U ▪ S T

zinnov

NEXT-GEN ENGINEERING

Transformation Across Chip-to-Cloud

JULY 2022

TABLE OF CONTENTS

Engineering and R&D (Research & Development) activities have been at the core of the industrial revolution. It has helped individuals prosper by making laborious tasks easier and hassle-free. From making mobility efficient, driving speed and efficiency, and performing complicated tasks, among others — Engineering has significantly transformed the Manufacturing, Hi-Tech, and Services-led verticals, over the last 2 centuries.

Furthermore, since the onset of the pandemic, a chasm has opened across various verticals, particularly for digital-heavy ones like the Software & Internet. To stay ahead in the game, enterprises across the globe are reassessing their business strategy for the future. Today, they have one common goal in mind — taking control of end-to-end engineering.

To facilitate this vision, global enterprises are transitioning every nuance of their industry, starting from the Chip-to-Cloud, to stay relevant and improve customer experience.

PANDEMIC IMPACT ON THE ENGINEERING MARKET

OVERALL ENGINEERING AND R&D SPENDING HAS REMAINED RESILIENT

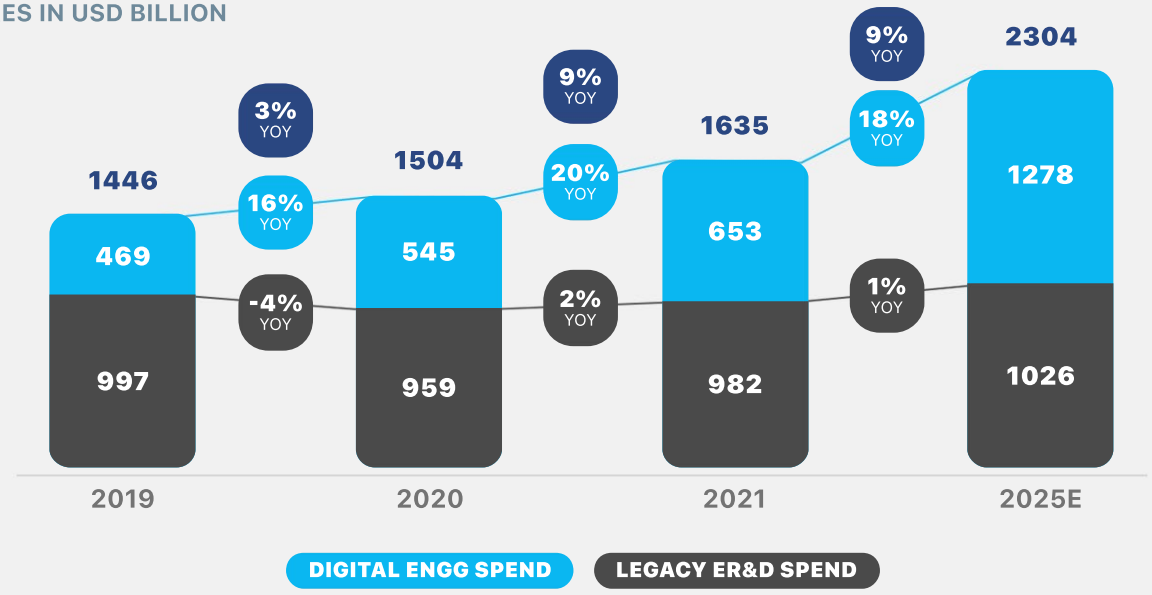
The pandemic has impacted enterprises across verticals resulting in various types of budget cuts, but the overall Engineering and R&D spending has remained resilient. This is majorly led by investments in Digital Engineering to accelerate innovation and bridge the gap between the market demand and existing capabilities.

What is Digital Engineering?
Digital Engineering focuses on enhancing customer experience and operational efficiencies enabled by next-gen engineering skillsets such as the Cloud, AI/ML, IoT, Analytics, etc.

What is happening in this space since the pandemic?
Due to the pandemic, Engineering and R&D spend growth slowed down in 2020 with a nominal 3% YoY growth reaching USD 1.5 Tn. However, in 2021, the spending reached pre-covid growth levels, growing at 9% YoY to reach USD 1.6 Tn.

