INNOVATION-LED R&D CREATING THE NXT PROGRESSIVE WORLD

Makers Lab™ Case Study Compendium

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We are at the precipice of change, triggered unwittingly by the pandemic that ravaged the world.

At one end, the pandemic made us realize the frailty of human life, and at the other, it triggered breakthroughs which have the potential to change the way we foresee the future.

I like to joke that the pandemic made virologists out of us data scientists and vice-versa.

At Tech Mahindra, the Makers Lab has been at the cutting edge of this change from the get-go.

Whether it was finding a therapeutic molecule to attack COVID-19 or creating an SOS service app to help communities, the team at Makers Lab has been working tirelessly to keep technology at the forefront with our customers, partners, academia and the government.

COVID-19 also proved that:

- Trust is a two-way street and technology has a big role to play.
- Diversity brings out an inclusive and democratized innovation.
- Business models must become flexible and durable for change.
- The old must give way to new be it in technology or processes.

While the team at Makers Lab presents this compendium of innovative case studies, I am upbeat about the change that is on the horizon…

A change that promises to alter the very fabric of IT going forward, one that is triggered by the likes of **R**obotics, **Q**uantum **C**omputing, **E**xtended **R**eality, **B**lockchain and **C**ognitive **A**rtificial **I**ntelligence.

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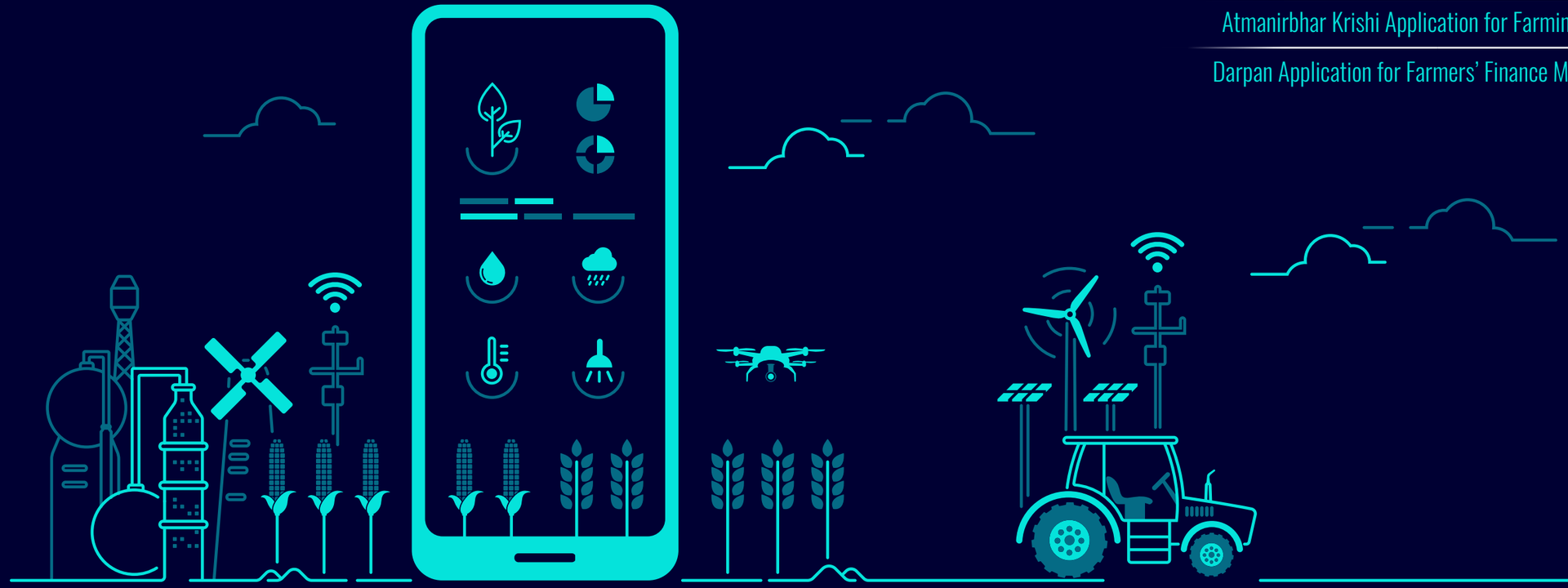


CASE STUDY

Panchang Intelligence for Accurate Weather Prediction

QUICK OVERVIEW

Short term weather predictions can be reasonably accurate but the same can't be said for longer term weather predictions.

At Tech Mahindra, rooted in ancient Indian knowledge we launched Panchang Intelligence (PI) for long-term weather prediction using Panchang (Indian Almanac)

BUSINESS CONTEXT

Today, the weather prediction apps available in the market are able to provide the forecast with a reasonable accuracy for the near future, like around a couple of weeks. But as we try to get the forecast for a longer duration in the future, the accuracy goes down drastically. On the other hand, the ancient Indian almanac, called Panchang has been providing fairly accurate predictions for daily rainfall for more than a year and a half in advance.

There is a need to assess the Panchang's accuracy and relevance across the world, and then bring it out in a usable format that can be used not only in agriculture but all the other weather-dependent industries.

