

NJDOT: Improving Lives Through Transportation Innovation

October 2019

So what's the problem?



Over 10 years ago





WHY?



IS MORE THE ANSWER?



Who we are

LM Industries is the world's future mobility platform TODAY, powered by digital manufacturing

Unique solutions to big challenges

Problem

Key challenges to adoption of high technology in mobility



- Technology is rapidly evolving
- 🗴 Business viability
- × Regulation
- Automakers (new and old) are slow and capital intensive

Solution





EFFICIENCY

Low operating cost and fast time to market with affordable battle tested products

INTEGRATION

The largest technology ecosystem in the industry

COLLABORATION

Efficient engagement with users and operators

FIRST MOVER

Shaping and challenging regulatory frameworks

Our disruptive approach as the first Digital OEM



Our first Product...



...Olli is a Connected Autonomous Shared Electric Experience



(not a bus or car)

Olli was designed on our proprietary co-creation platform...



Olli Low-Speed Autonomous Platform

Community Designer: Edgar Sarmiento, Colombia



...Launch Forth: the world's largest vehicle design platform...



Capabilities

- World's largest, most distributed and efficient R&D team
- Complex problem solving
- Conceptual and technical design challenges



- Solver community
- 200,000+ solvers globally
- 150+ challenges
 (2 month typical duration)
- **\$1M+** prizes awarded

Notable external partners/clients



SIEMENS

...and 3D printed in our Microfactory

FULL: https://youtu.be/UaOWOq-71JI SHORT: https://vimeo.com/345795994



Olli's evolution showcases our disruptive approach...



...including extensive testing and validation experience...

Testing and Validation

- CAD designed & optimized
- 3DP structure simulation + testing
- Energy absorption design & analysis
- Min and max speed crash tests
- · Drivetrain efficiency calibration and testing
- Thermal management system analysis
- NVH optimization
- Human perception data analysis

Significance

- 3D-printed chassis provides high level of crash attenuation
- Structural design and material selection optimizes load path and crash pulse reduction
- Digital design and additive manufacturing supports modeling and simulation for future enhancements
- Initial test results reveal crash performance and structural rigidity on par with commercially available vehicles



...and Leading ADAS (SAE L4+) integration

Testing and verification

- Wiring and connections quality control
- · Confirm proper synchronicity of full sensor suite
- Confirm drive by wire operations with remote control system to verify full autonomous control and functionality
- Platform calibration runs to synchronize the vehicle service brakes, steering and drivetrain
- Verify accuracy of GPS RTK link for accuracy and precision
- Autonomous drive test through obstacle course to validate driving accuracy and stopping point repeatability

Significance

- Verified effectivity and performance of autonomous driving system in controlled environment
- · Confirmed repeatability from vehicle to vehicle
- Qualified Olli autonomous and manual driving ability



Best in class autonomous driving software integration with Robotics Research

Local Motors' publishes first ever Safety Report

Olli Safety Report

- Local Motors is pleased to publish this Voluntary Safety Self Assessment (VSSA) for Olli in response to the U.S. Department of Transportation's (USDOT) voluntary guidance regarding automated driving systems.
- This assessment will address Local Motors' approach to the elements outlined by NHTSA in AV 3.0.
- As technology evolves, so will the safety protocols observed and adopted by Local Motors. We will periodically update our safety report based on real world experiences and data.

Significance

- Safety report based on real world experience and deployments in low speed, controlled environments
- Consumer education and acceptance is at the heart of our approach as evident by the Olli Fleet Challenges and our investment in the Global Demonstration facility in MD



Our goal is to drive the future, not just what drives you in the future.

Changing the Transportation Dynamic

The Race to Shared Autonomy





The Mobility Planner's Dilemma: Ridership vs Coverage



MAXIMUM RIDERSHIP

- Focus on maximum riders by serving densest, most easily accessible regions.
- Frequency: Many vehicles service fewer routes, resulting in timely and reliable service.
- Efficiency: More riders transported with fewer vehicle miles travelled. Thereby resulting in reduced transit subsidy per rider.



MAXIMUM COVERAGE

- Focus on **maximum coverage** by distributing service so all customers are near a route.
- Precision: Customers board and disembark near origin and destination.
- Equity: Providing to underserved populations like the poor and disabled.

"THE

An Olli Future vs Status Quo Today





"Status Quo" **Fixed Route Bus**





An Olli Future vs Status Quo Today: On a Campus

Current Solution

Fixed route bus service providing scheduled service to a limited number of high demand stops around a campus.



Future Solution

Dynamic services provided by on demand shuttles within geofenced district of a campus.



VS

Real World Applications



Where will shared autonomy start?



Campus Mobility: Beachhead Application

Olli is positioned to provide local campus mobility across a variety of segments



Olli is already deployed in key markets across the world...



Note: Upcoming deployments represent selected near term expected deployments; Olli deployed in 8 key markets today and over 10 by YE19; 1,200+ rides per day calculated as 80 daily rides with 16 vehicles in circulation; 25 Olli vehicles produced as 26 f September, 2019



...as Fleet Challenges drive early stakeholder engagement

ENGAGING WITH STAKEHOLDERS, INFLUENCERS & CUSTOMERS

Key Influencers & Stakeholders

- Riders and operators
- Olli fleet challenge judges
- Economic development agencies
- Commissions
- City/county organizations
- Regional business organizations
- Prominent business leaders
- Local politicians/regulators/legislators

QUALIFY PROSPECTS IN KEY OLLI SEGMENTS

Target Segments

- University campuses
- Business & industrial complexes
- Military bases/installations
- Municipalities
- Entertainment & theme parks
- Private residential communities and developers
- Airports and metropolis

Customer benefits



Direct insights into benefits of low speed autonomy



Affordable early access



Helps build policy, legislative and regulatory frameworks



Shape future operations and public safety requirements



Support sustainability initiatives

Riders are responding positively and communities are learning



10%
Detractor30%
Passive60%
Promoter

16%

Passive

81% Promoter

High stakeholder engagement via earned media





Next step: moving beyond the campus



With locally developed product extensions & variants

As the market matures Olli will transition from private campuses to public roads addressing key transportation challenges

Thank you.

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