Further, the Legacy Engineering spending marginally grew by 2% YoY in 2021, standing at USD 982 Bn, while the digital engineering spend stood at USD 653 Bn, growing by 20% YoY in 2021.

ER&D SPEND (2019-25E)
ALL FIGURES IN USD BILLION



CHANGE IN THE INDUSTRY DYNAMICS

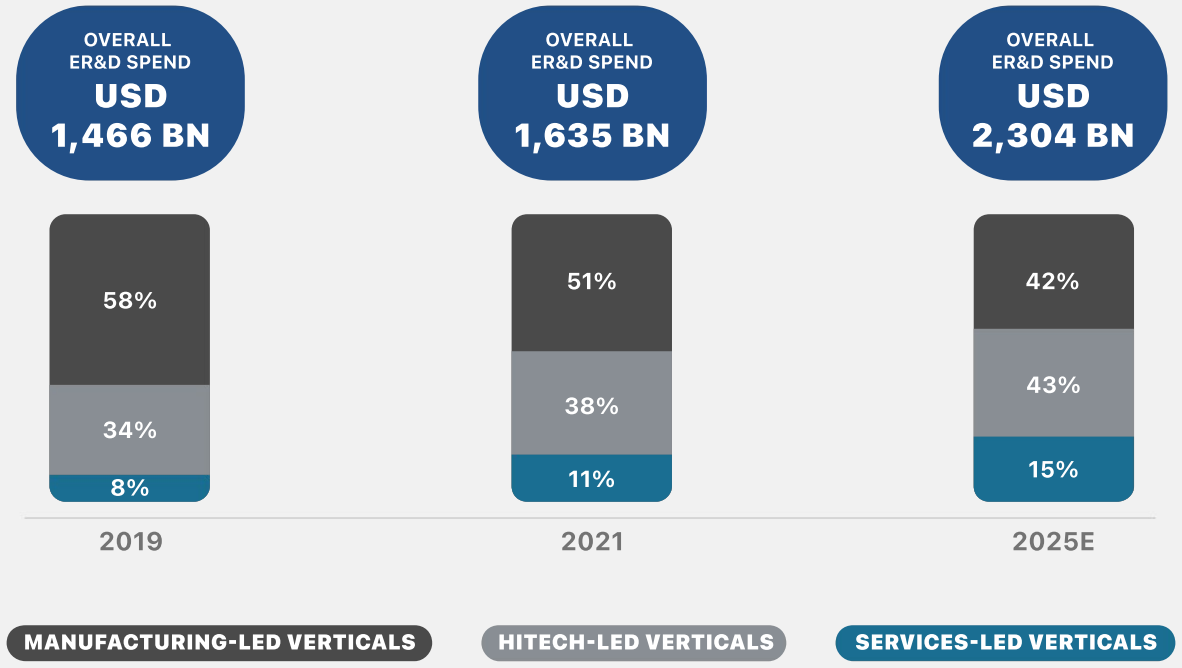
While the pandemic has impacted enterprises across verticals, the quantum of impact across the different types of verticals varied. The ecosystem is broadly divided into 3-types of verticals:

MANUFACTURING-LED VERTICALS	HI-TECH LED VERTICALS	SERVICES LED VERTICALS
Aerospace	Software & Internet	Retail
Automotive	Consumer Electronics	Healthcare (Players & Providers)
Industrial	Semicon	BFSI
Construction & Heavy	Telecom	Media & Entertainment
Pharma & Biotech	Storage & Peripherals	Travel & Hospitality
Medical Devices		

Traditionally, Manufacturing-led verticals such as Automotive and Aerospace used to dominate the ER&D market. However, it faced the brunt of the COVID-19 pandemic, with their revenue being hit significantly, impacting the total availability of funds. Thus, to balance expenses, the ER&D spending had to be compromised.

In recent times, despite their recent recovery, the contribution of Manufacturing-led verticals to the overall ER&D spending has reduced from 58% in 2019 to 51% in 2021. This downfall of numbers has put an enormous strain on the sustenance and maintenance of existing products, coupled with the need for investments toward new-age digital engineering workloads.

PAST VS FUTURE INDUSTRY LANDSCAPE



Conversely, Hi-Tech verticals such as Software, Semicon, and Telecom have stayed relatively immune to the detrimental effects of COVID-19. They are on a higher growth trajectory due to the high demand for software applications, chipsets, higher bandwidth, connectivity, and more.

