Integrating Customer-Centric Approaches in R&D

BRIDGING R&D AND MARKET NEEDS: IDENTIFYING KEY COMMERCIALIZABLE GAPS FOR SAFER AUTONOMOUS AND SOFTWARE-DEFINED ELECTRIC VEHICLES

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DISCLAIMER

The views and opinions expressed in this presentation are my own and do not necessarily reflect the official policy or position of any organization or entity I am currently or have been affiliated with.

OVERVIEW OF THE CURRENT PROGRESS

About 3 years ago…

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May Mobility

ARGO AI

Present

Battery Management Systems
Software-Defined Vehicle
Digital Cockpit and UX

BANKRUPTCY
BUSINESS PIVOT
-M $

Why?

- Electrification
- Ecosystem
- Infra Readiness
- Customer Acceptance

Fully Autonomous Vehicles

STEP1 **STEP2** *STEP3-9?* **STEP9**

- Many mobility startups fail due to market misalignment despite technical advancements.
- A lot of works are needed between step 2 and step 9
- Seamless transitions require a lot of R&Ds to support the process
- Integrating R&D with market needs can help in accelerating time-to-market for safer and more reliable next-gen mobility solutions

THE NEEDS TO UNDERSTAND INDUSTRIAL AND CUSTOMER PAIN POINTS

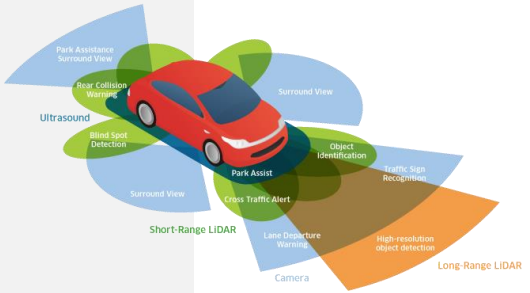
- Why the needs to integrate marketing perspectives with R&D innovations effort?
  1. **The emerging technologies productization like BEV, PHEV into emerging markets bring a lot of unforeseen challenges**.
  2. **Understanding actual customer pain points will help to research actual problems in the market.**
  3. **Speed to Market**: With the rapid evolution of consumer expectations, achieving faster Time-to-Market (TTM) is paramount for success.
  4. This will help to facilitate safer next-gen mobility the soonest to the market.

- **Resource Optimization:**
  - R&D is costly.
  - In certain countries, current R&D investments often do not translate effectively into market-ready products, leading to wasted resources.
  - Companies must focus on aligning R&D priorities with tangible market needs to maximize return on investment.
  - For universities, this will help to facilitate faster time-to-market for the new R&D outputs.