APPROACH AND SOLUTION

Discovery: Tech Mahindra team started the analysis as a research project. We developed a weather forecast based on the Panchang rules that involve planetary positions. Then we tested this with 40 years of revalidated data (1980 to 2020) across 7 locations in India and 8 locations across the world, spanning all continents from Australia to America. The results have been amazing, as we are able to see a very high level of accuracy across the world.

Optimization: Further, we built a weather channel for anyone to visit and view the results. Additionally, an API for the same has also been made available. The weather channel takes the input as a GIS location in terms of latitude/longitude. It also has a feature to point a location on the map or enter a pin code (India). Based on this and a time range, the daily rainfall predictions are given.

Roadmap: Tech Mahindra team has built this weather channel which is about to be launched. We are also publishing the results in appropriate journals so that they can be validated.

We believe that this API and weather channel will be relevant for multiple areas, e.g.

- Agriculture
- Insurance
- Banking and Finance
- Building Infrastructure and many more

IMPACT & HIGHLIGHTS

- Promising results for accurate weather prediction across the world
- Available as weather channel and API
- Provides much needed weather prediction for multiple industries

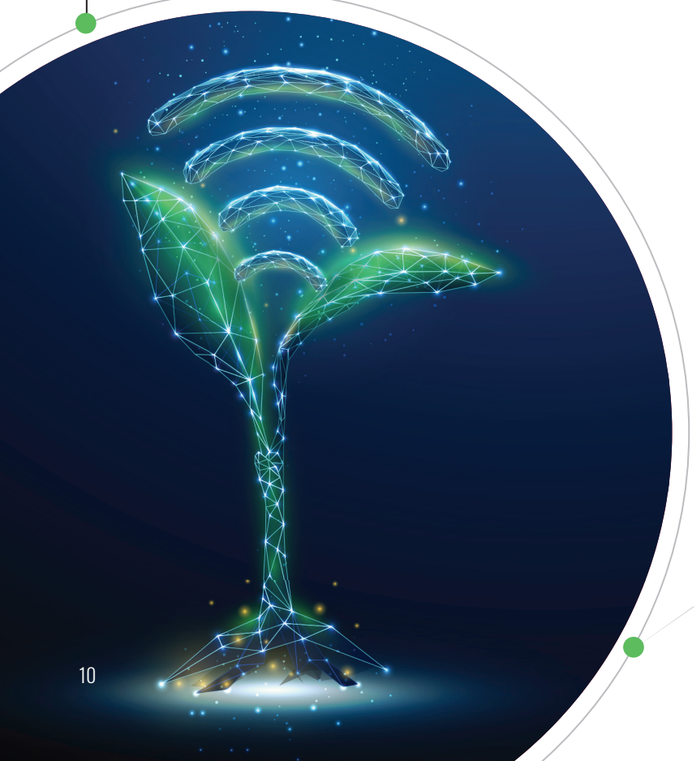
CASE STUDY

Atmanirbhar Krishi Application for Farming Insights (1)

QUICK OVERVIEW

Doubling farmers' income is one of the major goals for the Government of India, and we realize, this can only be achieved through the use of technology.

As a response, we worked on a platform that could help **140 million farmers** in India. The Office of Principal Scientific Advisor (PSA) launched the "Atmanirbhar Krishi" application under the Kisan Mitr platform to provide farmers actionable insights about farming and to provide early weather alerts. **The Atmanirbhar Krishi application has been built by the Tech Mahindra Makers Lab™ team and the data for this is being provided by various government departments.**



BUSINESS CONTEXT

In order to progress, thrive, and succeed, the farmers in India need to be equipped with all scientific information about the farming. This should help them double their income with allied and non-allied businesses and sustain this with technology. Driven by this thought, the office of the Principal Scientific Adviser (PSA) to the Government of India started a program, and with the support of Tech Mahindra and partners, we built a platform called **Kisan Mitr-Friends of the Farmer.** We also enabled scientific information generation for the farmers through a zero touch, zero-cost mobile app called **"Atmanirbhar Krishi"** (which directly translated to self-sufficient farming). The app collects data related to soil, fertilizer, crops, and so on.

APPROACH AND SOLUTION

Discovery: Tech Mahindra team started working with the Office of PSA and partners, for discovery and interpretation of data which was locked in different departments of the governments like Indian Meteorological Department (IMD), Indian Space Research Organization (ISRO), Department of Agriculture Cooperation & Farmer Welfare (DACFW), The Indian Council of Agricultural Research (ICAR), National Water Informatics Centre (NWIC) and Central Ground Water Board (CGWA).

Optimization: By understanding the domain from experts, we identified Weather forecasts, Weather based information from Indian Meteorology Department, Soil analysis, Crop analysis from the DACFW and ICAR, Land surface information, Vegetation index from ISRO, and surface and ground water information from NWIC, which includes CGWA.

Roadmap: Tech Mahindra team then designed and built a very simple, easy to use app which has the following features.

