Delivering Value through intelligence

Digital Transformation

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ABSTRACT

The world is becoming smaller and smarter due to the growing intelligence of devices. This paper explains how devices are becoming more intelligent, thus bringing more value to its users and the role of PM for these projects. Devices are monitoring the heart rate of a sports person, health of aircraft engines, traffic density and many more. As these parameters are transmitted over internet, they help users across global locations to take appropriate actions. Over the past few years, huge amount of data are collected over various domains and manual analysis were done. Now devices are created with more intelligence and they start making decisions on their own. Devices are also given the ability to learn, thereby the error band is reduced to a great extend. Impact of these machines/devices are there in our day to day lives. How much of value are being delivered? What is the extend these machines needs to be intelligent? Are there any grey lines? Are there unanswered questions when autonomous vehicles are moving around us? Will we get the confidence to travel by a cab without a driver? With the next revolution of Industire 4.0, devices are interacting and making decisions. What is the value add of Project Managers in IoT Projects? Few pointers are, see the actual value delivered to Customers, keep things simple, view beyond the horizon, keep pace with technology and be open for simple and great ideas. As project managers, are we ready for this intelligence?

INTRODUCTION

There has been an evolution in the intelligence that has been provided to the machines and devices. The devices have the capability to collect and transfer data for processing and also help larger machines to act, based on the available data. Technology and intelligent devices has helped to disprove claims made by humans during accident, getting the best out of a sportsman during matches, helps operators to look as important data rather than complex information and analyse and improvise in design of Formula 1 race cars. These are possible with the help of IoT enabled devices and the future of Smart factory is defined by Industrie 4.0. Systems are moving from Automatic to Autonomous, where machines are provided the capability to learn and operate. YuMi, the robot as concert conductor and autonomous driverless car are good examples of outcome of technological advanced projects.

When Project Manager is executing these advanced projects, things to focus are, there are constant change needs to be embraced, ensure that the right value is delivered to customer, Safety and cyber-security are the key aspects, contribute to the project as end user, view beyond the horizon and keep things simple, be open for simple and great ideas.

DETAILS OF THE PAPER

1. Evolution of Intelligence

There is a quantum leap in the development of devices over the last decade. Technology has changed rapidly, the bandwidth that was needed for communication has increased from 2G or less speed, to speed of over 4G and the data collection and processing has been on the increase. Stated below are some of the evolution that happened over a period of time.

a. Blaming machines

In the year 2006, one afternoon, there was an accident involving a speeding BMTC Volvo bus on a busy old airport road in Bangalore. The bus ploughed through a crowded bus shelter and then knocked down an autorickshaw and two bikes, leaving two dead and 20 injured. The immediate blame was on the machine, which was reported by the driver as brake failure.

This was further investigated with the manufacturer. Technology helped in this investigation. Volvo's braking system was designed, refined and manufactured to the highest quality standards and generally serve throughout a long service life. In the daily operations, the bus itself monitors brake pad wear and temperature as seen in Figure 1: Volvo breaking system**.** Further, it was technically proved that there is a 3-layered interlock system which will not allow the bus to start, if there is such a brake failure, as claimed.

Figure 1: Volvo breaking system.

Over a period, there were on-board telematics which helps to analyse the conditions under which the fleet is running, allowing to plan for maintenance, optimize the operation and vehicle availability. This is one of the use cases for Internet of Things (IoT).

b. Getting the best from a Sportsman

Pete Sampras, one of the greatest Tennis player, sometimes used to play 5 set matches, where some of the opponent was not able to hold up for the complete duration of the match. Sampras used to come from behind to win matches. During those years, there was no wearable devices which can monitor the player.

During recent badminton matches, the heat beat of the player are being displayed on the screen for the viewers. Figure 2: Heart rate fluctuation during badminton doubles match, shows the heart rate of a player during a match. The zoomed in portion of graph shows the difference in the heart beat of an experienced player and a beginner, during rally and interval. This clearly shows the pattern for analysis where an experienced player gets more rest than a beginner during the interval and the experienced player is better peaking up when required, during a rally. There are the wearable IoT devices which are transmitting telemetry data for analytics. The usage of these devices are seen in healthcare to a great extent.

