A blueprint for turning trends into action- An Industrial Automation point of view

Abhilash Gopalakrishnan

I. INTRODUCTION

In recent years, we are observing disruptive trends in terms of business as well as technology. For many Small and Medium Enterprises, this can cause havoc and add further challenges in addition to traditional ones in market. COVID 19 further amplify the effects. What approach should we take with these trends?

From an Industrial automation viewpoint, we can safely attribute these to Industry 4.0, which symbolizes smart systems. Smartness can be achieved using the fusion of many technologies and their interaction across physical, digital, and biological domains. Two key elements that stay central to all these efforts are digitalization and seamless flow of data across the system [1]. Lean start-ups are able to lead the change. On the other extreme are enterprises recruiting experts from other organizations and trying to make a new digital cross-cutting team. In between these two are the SMEs who are in a balancing act and trying to cross over from being small to medium, by attracting more customers. The purpose of this article is to set an approach and directions to turn these trends into action, thus turning the tide towards organizational benefit. Two quotes from visionaries holds some hints.

’What we need is an entrepreneurial society in which innovation and entrepreneurship are normal, steady and continuous’-Peter Drucker.

'You've got to start with the customer experience and work backwards to the technology. ' – Steve Jobs

Let us take a look at the example - Netflix. As of 2019, Netflix had 8600 employees. During its own reinvention in 2014, they went back to first principles and asked the hard questions. Today we find them as a software led business, where developers are responsible for all areas of the software lifecycle and they can deploy many times in a day without failure [2]. They used Amazon AWS, built a full-fledged delivery platform, with verification and validation integrated. In addition they made the flow of product, services and data seamless leading to data analytics. Their recommendation engines today are seen as value by customers [3].

The key takeaways from Netflix journey can be summarized as:

1. Identify what is important for our customers
2. Build on organizational strengths
3. Turn into a Software led organization
4. Create a data flow across the system also able to extract data for analysis
5. Experiment and Evolve based on insights from data analysis

Wait a moment. This is about a digital first organization. How doesit translate to an industrial automation organization? In his book on Cloud Strategy, Gregor Hohpe, lays out a step-by-step approach involving Understand, Organize, Move, Architect, Embrace the Cloud [4]. We would use this as guidance.

II. ORGANIZING FOR A CHANGE

'Begin with the end in mind' – Stephen Covey.

There key considerations to start include:

1. Current State of Systems, People and Tools in the organization
2. Vision or Future State of Systems, People, their Competencies and Tools
3. Organizational strengths or otherwise Core competence

Once we have clarity on the key considerations in the first iteration, we can move to experimentation. With experiments performed, we have insights to architecting for the new world. These can be organized as iterations across all three cycles, broken into 3 months. A measurement based on these aspirations could include:

a. Speed or Velocity of the end to end business delivery
b. Data flow and how seamless is to measure and analyse effectiveness.
c. Ecosystems including identified partners and processes.

A. Clarity on how to ride the wave

It is important to organize trends into three categories:

1. Foundational in nature and can cause ripples across the entire system.
2. Connects systems to real-world as well as people.
3. Can be incremental.

Examples of foundational change are Cloud computing and IoT. Both are approaches to distributed systems. Distributed systems can be considered a distant cousin of Distributed Control Systems standard IEC 61499 [5]. The standards like IEC 61499 and IEC 61850 integrates digital modelling and also consider functions getting distributed across devices. Artificial Intelligence and Data analytics are those we can build incrementally and deliver starting with statistical approaches in the beginning, then moving to probability-based approaches like Bayesian and later

towards advanced approaches like deep learning. In house experts with good knowledge of Six Sigma and its statistical methods are a good starting point.

An example of trends which gets us more connected to the customer involve connectivity and DevOps or continuous integration Embracing the cloud. These together with cloud is a life style change. The stye changes to a Continuous mode of delivery and action.

These need to be stitched together as an innovation engine. An approach like Design Thinking plays a key role and puts a focus on customer needs and empathy.

The outcome of this step needs to be seen as three elements:

1. A renewed vision for the organization
2. An assessment of the current state
3. A roadmap for the change involving how current systems could evolve.

At this point, leaders can start inspiring teams by sharing the roadmap and building awareness on the organizational initiative.

B. Experimentation leading to an innovation engine
With clarity on the directions, we can start preparing our organization for the change. An onboarding step consisting of awareness sessions and training like Industry 4.0 are needed to facilitate change. This sets the direction and inspires thinking.