- Zero-input, zero-cost for the farmers of India
- Available in 12 different Indian languages
- Detailed scientific parameters and information on how to use them
- Allows sharing of information across platforms, and also has features like text to speech
- Available for use by farmers, start-ups, Krishi Vikas Kendras, Self Help Groups or NGOs
- Excellent feedback from KVKs across India

IMPACT & HIGHLIGHTS

- Available for 140 million farmers in India
- Improves the understanding of various parameters of the farm by the farmer
- A framework that can be implemented across the world

CASE STUDY

Darpan Application for Farmers' Finance Management

QUICK OVERVIEW

In order to progress, farmers need to adopt an entrepreneurial mindset within the manufacturing industry that will help them better manage their finances in the process. Unfortunately, there are many farmers who are living in financial debt in India.

To address this, **Makers Lab™ at Tech Mahindra introduced "Darpan" application to 140 million farmers across India to provide them with the tool they need to control and manage their finances more effectively.**

BUSINESS CONTEXT

In India, most farmers own less than 2 hectares of land. They are actually entrepreneurs, but they seldom perceive themselves that way. This is evident by the numerous cases of unfortunate farmers who got into a debt trap and lost their farms, and in extreme conditions, their lives. They are also proprietors, and hence their family and farm income and expenses mostly get intermingled and lead to confusion about where they stand financially. This is a critical need and with 140 million farmers in India who are at the bottom of the pyramid, the Darpan app launched by **Makers Lab™** at Tech Mahindra is timely and addresses the need very well.

APPROACH AND SOLUTION

Discovery: Tech Mahindra team discussed at length with agriculture experts, who have worked with farmers in the interiors of the country for years, and designed a simple to use app which provides them ways to capture information about their spending and income for their farm and their home separately.

Optimization: The app provides a unique ability to capture information about exchanges between the farm and the family too. For example, if farm produce is used for the family or the family comes and works on the farm, even these transactions are captured. Moreover, the app provides a monthly MIS, a year-to-date profit and loss statement. Further, it also has a Loan and Asset Management module that helps farmers track their loans and the current market price of their assets too.

Roadmap: Tech Mahindra team has built this app and it is distributed across 90,000 villages in India through a partner. Many other institutions are also interested in launching the app as a support for farmers.
The features that make this app attractive are

- Multilingual support (en/mr/hi)
- Works offline after registration
- Intuitive and simple UI
- Reminder to enter data
- Data backup and Data restore
- AES encryption (end-to-end)
- Written and Voice notes
- Android support 6+
- Interactive dashboard
- Introduction document
- Feedback system
- Crash Reporter

IMPACT & HIGHLIGHTS

- Being launched across 90,000 villages in India
- Improves the financial handling for farmers and helps in getting a credit score
- Portable across countries, especially for small landholding

AUGMENTED & VIRTUAL REALITY

Case Studies

Augmented Reality Application for Park Visits

Virtual Reality Application for Online Learning Experiences

Virtual Event Management for ‘Walk for Life’

CASE STUDY

Augmented Reality Application for Park Visits

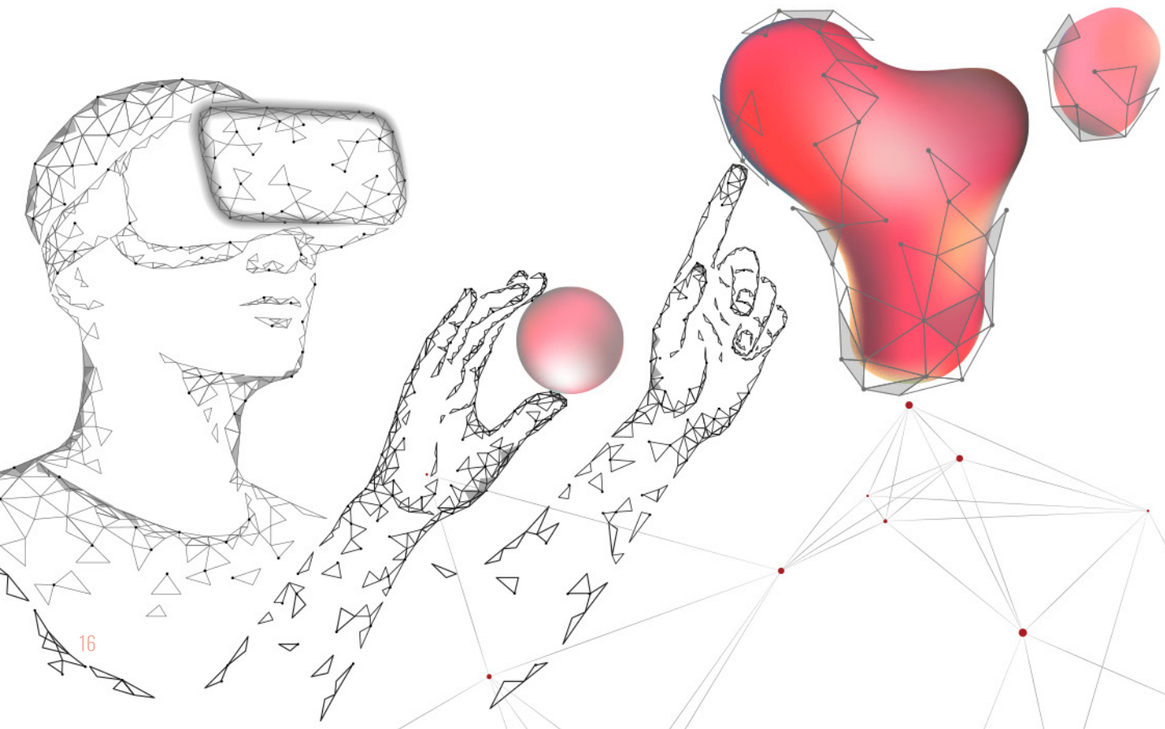
QUICK OVERVIEW

We believe that 3D avatar characters and their activities in virtual worlds will take people to the next level in the virtual realm. And that is why we worked with Husqvarna to build an application that helps visitors in parks and museums navigate themselves to the nearest locations/monuments.