On the other hand, Services-led verticals such as BFSI, Retail, Media & Entertainment, and Healthcare had minimal contribution in terms of the ER&D spending. Instead, they invested heavily toward IT areas. However, the growing need for customer-facing platforms such as Digital Banking, OTT, Telehealth, and Frictionless Commerce solutions, has led to the acceleration of Digital Engineering investments across these verticals, now more than ever.

Thus, it's safe to believe that the Hi-Tech and Services-led verticals have been able to navigate the pandemic better than Manufacturing-led verticals, due to their increased focus on next-gen engineering areas.

NEXT-GEN ENGINEERING

HIGH TRACTION IN NEXT-GEN ENGINEERING INVESTMENTS

Next-gen engineering paves the way for innovation and development beyond legacy platforms and systems. It offers the potential to re-think, re-define, and innovate to create more value for customers and differentiate oneself from peers to win in the long run.

The ER&D industry has arrived at an inevitable point of inflection where players across industries will either disrupt or face disruption from competitors.

To stay ahead of the disruption curve, next-gen engineering trends are rapidly growing across verticals. The widespread adoption of these next-gen engineering solutions is helping industries breakthrough decades of stagnation and address new-age challenges with cutting-edge solutions.

DIGITAL ENGINEERING FUTURE OUTLOOK

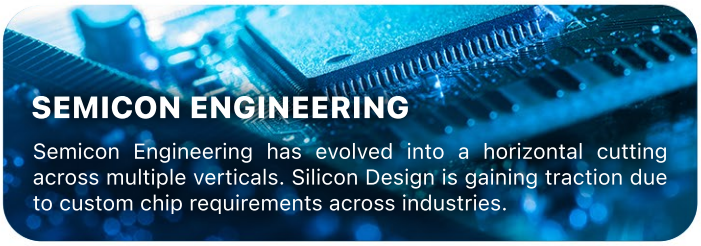
By 2025, the spending on digital is expected to be 1.2X of Legacy Engineering spending based on Zinnov's optimistic growth projections. Digital is expected to drive the growth at 18% CAGR, whereas legacy spending will remain stagnant. Further, next-gen engineering technologies and trends are expected to drive the spending growth in the ER&D market.

TOP TRENDS IN NEXT-GEN ENGINEERING: CHIP-TO-CLOUD

Zinnov's analysis and interactions with global experts across 12+ verticals, such as, Sustainability, Semicon Engineering, IoT, and the Cloud reveals that multiple next-gen engineering trends will drive the market forward.

CLOUD/AI

Platforms are being built on Cloud/AI to pre-process data closer to the source reducing the computational burden across systems.



SEMICON ENGINEERING

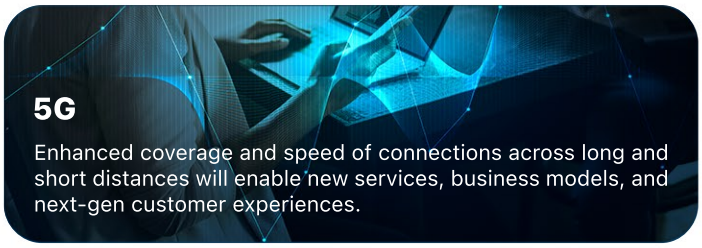
Semicon Engineering has evolved into a horizontal cutting across multiple verticals. Silicon Design is gaining traction due to custom chip requirements across industries.

IOT

IoT is driving the ongoing digitization & connection of various devices. Connected devices are expected to reach 29 Bn by 2030.

SUSTAINABILITY ENGINEERING

Adoption is buoyed by growing consumer preference and investor interests in sustainable products and energy transition.



5G

Enhanced coverage and speed of connections across long and short distances will enable new services, business models, and next-gen customer experiences.

DIGITAL THREAD

Across the value chain, Digital Thread is incorporating intelligence at every step and enabling outcomes by intertwining next-gen technology into the process.

Enterprises across the globe are expected to drive investments across the Chip-to-Cloud to drive their Engineering portfolio forward.