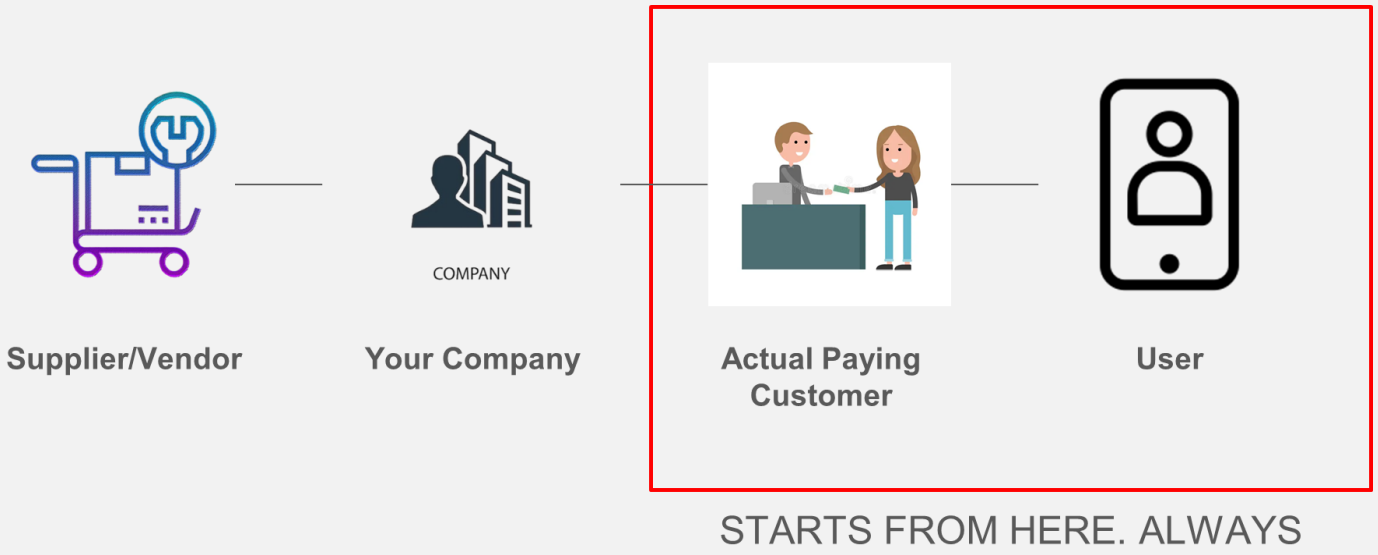
CHALLENGES RELATED TO EV INTRODUCTION IN EMERGING MARKETS

Related to Control Systems Development

Challenge	Description
Component Availability	Developing advanced control systems can hinder productization due to the need for extensive testing and homologation, compounded by supply chain and local market limitations. Do entry level cars support lidar and radar in the cost formulations?
Software Bugs and Updates (How Easy it is to be maintained for aftersales?)	Control systems rely on software for vehicle dynamics. Bugs or update issues can cause performance problems, especially in diverse environments of emerging markets.
Battery Performance Monitoring	Control systems must manage battery performance under unpredictable environmental conditions, requiring robust monitoring for optimal operation and longevity.
Cybersecurity and Privacy	Increasing regulations, such as the EU Data Act, impact how vehicle control systems manage data. Ensuring compliance with privacy laws while securing data can complicate system design and operation.



RESEARCH PRIORITIES DRIVEN BY MARKET INSIGHTS



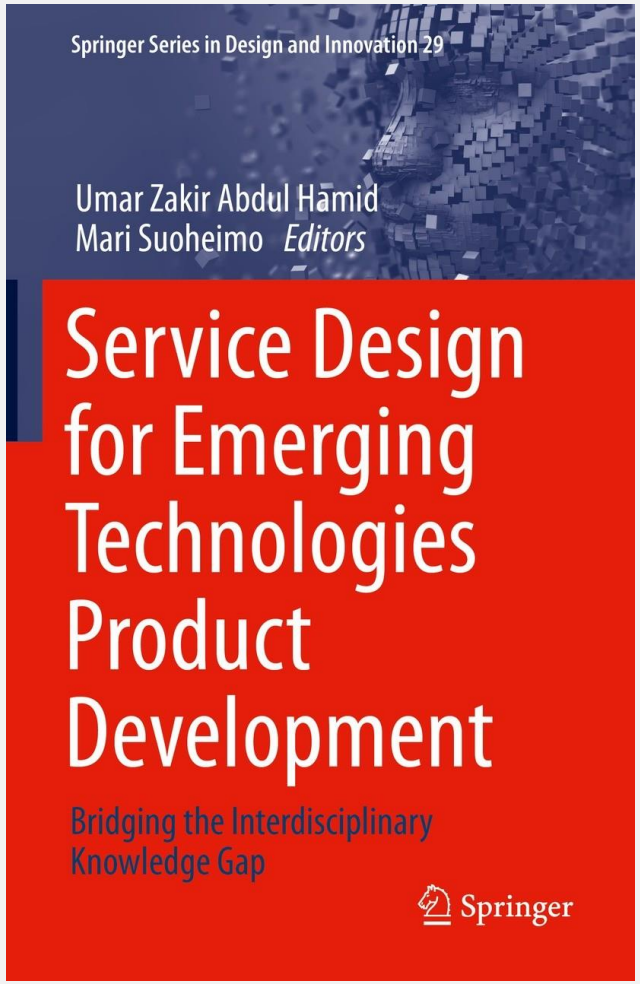
- **Mapping Customer Journeys**
  - Use surveys and feedback to understand real-world challenges.
  - Prioritize R&D efforts based on customer pain points.