Makers Lab™ at Tech Mahindra launched an augmented reality (AR) enabled application to help park visitors load and view directions to the nearest locations.

BUSINESS CONTEXT

Husqvarna reached out to **Makers Lab™** with a challenge where they wanted an application to be used by visitors in parks and museums to help them. They wanted this for self-navigating across the park, to pop up location/ monument specific briefs and descriptions to be viewed through an app effectively.



APPROACH AND SOLUTION

Discovery: We accepted the customer's challenge and brainstormed on it then identified that the digital information should be overlaid onto the real-world landscapes first then saved and reloaded or shared with the visitors. To fulfil this, we used Placenote SDK, which lets users dynamically scan any space and turn it into a trackable map for positioning digital content and it also provides a cloud to save the scanned maps.

Optimization: We considered the limitations of mobile data at remote places and storage space in mobile devices, and we optimized the application in such a way that visitors can only load and view the maps if their mobile handsets are in the range of GPS which are stored in the cloud.

Garden Admin:

- Garden admin will open the AR application.
- Scans the area through the application camera.
- Placing markers at different places while scanning.
- Saves the map with markers according to the GPS location.
- Saved maps will be used by visitors on the location with respect to visitors' GPS.
- Essentially, scanning and mapping is one-time activity but may be used to update the maps.

Visitor:

- Visitor opens the Garden Positioning AR application in the Garden.
- AR application will fetch the 3D Data/map from cloud according to the Visitor's GPS location.
- Visitors can see the markers placed in augmented world through AR application.
- The Markers will provide information about the location.
- With the help of markers Visitors know about their location where exactly in the garden.

IMPACT & HIGHLIGHTS

- Better navigation in public places
- Easy accessibility with mobile app
- Great feedback from customer after POC showcase

CASE STUDY

Virtual Reality Application for Online Learning Experiences

QUICK OVERVIEW

Global Leadership Cadre (GLC) wanted to build a VR application to onboard freshers into the company by giving them a virtual tour of the company.

Makers Lab™ made it possible and created a VR based induction program that smoothly onboarded new joiners to GLC Group.

BUSINESS CONTEXT

Due to the pandemic, it was difficult to provide a physical connect sessions with all the leaders for the GLC 2021 batch associates. They wanted this for self-navigating across, hence a VR application was asked to be developed to onboard freshers into the company by giving them a virtual tour.

APPROACH AND SOLUTION

Discovery: We (**Makers Lab™** XR team) came up with ideation to create a VR based induction offering and gave it to LLS team. It was presented during the 2021 GLC batch induction and the GLC's were trained to use the Cardboard headset and the VR application on Android smartphones.

Roadmap: We use hologram technology for associates to converse with leaders. Associates and leaders can be at different locations yet connect.

It is proposed that the learnings using VR be extended to GLC 2021 batch during their induction and then to other associates.

IMPACT & HIGHLIGHTS

- Virtual tour without physical hassle
- Easy accessibility with mobile app
- Great feedback from freshly appointed GLC candidates

CASE STUDY

Virtual Event Management for 'Walk for Life' *(2)*

QUICK OVERVIEW

As a result of the COVID-19 epidemic, major events have been closed, postponed, or canceled around the world. This affected CanSupport's fund-raising and awareness-raising event: Walk for Life, which they have been doing for the past 13 years.

Makers Lab™ at Tech Mahindra helped CanSupport by hosting their event on a virtual platform.

BUSINESS CONTEXT

CanSupport runs India's largest free home-based palliative care program. The palliative care teams care for around 2600 cancer patients and their families. They also run out-patient clinics, daycare centers, and a training program. Since 2008, the Walk for Life event is organized to commemorate World Cancer Day and to draw public attention to the rising incidence of cancer, show solidarity with cancer patients, honor those who have lost to cancer, and raise funds for CanSupport's needed free of charge home based palliative care services.

APPROACH AND SOLUTION

Discovery: Unlike the previous years where people got together at Rajpath for the walk, this year due to the Coronavirus pandemic restrictions, the walk turned 'virtual'. In order to connect everyone virtually, **Makers Lab™**, R&D unit from Tech Mahindra joined hands with CanSupport to make an application 'Walk for Life – 2021' which had an inbuilt tracker for participants to track their walk/run goal, count their steps and calories burned.

Utilization: People who like to participate in a walkathon to raise money will use this app. An individual, a group, or a corporate can register for the event by selecting the distance they wish to walk/run & make payment for it. People can start on the day of the event, and once it is over, they will receive a certificate and be able to share photos on social media.