NEXT-GEN ENGINEERING TRANSFORMATION ACROSS VERTICALS

The critical next-gen engineering trends are influencing the way enterprises are looking at future avenues to accelerate innovation and investments. The factors responsible for the same are stagnated growth, limited differentiated offerings, disruption by start-ups, etc.

The trends riding the next-gen engineering transformation wave tend to vary across verticals. There is increased focus on the Chip-to-Cloud Engineering capabilities across industries. Major trends across focus verticals and their business impacts are listed below:

AUTOMOTIVE

NEXT-GEN ENGINEERING TRENDS	IMPACT
CUSTOM CHIPSETS (SEMICON ENGINEERING)	
Enterprises are investing heavily to deliver connected and autonomous functionalities in their vehicles without compromising on performance. They are trying to achieve this by creating custom chipsets on their own which can deliver better outcomes.	• High-performance computing systems • Decoupling of software & hardware • Reduced complexity
DIGITAL THREAD	
Enterprises across are changing the way they use data. Digital thread concept overcomes bottlenecks and replaces manual or semi-manual work by leveraging data collected across the lifecycle.	• Personalized customer journey due to data collection across lifecycle • Digital transformation of product creation process • Digital/ Automated factory floor
SUSTAINABILITY ENGINEERING	
Sustainable mobility has been the focus areas of OEMs driven by the disruptions from the likes of Tesla, Rivian, etc. OEMs are investing nearly 35-40% of their R&D spend towards sustainable mobility options such as Electric Vehicles & carbon emission reductions.	• Sustainable mobility offerings for customers • Meeting Government emission mandates

MEDICAL DEVICES

NEXT-GEN ENGINEERING TRENDS	IMPACT
CONNECTED CARE	
Increased proliferation of connected devices, robots and cloud to drive spend for medical devices firms. Robotics can empower experts with remote surgeries at pinpoint precision and connected devices such as fitness bands, watches, pacemakers, etc. have the potential for remote monitoring.	• Remote monitoring, Remote diagnostics, and remote care • Robot assisted surgery
PRODUCT SECURITY & DATA PRIVACY	
Enterprises are significantly investing in cybersecurity to make the most of the data by protecting and analyzing the patient's medical history. Enterprises strongly believe in effective data management, hence, are developing solutions built on the foundation of absolute control of data by the patient.	• Secure patient records • Secure remote diagnosis and Telehealth • Elimination of redundancies and uniformity of data
SIMULATION SOLUTIONS	
Enterprises are investing in Digital Engineering solutions to run iterations and simulations by incorporating multiple variables. These solutions are making the process of innovation easier by eliminating complex steps of iterating testing scenarios.	• Cost effective from design to prototyping stage • Faster time to market • Remote testing/simulation is possible

RETAIL

NEXT-GEN ENGINEERING TRENDS	IMPACT
FRICTIONLESS COMMERCE	
Touchless solutions have to potential to make the shopping experience a delight and frictionless for the customers. Enterprises are building retail solutions like shopping through the mobile app, Walk-In-Walk-Out, Autonomous shopping, etc. These solutions make the in-store customer experience seamless.	• Improved in-store customer experience • Improved margins and profitability
PARTNERSHIP-LED INNOVATION	
Amid the race to technological superiority, enterprises have realized that to not get disrupted it is important to work together with various technology providers, start-ups and academia on cutting-edge technologies. The partnership model is a mutually beneficial way forward by minimizing risks and maximizing the possibility of success.	• Faster product development and GTM • Reduced development cost and risk • Higher value delivered to customers

SEMICONDUCTOR

NEXT-GEN ENGINEERING TRENDS	IMPACT
DISAGGREGATED CHIPS	
Disaggregated chip design is driving the differentiation across fabless players to use 3rd party Silicon IPs to deliver new products faster and cheaper. Thus, players are investing in quality 3rd party IPs that are verified at IP/chiplet level for faster Go-to-Market.	• Reduced development time • Over 10X reduction in bugs • Opportunity to reuse the IPs across multiple products
PACKAGING INNOVATION	
As Moore's Law is converging to 5nm node, 3nm, and 2nm nodes. At these nodes, the die becomes very expensive to manufacture and utilizing the die economically becomes complex. To eliminate the complexity in manufacturing enterprises are investing in Chiplets i.e. breaking the die into smaller pieces.	• Higher computational power • Reduced die complexity and cost • Better thermal management