Customer Persona as a Tool/Framework

- **Profile**: Ahmad, a first-time EV driver in Egypt
- **Priorities**:
  - Consistent and reliable navigation
  - Driving long distances at high speeds
- **Challenges**:
  - Charging and range anxiety due to lack of infrastructure
- **Potential Solution**:
  - Optimizing vehicle control with the Battery Management System (BMS)

BREAKING DOWN SILOS FOR EFFECTIVE R&D

Transdiscplinary Discussions for Outside-In Perspectives



- **Cross-Functional Collaboration:**
  - Encouraging collaboration between technical, marketing, and business units is essential for aligning R&D with market expectations.
- **Current Organizational Challenges:**
  - Many companies suffer from a siloed approach where different departments fail to communicate effectively, resulting in missed opportunities and delayed product launches.
- **Diversity in R&D Teams:**
  - Integrating diverse professional backgrounds, such as business analysts and control systems experts, fosters innovative solutions and perspectives in R&D.
- **Expected Outcomes:**
  - Enhanced collaboration can significantly reduce inefficiencies and accelerate the overall innovation process, leading to quicker market introductions.

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MARKETING PERSPECTIVES IN ML-BASED AUTOMOTIVE R&D

Machine Learning in Automotive Development

- The integration of machine learning (ML) into R&D can drive innovations in product features and user experiences. Integrating market feedback can improve it further (see photo)

However, Awareness and Feature Utilization is Important

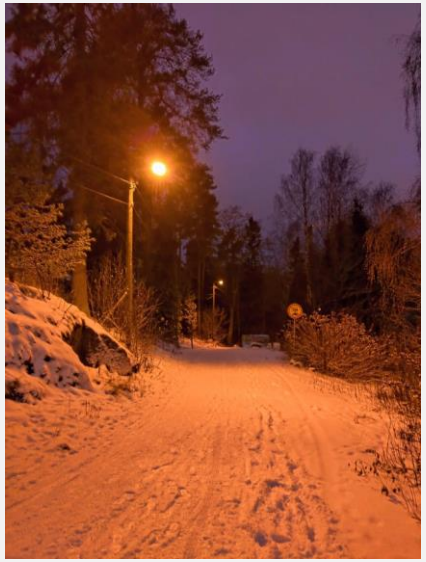
- A case study reveals that some Battery Electric Vehicle (BEV) features go unused simply because customers are unaware of their existence.

Aligning ML with Market Insights:

- By ensuring that ML applications are closely aligned with customer needs and expectations, companies can enhance safety features and overall usability.

- Driver Monitoring Systems with overly active warnings (false positives and false negatives) will lead to increased distractions.
- There are different human factors (HF) and user experience (UX) behaviors in the EU and China (for example).

LOCALIZING ML FOR SAFER CASE MOBILITY



- **Importance of Localization:**
  - Tailoring machine learning algorithms to fit local driving conditions and cultural contexts is vital for their success.
- **Regional Examples:**
  - For instance, traffic patterns and weather conditions in South Africa significantly differ from those in Finland, necessitating different approaches in algorithm development.
- **Goals of Localization:**
  - Localized ML solutions can enhance predictive capabilities for driver behavior and minimize risks associated with different road conditions.
- **Collaborative Efforts:**
  - Building partnerships with local stakeholders can provide valuable insights into regional challenges and regulatory requirements.

