Interview

Raunak Bhinge, Founder, Infinite Uptime Inc. and Infinite Uptime India Pvt. Ltd.

'We Provide Real-world IoT Solutions to Make Manufacturing More Efficient'

Meet Raunak Bhinge, a Pune-based entrepreneur in his late twenties and architect of first-of-its kind, patented industrial IoT solution based on predictive analytics to pinpoint any kind of anomaly in heavy engineering machines by harnessing artificial intelligence for improved productivity, quality, monitoring and predictive maintenance. In a special conversation with Industrial Product Review (IPR), Raunak, an IITian and a Ph. D. scholar, talks about his patented technology, future of predictive analytics and about the real-world industry 4.0 applications.

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Q. Pursuing graduation and post-graduation from IIT Madras, earning a doctorate from University of California (UC), Berkley, setting up a start-up in the USA, having a manufacturing unit in India and acquiring clients spread across the globe. Many would perceive this as something that was scripted. Was it?

A. Not at all! Nothing was planned as such. It just happened and I went with the flow. I didn't even know that I would pursue Mechanical engineering before landing into IIT. After graduation, I opted for M. Tech at IIT Madras and then decided to apply for Ph.D. (in University of California, Berkley) only in the last year of M. Tech. It was a decade of learning new things and creating the real-world applications. I owe it to my alma-matter, my co-workers and of-course to my family. It happened as it came along.

INFINITE UPTIME

"At Infinite Uptime, we work on predictive solutions to control the processes. Our comprehensive solution can predict when a particular machine is going to breakdown. Having this information beforehand, the plant in-charge succeeds in avoiding breakages. Our products improve quality, increase productivity and reduce downtime.

Q. Your father, Shri. Dhananjay Bhinge has an engineering background and runs a couple of companies. He must be a source of inspiration for you.

A. Yes, he is. My father, also an IITian, set up his manufacturing business in early '80s. He deals in various industry verticals including forging, auto components, mobile accessories, IoT sensors and lifestyle automation. He is at the helm of ForgeMax Autocomp Pvt. Ltd. (formerly Dhananjay Industries) and Phaneron Systems. My brother Ranjit has also joined our business and handles Phaneron Systems which deals in showroom, lighting security automation. I grew up with machines around and this initial exposure has immensely helped me shaping my career lately.

Q. Infinite Uptime has its roots in your Ph. D. topic. What exactly was the topic?

A. 'Predictive Analysis of High-Frequency Sensor Fusion for Predicting Wear Patterns in Manufacturing Machines,' was my Ph.
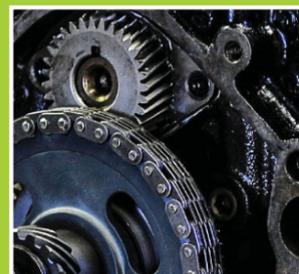

Raunak Bhinge, Founder, Infinite Uptime Inc. and Infinte Uptime India Pvt. Ltd.

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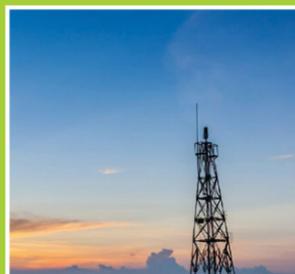## INDUSTRIES SERVED BY INFINITE UPTIME

Manufacturing

Test Rigs

Critical Rotating Equipment

Tool Tracking (GPS + Cellular)

D. topic. When a machine de-grades it hampers end product. My area of research was predicting these kinds of anomalies during the manufacturing process by using high-frequency sensor data. Predicting any such anomaly beforehand means a lot to a manufacturer. I decided to further explore this concept and successfully developed IoT products for my first start-up - Infinite Uptime.

Q. Infinite Uptime, as we understand, uses Artificial Intelligence (AI) for improved productivity, quality, monitoring and predictive maintenance. You have developed a device named Industrial Data Enabler (IDE) to capture the anomalies and Industrial Data Analytics Platform (IDAP) to analyze the findings. How does this work exactly?

A. Industrial Internet of Things or IIoT, as it is popularly known as, incorporates machine learning and big data technology, harnessing the sensor data, machine-to-machine (M2M) communication and automation technologies that have existed in industrial settings for years. The driving philosophy behind the IIoT is that smart machines are better than humans at accurately, consistently capturing and communicating data. This data can enable companies to pick up on inefficiencies and problems sooner, saving time and money and supporting business intelligence efforts. In manufacturing specifically; IIoT

holds great potential for quality control, sustainable practices, supply chain traceability and supply chain efficiency.

The unreliability of a machine is the biggest problem in any manufacturing process, which is characterized by its high-frequency data. Being able to quantify that and use the right algorithm and able to do frequency spectra analysis on the edge to figure out how the machine is performing; whether it is degrading or not and if yes, then at what stage it is at the moment – analyzing all these things are very important.