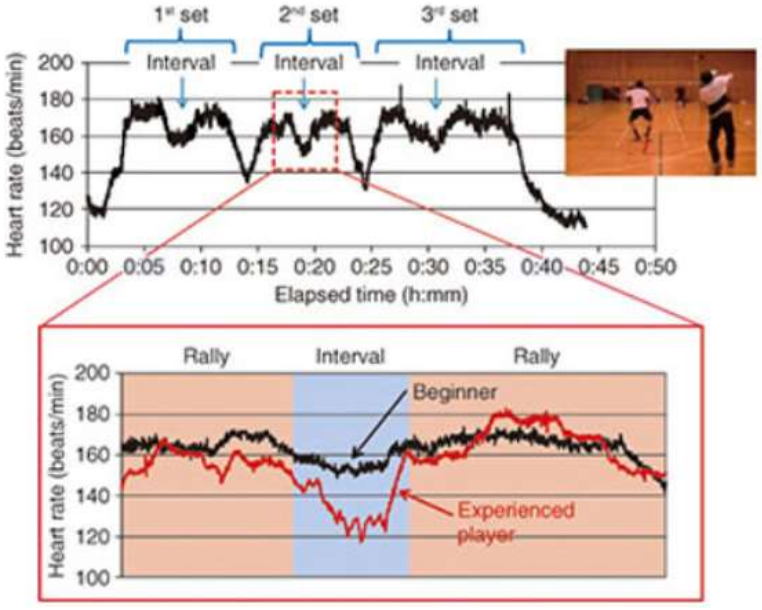

Figure 2: Heart rate fluctuation during badminton doubles match

c. Complexity beyond human comprehension

In the early and the middle 20th century, most of the manufacturing companies were getting automated and the main source of automation was though Pneumatic controls. Pneumatic systems were generally powered by compressed air. Pneumatic logic was available within a device which was used for control.

In the late 20th century and over the last 3 decades, electronics started to play a major role in the control system. The electrical and electronic system combined control systems started to replace the pneumatic systems. Data from various devices in the field started to show up in control system monitors which were available in central control rooms. Figure 3: Evolution of Control System, shows the control system evolution since early 20th century to the future.

As technology advanced on the Servers and datacentres, control system became more advanced. The monitoring by operators reduced as additional logics were written to control the various processes. On the other hand, there has been an increase in the amount of data available and presented to the operators. There are 100's to 1000's of control loops, connected to 10's of thousands or more devices, collecting and processing data and presenting to operators. This increased complexity puts high demand on the operator's competence and a big cognitive load.