IMPLEMENTING SAFER SD-BEVS

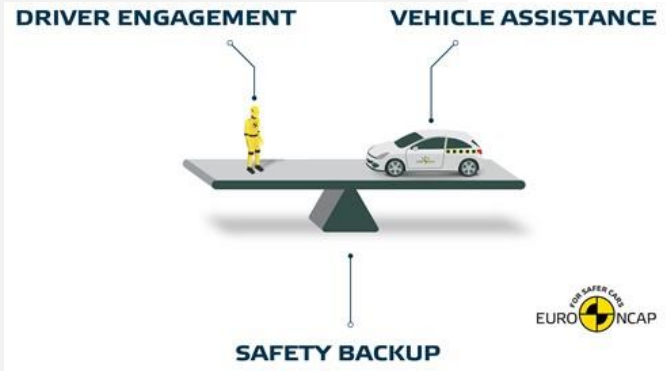
INCREASING THE ADOPTION FOR NEXT-GEN MOBILITY AND LEARNING CURVE TO PRODUCTIZE AUTONOMOUS VEHICLES

- **Focus on Software-Defined Battery Electric Vehicles (SD-BEVs):**
  - Applying the concepts of machine learning and market input to enhance safety features in SD-BEVs.
- **Improving Safety Features:**
  - Utilizing customer feedback to identify pain points and enhance collision avoidance features can significantly improve user safety and satisfaction.
- **Real-World Impact:**
  - Showcasing the effectiveness of implemented technologies in reducing accidents and improving the overall user experience.

Regulatory Considerations - Addressing Barriers to Development

- Understanding regional regulations affecting technology deployment.
- Need for strategies to navigate regulatory challenges.

- Incorporating Market Feedback into R&D from the Start
- Building Products with Homologation Requirements in Mind from Day One
- Faster Learning Curve Iteration towards Full CAV Mass Adoption

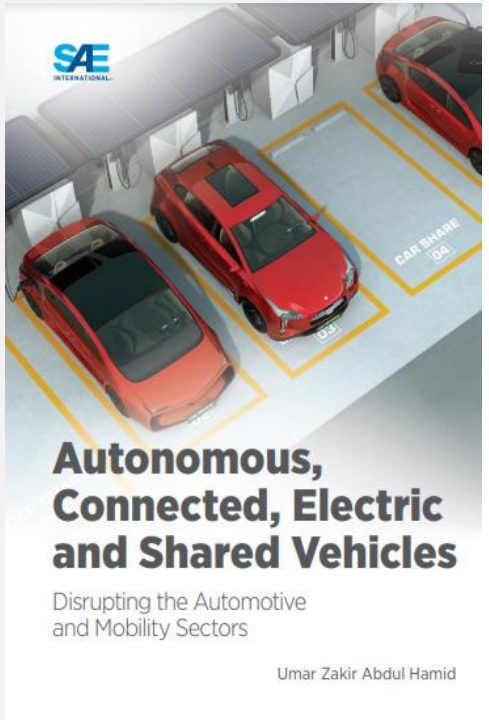


ASEAN NCAP

CONCLUSION

- **Summary of Findings:**
  - The need for a robust synergy between R&D and market insights is critical for enhancing safety and reliability in CASE mobility.
- **Key Takeaway:**
  - A focus on cross-functional collaboration and a customer-centric approach will enable faster adoption of new technologies in the market.
  - Towards faster market-ready lifecycle of R&D outcome.
- **Future Directions:**
  - Further **transdisciplinary research** is necessary to quantify the impact of R&D integration on productization and market readiness.
- **Call to Action:**
  - A collaborative effort involving technical, business, and regulatory stakeholders is essential for advancing the development of safer and more efficient CASE mobility solutions.

"in the long run, leaders from different companies who encourage and prioritize cross-functional communication will be able to co-create the ecosystem we've envisioned for years"



THANK YOU

Software-Defined Vehicle | Digitalizatio

X-as-a-Service | CASE Mobility

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