Roadmap:

- We created a site map to understand features & items that were needed in the app.
- We finalized coding language & data base system that will be used in making this app.
- Created a wireframe structure & confirmed it from the client.
- Worked on designing User Interface & shared it with the developers.
- Developed frontend & backend.
- Tested the walkathon 2 times by creating a real event.
- Launched app on Play store and Apple store.

IMPACT & HIGHLIGHTS

- CanSupport helped to join the walk remotely from different states of India.
- Participants and friends joined the walk from foreign countries like the US, Canada, Sweden, Singapore, the UK, and Germany.
- Many participants from Indian cities such as Bangalore, Mumbai, Pune, Chandigarh, Amritsar, Bhatinda, Rohtak, Lucknow, and Kochi also participated.
- This year the walk witnessed participation from more than 2500 participants from 15 Corporates, 22 schools & Institutions and 28 NGOs and RWA Groups.

ARTIFICIAL INTELLIGENCE (AI)

Case Studies

Chatbots for Improving Operational Efficiency

Customized Chatbots for Customer Query Handling (UK)

Customized Chatbots for Customer Query Handling (Thailand)

CASE STUDY

Chatbots for Improving Operational Efficiency (3)

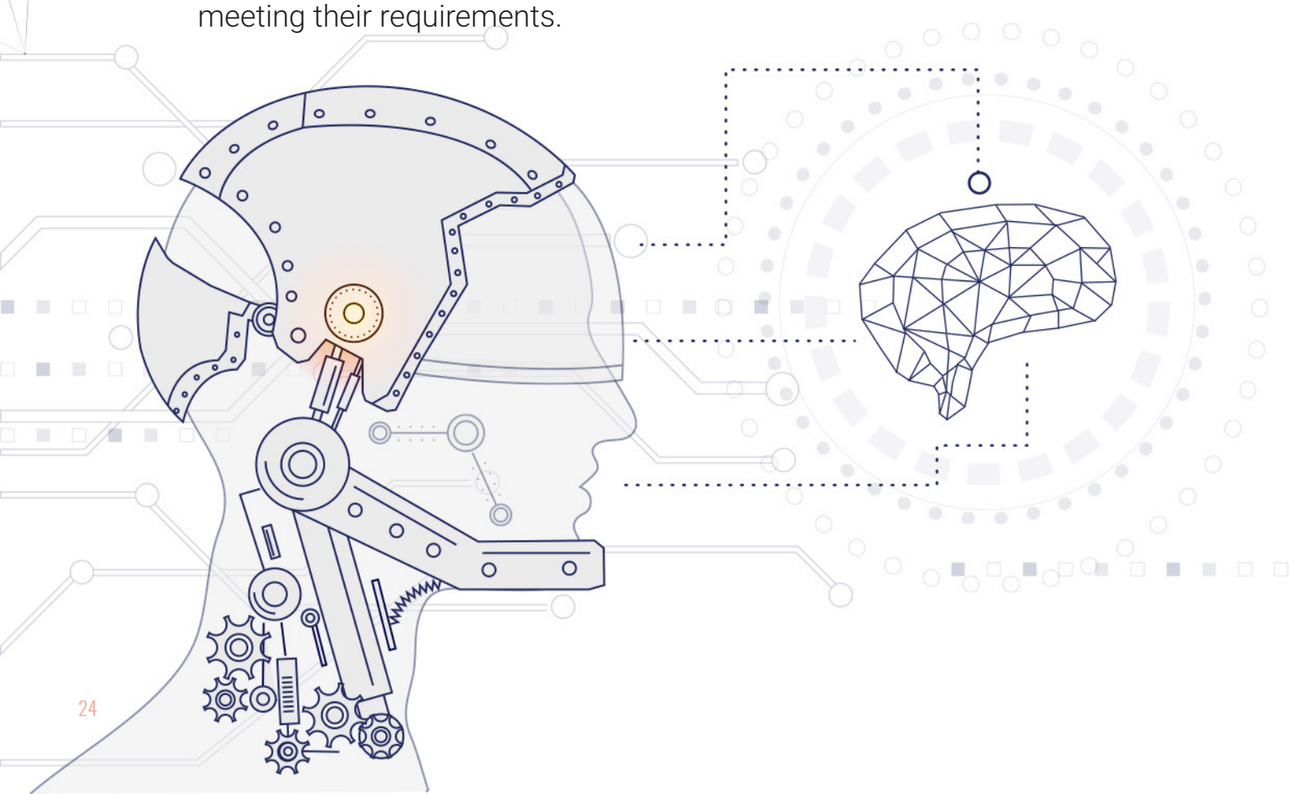
QUICK OVERVIEW

In order to address the excessive queries in the human resource and customer service departments, our tier 1 German car maker client approached us about implementing chatbots to improve the speed of responses.

Makers Lab™ provided Entellio chatbot services that reduced the involvement of human operators by assigning several repetitive tasks to chatbots.

BUSINESS CONTEXT

A Tier-1 German carmaker had a large number of queries in Human Resources taking significant time to resolve. The same situation was observed in customer service requests too. Our client wanted to have a system in their premises that answered instantly and redirects to a human agent when manual intervention is required. Their prior attempts of developing the system were unsuccessful in meeting their requirements.