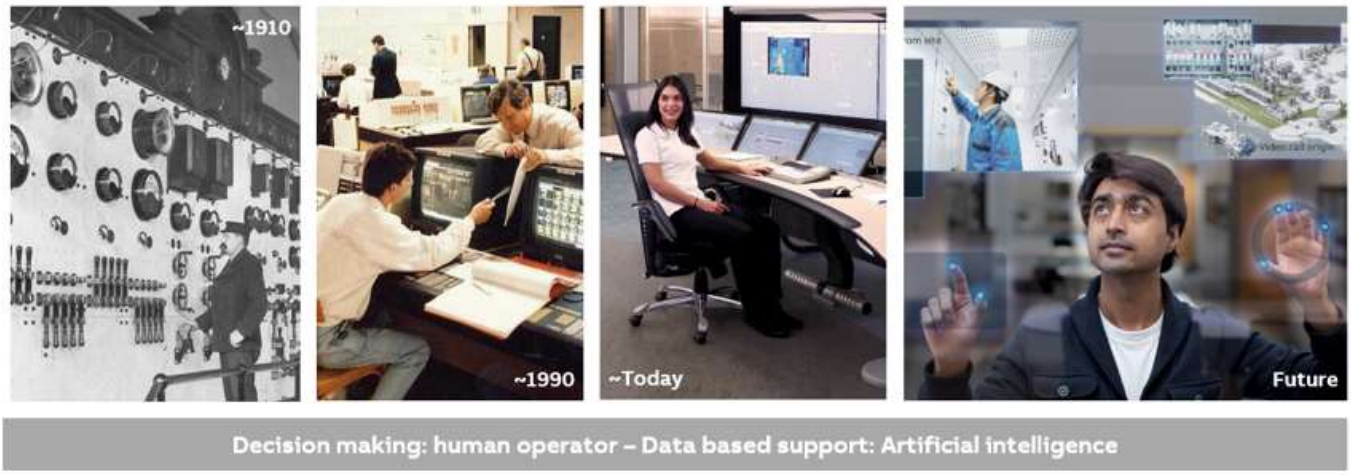

Figure 3: Evolution of Control System

In the future Artificial Intelligence is being introduced which will sort and analyse the available information. Some information will be taken by the AI and some by the operators, thereby helping the operators to have focus on the critical actions, rather than on all actions.

Devices are also equipped with the capability to measure and act, rather then to send the data to the central control system and then wait for its processing and respond to the change.

d. Formula 1 and its technological excellence

Formula 1, uses the cutting-edge technology in its development of cars for the races. Formula 1 embraces complex computerization and with engineering brilliance has driven the technological revolution. During a Formula 1 race with an average duration of 90 mins, a car generates close to 400 GB data, which is 4.44 GB per minute. There are 150 sensors monitoring the car and driver behaviour. These sensors track vital stats such as brake wear, tyre life and driver biometrics. In one lap they can transmit more than 2GB of data. McLaren, a Formula 1 team, transfers this critical data into one repository by using SAP HANA, an in-memory database management system which enables its existing systems to process this data some 14,000 times faster than ever before.

A commercial car, might take 5 to 7 years, working its way from the drawing board to production whereas, an F1 car takes around 5 months. To understand that performance, analytics intuition is

required so engineers and data analysts can make sense of the car's speed, stability, as well as aerodynamics and tyre degradation around a racetrack. More testing programmes are also completed at the team's manufacturing base as well as their state-of-the-art wind tunnels.

Figure 4: Team members from the Mercedes AMG Petronas Formula 1 team examine data analytics from the race car

Figure 4: Team members from the Mercedes AMG Petronas Formula 1 team examine data analytics from the race car. There are many variables during a race, like rain, accidents and introduction of Safety car, which completely change the dynamics of a race. During a race, all the data from the devices are collected, processed and evaluated by a team of engineers, thereby helping the team to make and change strategy based on the track conditions. Certain of these data are further stored and transferred securely to the respective team manufacturing base for further analytics. Every year, based on these data, there are improvisation done on the car design and dynamics.

e. IoT Devices and Industrie 4.0

IoT devices, or any of the many things in the internet of things, are non-standard computing devices that connect wirelessly to a network and have the ability to transmit data. At the high end of the scale, Intel projected internet-enabled device penetration to grow from 2 billion in 2006 to 200 billion by 2020, which equates to nearly 26 smart devices for each human on Earth. Gartner estimated the total spend on IoT devices and services at nearly $2 trillion in 2017, with IDC projecting spending to reach $772.5 billion in 2018, 14.6% more than the $674 billion it estimated to be spent in 2017, with it hitting $1 trillion in 2020 and $1.1 trillion in 2021.

Industrie 4.0, where physical machines in a factory communicate over Internet of Things, resulting in a "Smart Factory". Industrie 4.0 originates from the German strategy for computerization of manufacturing and was revived at the 2011 Hannover fair.

2. Automatic to Autonomous

There are many systems which were automatic, starting from a simple automatic washing machine at home to a complex industrial process. Artificial Intelligence (AI) is gaining popularity and momentum recently, which includes Machine Learning (ML). This gives autonomy to machines to take decisions on their own and learn.