Since this was my Ph. D. topic, I explored it further and developed Industrial Data Enabler (IDE). It is a simple 'plug and play' product that rests on the machine or on a particular part of the machine and non-invasively collects all high-frequency data parameters 24x7. Once IDE does high-frequency extraction analysis, we push the data for deeper time-range analysis to our proprietary cloud platform – Industrial Data Analytics Platform (IDAP). A machine is made to repeat an action umpteen times. IDAP analyzes such pattern and detect changes in the same. Based on this pattern extraction, IDAP determines two things –
- predicts whether the process is out of control as compared to what it normally is and
- pinpoints at which frequency the anomaly has taken place.

This change in frequency can be due to having a problem in the bolt, bearing

or spindle. Based on our findings the manufacturer can then recognize the exact issue and troubleshoot it.

IDE is highly versatile and does not need any customization. As of now, such a 'plug and play' process control solution with edge analytics is a one-of-its-kind in the world. We have successfully registered an international patent for these products.

Q. Does a plant manager get alerts from IDE/IDAP?

A. The plant manager gets everything – from a text message to an email having details of a possible breakdown. The system can be configured to stop the machine, in case of an emergency. We can also accessorize the system with IoT indicators, IoT hooters that can be directly connected to our cloud platform. IDE can also be combined with the biometric system.

Q. Are these products affordable for any kind and size of the industry?

A. Absolutely! These products have unit economics. If the cost of a product is 'X' and if the returns are far more than 'X', then it doesn't matter what kind of industry it is. Ultimately 'Return on Investment' (RoI) is what matters the most to a manufacturer and not the cost of the product. So, SMEs can also go for such IoT solutions to enhance their productivity.

Q. Is there any scope for you to go beyond this?

A. Yes, there is a tremendous scope in this field. We are actually working on a lot of things. But we are doing what is best right now – that is providing intelligence. Our R & D team is focusing on making this intelligence more accurate, more useful and with more depth rather than going beyond. We just want to make this system the best in the world.

Q. Are there any new products of Infinite Uptime coming up?

A. Yes, our new products come out every three months. Besides IDE and IDAP, we have our edge-computing based long-distance temperature system and an energy monitoring platform. We also work with Original Equipment Manufacturers (OEMs) and help them make their products smart and IoT-enabled. Our R & D units in India and the USA works on numerous applications in electronics, design, firmware, high-frequency analytics, edge computing, connectivity, cloud computing, pattern recognition and machine learning.

Q. Infinite Uptime has tested and refined its flagship products – IDE and IDAP – by getting associated with several Fortune 500 companies in the USA. Since you were getting quite a good acceptability in the USA, what was the reason for having the manufacturing plant in India?

A. We did demonstrations for many Fortune 500 companies in the USA, when we started. These (Fortune 500) incorporations were the ones who prophesied the value in our idea and pushed us to pursue this further with a commercial approach. So, all these Fortune 500 companies who helped us at the initial stage are more like our partners. Post-this, we visited manufacturing behemoths in China, where the product got received very well. However, I decided to manufacture this product in India, as I wanted to be in an environment where the

APPLICATIONS IN OTHER SECTORS

- **Aerospace**
  Improved productivity, higher operating efficiency and a source for diagnostics using vibration and acoustics.
- **Material Handling**
  Calibrating conveyor belts, elevators and motors.
- **Power Generation**
  Diagnostics and analytics for large motors in wind and hydro electric facilities. Cellular enabled IDEs reduce manpower needed for routine maintenance.
- **Petrochemical**
  Precise monitoring of pumps, mixers, blenders and other equipments in remote locations using cellular data.

- **HVAC**
  Analytics with big vibration and acoustic data to diagnose and characterize issues in critical HAAC environment such as chillers, pumps & coolers.
- **Food Processing**
  Vibration to monitor viscosity quality and precision of cutting blades.
- **Mining**
  Predictive maintenance of drills & grinders and data-driven slurry management.
- **Automotive**
  Real-time Drivetrain monitoring, gearbox monitoring, transmission and axle monitoring in cars, tractors, heavy vehicles.

customers are. The USA doesn't have much manufacturing and most of the manufacturing tasks are outsourced to China, India, South East Asia, Eastern Europe, Mexico and to Brazil. India is a much better place to do business, globally.

Q. You have acquired customers from multiple industrial domains in various parts of the world. Was it difficult to acquire the customers? And can you name a few key customers?

A. Infinite Uptime was commercially launched at the beginning of 2017 and we are doing fairly well. The initial market response was very quick and encouraging. We started getting customers within one month of our launch. The cycle times are smaller because of the value proposition. Our products are process controllers, which everyone wants. Within first six months, we have received multiple anchor customers. I cannot mention the names here, as we are bound by non-disclosure agreements. We are working with leading Indian companies in forging, mining,

petrochemical, stamping, grinding and steel manufacturing. Since our service is more equipment specific, we have wider scope in all kinds of manufacturing units where forces, motions and mechanical properties are much higher. We also have a few key customers in countries like China, Taiwan and Mexico. We do have a dedicated support team for all our customers.