APPROACH AND SOLUTION

Discovery: We conducted an analysis of their existing query resolution processes. This analysis was followed by an evaluation of existing chatbot frameworks in the market such as RASA, kore.ai, api.ai.

Optimization: We then created a Chabot using the same FAQ (Frequently Asked Questions) on each existing framework on Entellio (Tech Mahindra conversation framework). Entellio was found to be most suitable particularly in responding to natural language questions and ease of use to re-train the chatbot whenever required.

Roadmap: We then developed a chatbot framework named AISHA based on Entellio architecture

- Integrated with their API to answer personalized queries
- Provided automation through integration with their RPA
- Used Agile methodology in quick development of the chatbot framework
- Provided Skype channel to ask questions using Skype

IMPACT & HIGHLIGHTS

- 70% accurate answers by Entellio
- 24x7 availability led to quick responses
- Great feedback from customer HR head and their product manager

CASE STUDY

Customized Chatbots for Customer Query Handling (UK)

QUICK OVERVIEW

To handle excess phone calls and queries coming to our UK-based council client, **the Makers Lab™ at Tech Mahindra implemented 5 chatbots with different functions** to resolve the issue.

Each chatbot is customized to handle different operations from HR, IT, Procurement, Finance, and other functions.

BUSINESS CONTEXT

The UK council client had a large number of phone calls ranging approximately 30,000 with over 15,000 live chat sessions. On average, 35% of incoming calls were left unhandled.

Further, 30 council members were busy handling customer queries. The customer wanted an application to help them resolve maximum queries and have minimum resolution time.

APPROACH AND SOLUTION

Discovery: Due diligence was carried out by our team to identify the current state and challenges. It was discovered that 5 chatbots were required for different functions such as HR, IT Help desk, Procurement, Finance, Other Functions.

Optimization: We then began addressing the requirements by establishing ROI assumptions and providing system provisioning requirements.

Roadmap: We then deployed and customized Entellio by creating 5 chatbots.

- Integrated with their API to answer queries about different functions
- Implemented conversation workflows for smooth conversation
- Enabled live chat transfer
- Developed Omni-channel capability

IMPACT & HIGHLIGHTS

- Ensured productivity gains
- Improved processs –headcount reduction
- Projected operational expenses savings of GBP 180k+ (approx.)

CASE STUDY

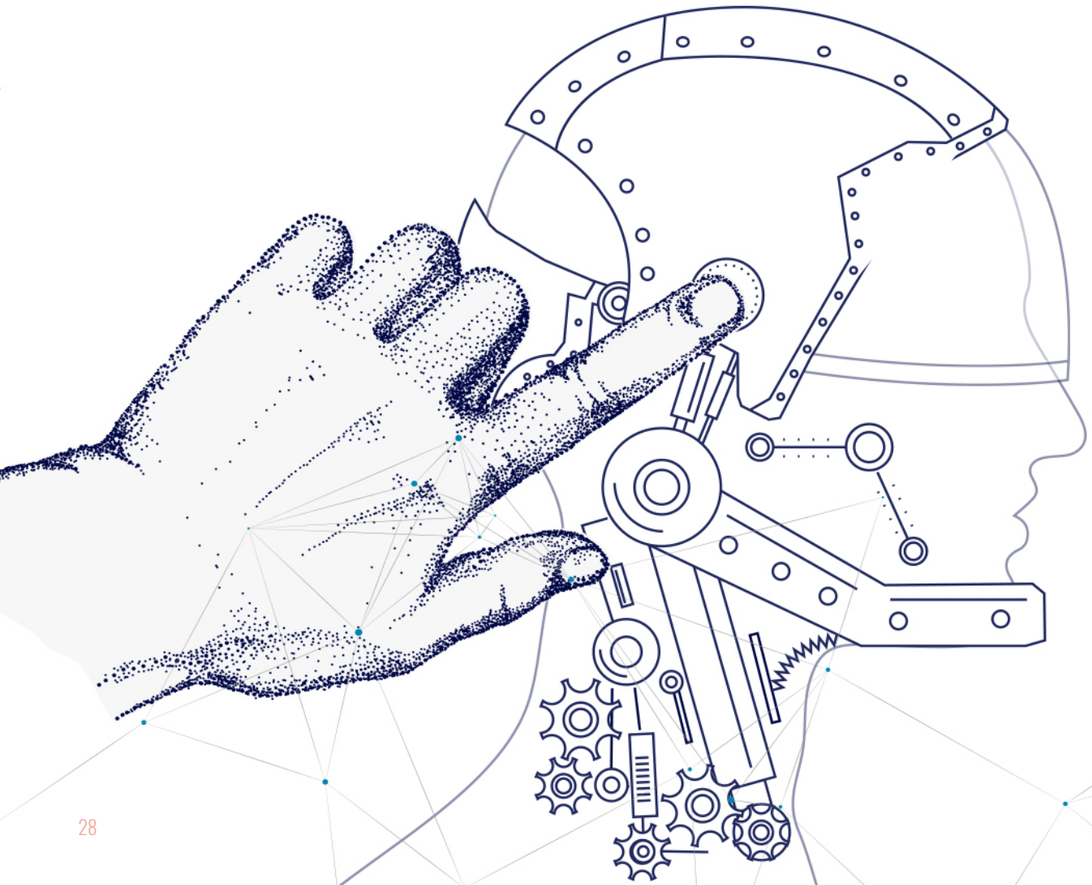
Customized Chatbots for Customer Query Handling (Thailand)

QUICK OVERVIEW

To resolve a large number of queries coming to our Thailand-based telecom company, **Makers Lab™ at Tech Mahindra delivered customised chatbot service that provides support in Thai language.** The chatbot helped to establish ROI for the customer.

