environments

Customer Impact

Price/Performance Value: Products or services provide the best value for the price compared to similar market offerings

Customer Purchase Experience: Quality of the purchase experience assures customers that they are buying the optimal solution for addressing their unique needs and constraints

Customer Ownership Experience: Customers proudly own the company's product or service and have a positive experience throughout the life of the product or service

Customer Service Experience: Customer service is accessible, fast, stress-free, and high quality

Brand Equity: Customers perceive the brand positively and exhibit high brand loyalty

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Key Impacts:

- **Growth Pipeline:** Continuous Flow of Growth Opportunities
- **Growth Strategies:** Proven Best Practices
- **Innovation Culture:** Optimized Customer Experience
- **ROI & Margin:** Implementation Excellence
- **Transformational Growth:** Industry Leadership



The Innovation Generator™

Our 6 analytical perspectives are crucial in capturing the broadest range of innovative growth opportunities, most of which occur at the points of these perspectives.

Analytical Perspectives:

- **Mega Trend (MT)**
- **Business Model (BM)**
- **Technology (TE)**
- **Industries (IN)**
- **Customer (CU)**
- **Geographies (GE)**