Figure 5: Andrea Bocelli on stage with YuMi as Conductor

YuMi the robot, making collaboration between human and robot a reality. In Figure 5: Andrea Bocelli on stage with YuMi as Conductor, YuMi was a world's first truly collaborative dual-arm robot. YuMi robot was able to learn the movement of a conductor, sensing the music, and conducted an entire team of singers and musicians.

Testing of autonomous vehicles has been happening over the last few years. There are sensing devices are mounted on the vehicle which are like eyes to the vehicle. Humans are backup drivers during the testing. These vehicles are autonomous due to the decision-making capacity that is embedded within the vehicles. There is huge amount of data processed from various sensors which helps in navigation of the vehicle.

As there is huge progress on the intelligence provided to the machines, there are various questions asked and new government regulations that are brought in place. What is the extend that these machines should be intelligent, how much autonomous they need to be and how much will the humans will be able to trust these technologies, are some of the key questions that needs to be answered, for the intelligent devices to be successful and provide greater value to the society.

3. Role of Project Managers in Innovative and revolutionary projects

Project managers needs to understand that as the technology is rapidly advancing the landscape of the project is also changing. There are new challenges and risks which are coming up during execution of these projects. There are some points listed which will keep the project manager in focus for the successful outcome of the project.

a. Embracing Change

When the IoT and AI related projects are executed, many of the stakeholders do not know or understand the expected outcome. There are changes happening very rapidly and one of the main reason is the technology that is behind. These changes need to be embraced and considered for successful project execution.

b. Is actual value delivered to Customers?

When high technical and revolutionary projects are executed, technology blocks the view of the actual value that gets delivered and the team tend to do things which does not yield real value to the customers. Hence the key requirements that deliver the highest value, should always be given the highest focus and importance.

c. Safety and Cyber-Security

One of the key aspects of project execution are the cyber security and safety of the systems that are developed. As these devices communicate over the internet, it is important that these systems are secure and does not get hacked. Security also plays an important role. There was a recent accident by an Uber driverless car. One of the initial observation was, Uber during its tests, it replaced the practice of having two drivers with one driver, it turned off the safety equipment in the cars while testing software and had the LiDAR (Light Detection and Ranging) sensors installed only on the top of the vehicle and not on the sides as well, unlike other vehicle manufacturers. Was Uber rushing in fast by cutting corners? Safety and cyber-security should never be compromised as they will have a lasting impact on the project and the company.

d. Contribute to the project as End user

Certain of the solutions when available in end user usable form, the project manager can use the device or solution and provide a very early feedback to the team. As most the components will be a black box, it will be similar to a customer feedback.

e. View beyond the horizon

It is not easy for the team to look beyond, as their focus will be on the current delivery. It is also important to note the changes that are happening within the industry, as well as the technological advancement. A quote from Joel Barker, "Vision without action is a dream. Action without vision is simply passing the time. Action with Vision is making a positive difference."

f. Keep things simple, be open for simple and great ideas

Certain complex solutions might not be required for a complex problem faced by the customer. With the help of technology, there can be simple solutions for those customer issues. Generally, it is easy to complicate things rather than to simplify. There is also a need to be open to simple and

great ideas, which can sometimes bring in a tactical change in these technically advanced projects.

CONCLUSION

Technology advances are rapid in the last few years where millions of devices are Internet of Things (IoT) enabled thereby a rapid progression in data collection and analysis. As machines are provided the ability to learn using machine learning (ML) through Artificial Intelligence (AI), project becomes more challenging as the landscape and the risks changes. The project managers need to accommodate the changes, ensure that the focus is on the goal and the maximum value is delivered to the customer, give importance to Safety and cyber-security, view beyond the horizon and keep things simple as much as possible within the team. I would conclude with a quote from Stephen Covey, "All things are created twice; first mentally; then physically. The key to creativity is to begin with the end in mind, with a vision and a blue print of the desired result."

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