TELECOM

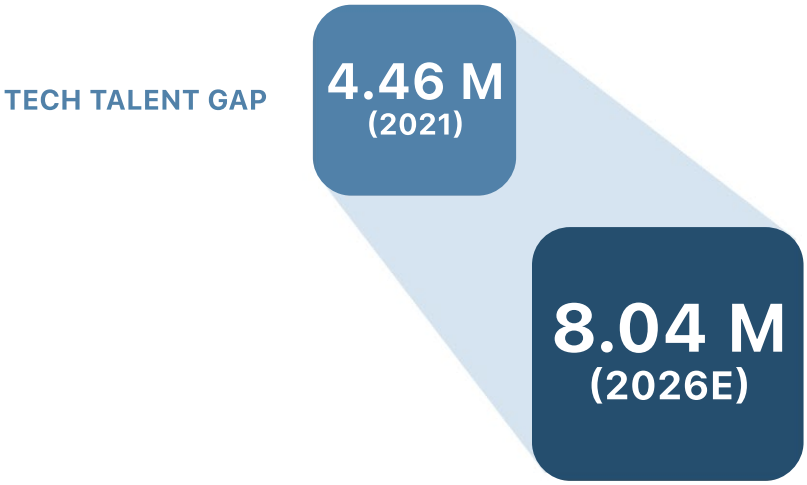
NEXT-GEN ENGINEERING TRENDS	IMPACT
AI ON EDGE	
Enterprises across industries are investing in devices and machines that can operate with the intelligence of human cognition. AI on Edge enables AI computation near the user at the edge of the network, close to where the data is located, rather than centrally in a cloud computing facility or private data centre.	• Realtime data visibility and analysis • Reduced network costs • Decentralized and offline data processing
PRIVATE 5G	
Enterprises across industries are investing in leveraging Private 5G and connected devices across use-cases requiring low latency such as Autonomous driving, performing remote surgery, edge computing, etc. to stay ahead of the innovation curve and deliver best-in-class services to customers.	• Low latency and very high internet speeds • New avenues for development in connected devices • Ease of remote diagnostics and control

CHALLENGES IN NEXT-GEN ENGINEERING

Though industries across the Manufacturing, Hi-Tech and Services-led segments have ramped up their focus on next-gen engineering areas. However, in recent years, they are encountering various challenges.

TALENT SHORTAGE

To impact the marketplace and carve out a niche for themselves, enterprises need to hire good talent across the next-gen engineering skillsets. But this is easier said than done with the Engineering industry witnessing a skilled-talent crunch. Therefore, realizing the full potential for digital transformation without a large availability of the right kind of talent has become a top challenge.



Further, the pandemic catalysed the digitization of products across enterprises from various industries. This is demonstrating a high-growth opportunity and is estimated to open nearly 149 Mn new digital roles between 2021-25. But a variety of external factors are creating a supply-demand gap in the market. For instance, the enterprises had to grapple with the 'Great Resignation' in 2021, where a record 69 Mn Americans quit their jobs for better pay and benefits. It's impact still lasts and is forcing global companies to increase their incentives to get the best bet for talent. This is coupled with the 'Great Inflation,' where the compensation costs saw an increase of 4.4%, resulting in a challenging market scenario, from a talent dynamics perspective. Further, Zinnov's analysis reveals the tech talent gap would be close to 8.04 Mn by 2026 due to the persistent hunt for talent.

LACK OF CHIP-TO-CLOUD CAPABILITIES

Over the years, enterprises operating across verticals have invested in developing capabilities and hiring talent dedicated to a specific suite of capabilities within a vertical. As the next-gen engineering trends pick pace, the boundaries between verticals and horizontals are fading significantly. To get an edge over peers, enterprises need to focus on becoming agile and cross-integrate horizontal capabilities. However, the lack of necessary skillsets such as Chip Design, Cloud Engineering, etc., are putting them at the risk of being left behind. This is being coupled by new-age players with Chip-to-Cloud capabilities causing multiple challenges for enterprises. For example, new-age Automotive players with Chipsets, Autonomous Driving algorithms, and Cloud capabilities have compelling offerings for their customers.