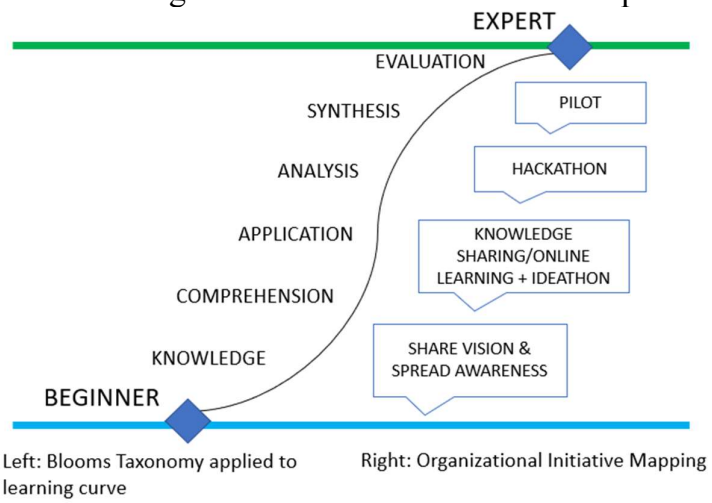

Fig 2: Learning curve mapped to organization initiatives

Next step is to execute ideation summits, where we pick good ideas. These ideation lead to hackathons. At hackathons, leaders provide organizational support and resources to realize these ideas. Once three to four ideas are realized in hackathons, leaders need to promote them as pilot projects. In this stage leaders and teams share them with a small set of prospective customers interested in exploration.

The biggest value of hackathons is the identification of makers. These employees are ready to go the extra mile and passionate about change. They need to recognized, as to encourage the behaviour. It is as well important to keep them as part of the core innovation engine maybe making them leads in the pilot projects as well. This builds appreciation for bottom-up innovations. Internships from University can also enable a healthy trigger to supply fresh thinking especially in areas of data.

A way of recognition could include vouchers for attending online or internal/external training in the organizational directions. Leaders can also encourage them to share the learning and journey, thus creating communities.

A small team needs to support design thinking approach. This team can support the identified makers to drive the workshops and thereby nurture people to bringing great ideas to life. Tools like Mural and Miro serve well as collaboration tools capturing discussions and customer journeys. Support team like Intellectual Property management needs to be knit into this as well to potentially capture high value ideas.

Once this organization is in place, we are ready to start with bigger experiments. One typical place to start is migrating some functions to cloud as services with APIs. Migration to newer front ends like angular or react, using containers like Docker. Cloud platforms to consider include Amazon AWS, or Microsoft Azure as well as local players like E2E Networks. These initiavies should align with organizational digital transformation as well as previous hackathon efforts based on the feedback. The overall approach also should focus on renewed customer experience. across different form factors like Tablets, Mobiles and PC/Laptop. As in Fig.3, experiments can best make use of open-source approaches like Linux, Jenkins etc, to stay lean and also cheap and stay away from getting locked to any specific vendor.

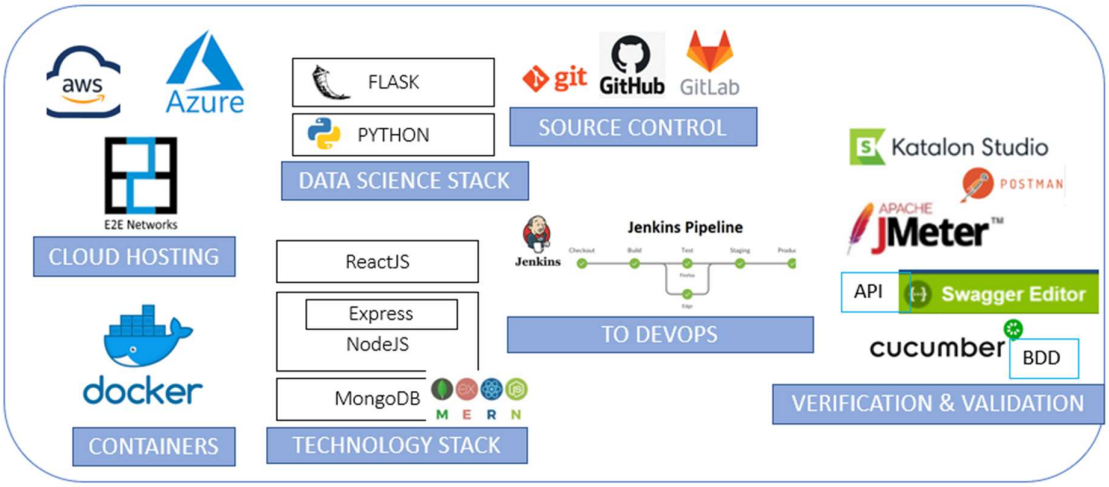

Fig 3: Some key elements of a new ecosystem

This stage results in two or three running pilots. Data from pilot users lets us get more insights on business value, which can be used to ignite the next step.