Q. This is quite impressive! Are you able to fulfill the increasing demand from the current facility?

A. At the moment, we are able to fulfill the orders. But, to cater to the ever-increasing demand, we are expanding rapidly. We are on a hiring spree, as we need large support and analysis team in India. Currently, we have around 15 people working with Infinite Uptime in the USA, India and China. We have a R & D unit in the USA and a manufacturing-cum-R & D unit in India (in Pune). We have another establishment in suburban Pune (in Aundh). We are looking for a larger corporate office to accommodate

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INFINITE UPTIME
A SMARTER FUTURE FOR INDUSTRY

CALIBRATION SERVICE

Calibration services using our software and download your ISO compliant calibration report

- Data collection software provided
- Remote / on-site calibration by Infinite Uptime
- Calibration report as per ISO annually

PATTERN RECOGNITION

Uses pattern recognition technology to annotate your data

- Automated part counting
- Downtime characterization
- Data - driven productivity targets
- Equipment loading condition detection
- Setup and production time detection

OEE IMPROVEMENTS

Overall Equipment Effectiveness

- Factory-wide OEE calculation
- Supplier OEE calculation
- OEE inclusive of all equipment – manufacturing equipment and critical utilities
- Identify areas of OEE improvement for 5% Year-on-Year improvement
- Gamification of productivity and OEE

ANOMALY DETECTION

Detect anomalies and defects in real-time through visual LED indicators

- Chatter, Tool Wear and Tool Failure
- Bearing looseness, misalignment and eccentricity
- Insulation failure and overheating
- Improper clamping and imbalance
- Visual on-board LED indication

IDE

USE AS A STETHOSCOPE

Portable, easy to use and diagnose defects

- Battery-powered
- On-board analytics
- Portable and hand-held

IDAP

AUTOMATED FAILURE MODE DETECTION

Artificial Intelligence to detect anomalies and ensure asset reliability

- Chatter, tool wear and tool breakage detection
- Collision detection
- Eccentricity, waviness and bearing wear-out (inner and outer raceway) detection
- Motor imbalance detection
- Overheat and anomaly detection

BACKUP BATTERY

Backup battery allows wireless testing and installation, and never stops monitoring even in a power outage

- Never stop monitoring
- Can be wired permanently
- 6 months to 1 year battery life

INDUSTRY-CERTIFIED

Designed and built for harsh environments in the industry

- IP66 certified
- Rust-proof and corrosion-proof
- Built for harsh environments
- Intrinsically safe

ISO REPORTING

Integrated tools for ISO compliance

- Productivity / OEE reports
- Monitoring / quality reports
- Alarm / Downtime reports
- Cycle time variability reports
- Equipment condition history reports

TREND ANALYSIS

Use big data to identify productivity trends and areas for improvements

- Machine-wise productivity
- Tool-wise productivity
- Shift-wise productivity
- Losses and loss analysis
- Identification of areas of improvement
- Data-driven benchmarking

MULTI-SENSOR FUNCTIONALITY

Monitor multiple data sources on the same machine

- Monitor multiple tools in a CNC machine
- Controller data extraction software with integration
- Integrate data from IDE with other sensors such as long-distance temperature, energy (current, voltage & power factor), flow rate and pressure
- Infinite Uptime's IoT LED tower indicator can also be integrated for a full-fledged solution

additional staff. Apart from India, we see a lot of potential in China. We may strategically expand to such potential countries in the near future.

Q. How do you compare the startup ecosystem in the USA and in India?

A. In the USA, there is a lot of excitement about tech-startups. Ph. D. work is considered most suitable for startups as it has a lot of background research work in place. Tech startups get orientation and free space to work. Lately, India is heading in the right direction. We are not there yet, but we are initiating right steps to reach up there. Schemes like 'Startup India' are certainly going to boost the domestic startup culture. We have a prolific ecosystem for startups in cities like Bengaluru, Pune and Delhi. Being an IT hub, Pune is doing well IoT.

Q. As per a survey by PricewaterhouseCoopers (PwC), more than 80 percent German companies

will have digitized their value chain by 2019. Where does India stand in adopting smart manufacturing?

A. By 2020, nearly 60 percent Indian companies will start following practices of Industry 4.0. Indian MNCs will adopt these smart practices first. The Indian industry shall do it not just for the sake of the buzzword Industry 4.0, but because of its benefits.

Q. Do you think IoT and Industry 4.0 shall create room for Indian software companies to shift its focus from providing services to developing products?

A. Hopefully. To some extent, it is already happening. There are several companies aggregating data in the manufacturing companies. If you look at the background of founders and employees of these new companies they were earlier associated with some of the well-known Indian IT brands. Hopefully, a number of such

IT solution product companies will go up. Because it's a very big market and there will be multiple players in the data aggregating space in days to come. One of the biggest problems in implementing Industry 4.0 is its interoperability, which is an IT task. That's why more and more IT companies are coming together to build products required for smooth transition of Industry into Industry 4.0.

Q. What is the way ahead for predictive analytics?

A. Making quick decisions on the edge rather than in the cloud is the future for predictive analysis.

Q. Where do you see Infinite Uptime five years down the line?

A. On every machine!

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NEXT ARTICLE

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