BUSINESS CONTEXT

A telecommunications company in Thailand had a large number of IT service requests that were left unhandled. Operational expenses and time required in servicing those requests kept increasing. The client wanted an application to help them resolve these requests with minimum turn-around time.



APPROACH AND SOLUTION

Discovery: We ensured due diligence by identifying current state and challenges. It was discovered that a chatbot with self-serve options can assist with query resolution. The addition of Thai language support would be beneficial.

Optimization: We then began addressing the requirements by establishing ROI assumptions and providing system provisioning requirements.

Roadmap: We deployed and customized Entellio for their ITSM. The chatbot was delivered in phase 1 and extended for phase 2.

- Reduced MTTR by chatbot integration with ITSM
- Auto categorization for top categories
- Self-service option provided to users. Step by step guide along with screenshots to help
- Added Thai language support

IMPACT & HIGHLIGHTS

- Round-the-clock support
- Reduced incidents
- Reduced calls to service desk

INTERNET OF THINGS (IoT)

Case Studies

IoT-based Customizable Enterprise Vehicle Management Application

IoT-based Application for Energy Management and Monitoring

CASE STUDY

IoT-based Customizable Enterprise Vehicle Management Application *(4)*

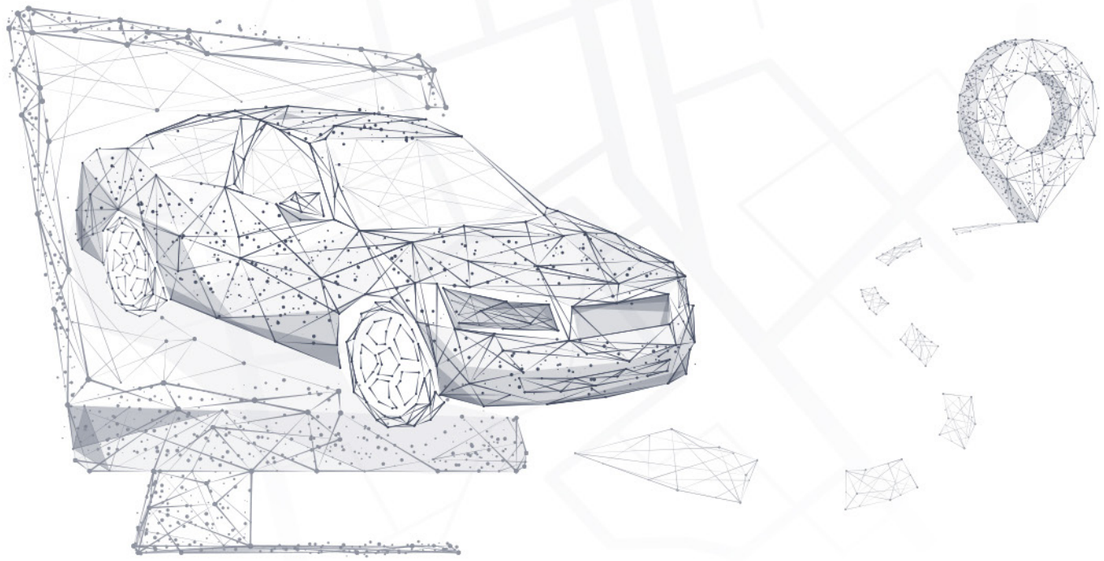
QUICK OVERVIEW

Annually, cargo crime in the US alone accounts for a direct merchandise caused loss in billions of dollars. This is because of inadequate monitoring, pilferage driver negligence, security failures. Moreover, nearly 1.25 million people die in road crashes every year.

Makers Lab™ at Tech Mahindra introduced Vetturino to monitor vehicles and raise alarms. This is not just a device but an entire ecosystem that is highly customizable and can be tailored to enterprise needs.

BUSINESS CONTEXT

Cargo crime is typically a challenge for logistics companies. Primarily it happens due to inadequate monitoring, pilferage driver, negligence, security failures. Alternatively, road statistics show that deaths of passengers are caused due to road accidents and show an ascending graph. Again factors causing these accidents are largely due to engine failures, mechanical failures, driver negligence, driver fatigue, and over speeding when manual intervention is required. Their prior attempts of developing the system were unsuccessful in meeting their requirements.



APPROACH AND SOLUTION

Discovery: Vetturino directly reads all the primary parameters from the vehicle like speed, RPM, engine temperature. But it doesn't just stop there. It is capable of reading all 160+ service parameters from the vehicle which include individual cylinder misfires, engine fuel rate, exhaust pressure, engine power, and more. And all this is directly configurable from the cloud application.