C. Architect for the new world

By now, we would have gained enough understanding from experimentation. This is a great time to architect for change. An approach of integrating products and services as product service systems with a platform approach is a common observed direction of vision. We can bring together teams from earlier experiments and get to architecture decisions like choosing cloud provider, technology for backend and front end, operating systems, database approaches and scaling methods. These are generally driven in alignment to domain functional distribution like IEC 61499 combing architecture principles like reactive manifesto [7].

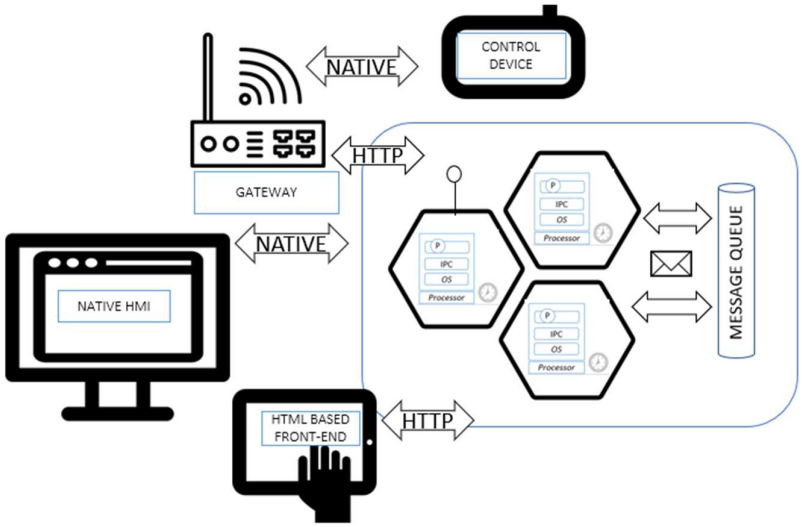

Fig 3: The Overall Architectural Change

III. CONCLUSION

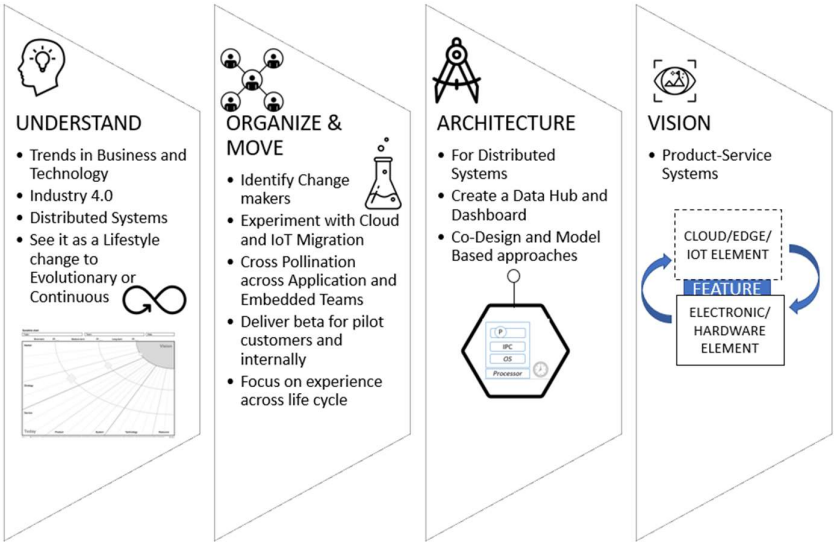

Fig 4: Overall approach to turn trends to action

We have summarized an approach for turning trends into action based on cycles of building clarity on where to go, experimenting and architecting for distributed systems. It discusses iteratively building an innovation engine as part of the organization. We believe in unleashing the strength of people as makers, giving due focus on Systems and Tools. A direction towards an evolutionary architecture based on product-service systems is key to unravelling the future. We believe this road mapping approach will enable industrial automation organizations to turn trends to actional projects and pilots thus spinning continuous innovation into their execution strategies.

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