PRESSURE ON ER&D BUDGETS

Despite the need to channel new investments into next-gen engineering areas, enterprises are under constant pressure to control their ER&D budgets. To start with, they need to optimize their Legacy Engineering budgets which are directed towards maintaining and sustaining their existing product portfolio. Followed by, squeezing dollars from the budget and leverage it to fund their next-gen engineering investments. This, along with the limited bandwidth, increases the burden of managing the Legacy Engineering areas effectively.

NEED FOR RELIABLE PARTNERS

Before the pandemic, enterprises were more comfortable partnering with vendors with specific expertise. Some of the key factors for partner selection were previous experience, expertise, cost, and engagement models.

Everything changed amid the pandemic when enterprises had to scale up offerings and expand portfolios with new solutions. One-stop-shops became the top priority to help reduce touchpoints and overall costs - a practice that has since remained prevalent across industries.

Today, enterprises have realized the benefits of an end-to-end partner to help them with efficient project management possibilities. They can get better cost structures and seamless assistance in portfolio expansion and digital transformation..

END-TO-END ENGINEERING SOLUTION BY UST

UST, a leading digital transformation player, has invested in and built end-to-end Product Engineering offerings to address next-gen engineering challenges faced by enterprises.

With their suite of end-to-end engineering offerings spanning embedded, silicon, software, and hardware segments, they are helping enterprises bridge the gap between supply and customer demands. They are becoming a partner of choice across next-gen engineering segments such as Cloud/AI, IoT, etc., by offering one-stop-shop solutions and an attractive partner ecosystem.

Over the years, UST has delivered customized solutions across verticals like Semiconductors, Medical Devices, Smart Devices, and more. They have helped customers enjoy faster product development cycles, go-to-market, fewer touchpoints, impact their P&L positively, and create differentiation among peers.

Here are a few case studies where UST built end-to-end engineering solutions that are creating huge traction in the market.

CASE STUDY 1
A LEADING GLOBAL PROVIDER OF SMART CITY TECHNOLOGIES

The client is a US-based global leader in smart city technologies. They have extensive expertise in smart lighting controls and smart city applications. They help cities, towns, municipalities, and utilities future-proof their investments and become smarter, safer, and more sustainable. The company had the vision of accelerating the time-to-market of its best-in-class smart lighting controls and smart city platforms to help cities and utilities realize the benefits of their solutions faster.

Challenges Addressed:

- Need for end-to-end Engineering support in High-Tech services across Software Development, Manufacturing, R&D, Supply Chain, Firmware, Cloud platforms, and Mobility.
- Support in delivery growth across geographies, including, North America, Latin America, and Australia.

Solution:

UST utilized its strong Semiconductor capabilities and UST BlueConch's deep experience in Product Engineering to uniquely position the partner to meet their growing global market demand. UST largely worked on Manufacturing, Supply Chain, and Firmware development, while UST BlueConch focused on Software, Cloud services, and Customer Support.

UST focused on enhancing and scaling up the partner's highly reliable product lines with the help of its skilled Hardware, Firmware, and Software engineers. Additionally, UST optimized the Supply Chain and Procurement by incorporating localization wherever feasible. Focused on intelligent lighting systems, the multi-year partnership involves all aspects of the business from system design to operations. The solutions will be delivered out of UST's multiple Centers of Excellence (COEs) across the globe. UST also went above and beyond to actively pitch the partner's solutions to its customers in 25+ countries where they have their operations running.

The solution provided by UST significantly influenced and enhanced the partner's product lines and supply chain, thus translating to higher growth across geographies and a positive impact on P&L.

CASE STUDY 2
US-BASED AUTONOMOUS GROCERY RETAILER

A niche US-based Autonomous Grocery Retailer opened its first store in Georgia. It is approximately 1500 sq. ft, with autonomous, hybrid, bistro, and back-office facilities and stocks more than 1500 stock keeping units (SKUs). It offers items such as meats, baked goods, dairy, and ready-to-have meals, alongside everyday grocery items with no checkout. Anchored in the store is a bistro that offers freshly prepared breakfast, lunch, and dinner items, including sandwiches, salads, and healthy rice bowls.