Optimization: Vetturino has been built in-house from scratch. The Cloud-based enterprise application is a very powerful and flexible tool. It is highly customizable and can be tailored to the enterprise needs. While both Vetturino, the device, and the cloud application are coupled, they can be configured to work independently as well. The device can be used with a different cloud application, and the application can be used with a different device as well.

Roadmap: Vetturino is suitable for fleet management as well as monitoring individual vehicles. Vetturino can be used for managing convoy

- The leader of the convoy would be able to plan the route as well as to add vehicles and assign drivers to those vehicles
- Driver of convoy vehicle would be able to see his position w.r.t remaining vehicles in a convoy
- Leader shall get an alarm in case of any threshold breaches or deviation to route by vehicle
- Vetturino device shall act as WiFi router so these devices shall act as repeaters for transmitting data
- Vetturino can connect to the cloud via various methods, including WiFi and GSM, which make it ready for future 5G network expansions

IMPACT & HIGHLIGHTS

- 75 % reduction in vehicle failures caused due to un-monitoring
- Up to 20% increase in performance of vehicle as driving patterns are being monitored
- Estimated to earn $1M revenue business in 3 years

CASE STUDY

IoT-based Application for Energy Management and Monitoring

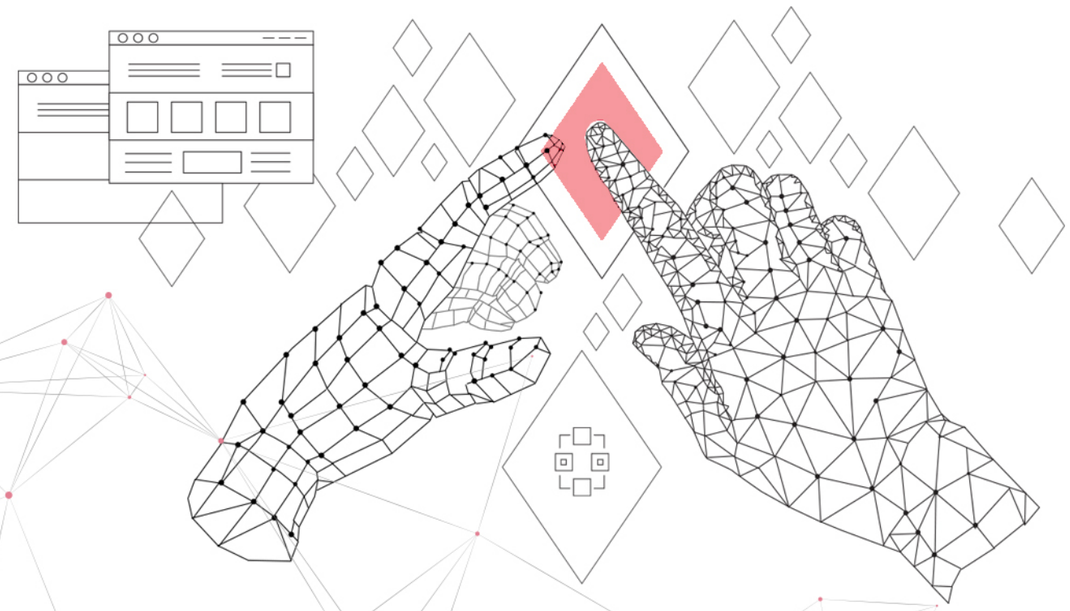
QUICK OVERVIEW

There is a need to save and use energy cautiously, as it impacts global energy prices, emission targets, and legislation.

In order to cater to the solution of this global problem, **the Makers Lab™ at Tech Mahindra has been developing an optimal and frugal innovation called eNetra which can address this issue without much hustle.**

BUSINESS CONTEXT

eNetra is a compact, non-intrusive IoT device that gives regular energy meters the ability to connect to the internet. It captures the consumption metrics and sends the data to the cloud. It provides persona-based access to monitor consumption of energy in real time using mobile applications as well as web portal.



APPROACH AND SOLUTION

eNetra can be employed wherever energy consumption to be monitored. It can be used by industries and individuals alike.

Industry scenario:

- In a manufacturing industry, various machines and heavy equipment are placed throughout the work floor.
- Energy meters are generally set in place individually for every workstation.
- Monitoring the energy consumption and observing the trends can give great insights into the way work is getting done.
- By having access to this data remotely and in real time can magnify the benefits.
- A clear picture of the usage of machines can be obtained.
- By having a historical record of the consumption data, analytics too can be done.
- Also, scheduled reports can be generated with ease in no time.

Individual scenario:

- A real time update on the consumption rate can be obtained.
- When the data is compared with previous records, clarity on the power usage trend is gained.
- Using this, energy efficient decisions can be taken resulting in savings of money and energy!
- Also, by sending this data to the respective energy boards, bills can be generated immediately with reduced manual labour and more accurate metrics.
- Pre-paid based energy plans too can be implemented using eNetra.

IMPACT & HIGHLIGHTS

- A reduction in cost to serve
- Makes it possible to use power resources more efficiently
- Help for revenue protection
- Electricity theft can be detected
- Opens gateway for the delivery of energy services
- Monitors the electric system much more quickly
- Periodic reporting of electricity usage and cost
- Eliminates manual monthly meter readings
- Enables consumers to adjust their habits in order to lower electricity bills
- Restores consumer's faith in utility providers

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