The outlet is an innovative convenience store that has a hybrid frictionless checkout system built by UST. They further plan to deploy 500+ similar stores in the US with UST's support.

Challenges Addressed:

- Need for an end-to-end Retail solution across multiple workstreams in the store
- Onboarding a trustworthy partner to support with ideation and implementation
- Improving customer experience through a differentiated contactless shopping experience during the pandemic

Solution:

UST helped automate the store and successfully create a hybrid autonomous technology to offer innovative solutions and combat food insecurities in underserved communities. They provided end-to-end project management solutions for the client's store. Further, UST implemented their Vision Checkout solution at the store to automate the entire shopping experience and help improve customer experience.

UST Vision Checkout is a self-checkout POS that uses computer vision to identify SKUs. Along with this, Voice and Gesture AI technologies lead to a 3X faster checkout experience for customers. UST Vision Checkout also has barcode scanning and touchscreen functionalities that cover specific merchandise sections like age-restricted products, frozen assortment, fruits and vegetables, and the bistro.

Other features of the store which create a seamless shopping experience include the UST Scan & Go solution, curated for specific events and customer types. In addition, the UST Product Box, which facilitates the quick onboarding of SKUs requiring Computer Vision training. Further, the UST Cold Truth provides IoT-based, real-time food temperature measurement at the shelf level, improving the store operational efficiency. Followed by, the UST Store, that offers dynamic content display capabilities and comes with monetization opportunities by providing audience analytics.

Automated shopping is enabled by the UST-built Customer mobile app (scanning a QR Code on the entrance turnstile). The items selected by the consumers are automatically added to a virtual shopping cart tracked via a LIDAR camera, and the information is sent to a backend software built by UST. Additionally, the company has also developed a complete e-commerce application for the client. Further, the system provided by UST is integrated with a robotic delivery system from another partner for helming last-mile delivery.

CONCLUSION

Today, enterprises focus on next-gen engineering capabilities and horizontal integration technologies to stay ahead of disruption. However, they struggle to differentiate their solutions from their competitors.

To resolve this growing concern, enterprises must go beyond the traditional evolutions and offer digitally transformed products with a critical focus on Chip-to-Cloud transition. Further to support and accelerate transformation, enterprises must choose technology partners that complement their journey and assert their impact and dominance across markets.

Leaders who tap into these trends at the earliest will experience long-term success for their business.

AUTHORS

KINGSLEY SAMUEL
Principal
ZINNOV

MOIN MOOSA
Project Lead
ZINNOV

ABOUT UST

For more than 20 years, UST has worked side by side with the world's best companies to make a real impact through transformation. Powered by technology, inspired by people and led by our purpose, we partner with our clients from design to operation. Through our nimble approach, we identify their core challenges, and craft disruptive solutions that bring their vision to life. With deep domain expertise and a future-proof philosophy, we embed innovation and agility into our clients' organizations—delivering measurable value and lasting change across industries, and around the world. Together, with over 29,000 employees in 30+ countries, we build for boundless impact—touching billions of lives in the process. Learn more at www.ust.com.

ABOUT ZINNOV

Founded in 2002, Zinnov is a global management and strategy consulting firm with a presence in Santa Clara, Houston, Bangalore, Gurgaon, and Paris. With a team of experienced consultants, subject matter experts, and research professionals, Zinnov assists Software companies, Global System Integrators, Enterprises, and Private Equity firms in developing actionable insights that help them create value – across dimensions of both revenue and optimization. Over the past 20 years, Zinnov has successfully consulted with over 250+ Fortune 500 companies by:

- Structuring and implementing Digital Transformation levers enabled by technologies like AI/ML, Cloud, IoT, and RPA.
- Advising global PE firms in asset shortlisting and target evaluation, commercial due diligence, and value creation.
- Helping global companies outline and drive their open innovation programs, design and operate accelerator programs, and enable collaboration with start-ups across specific use cases and predefined outcomes.
- Enabling global companies to develop and optimize a global engineering footprint through center setups and technology and functional accelerators to achieve higher R&D efficiencies, innovation, and productivity.
- Growing revenue for companies' products and services in newer markets through account intelligence, market entry, and market expansion advisory.

For more information, reach out to us at info@zinnov.com, or visit us at www.zinnov.com.