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Case Study

A comprehensive 7M IoT adoption model-a lifecycle shift paradigm

Satish Kumar Sogi[1*] and Sudesh Kumar Mittal[2]
Department of Computer Science and Engineering Rayat Bahra University, Mohali, India[1]
Chitkara University Institute of Engineering & Technology, Chitkara University, Punjab, India[2]

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Abstract
A critical rhetorical model is required for the transformation of an enterprise which is planning a radical shift due to strategic Internet of Things (IoT) adoption in the operations. A systematic approach is required to deal with this transition of an organization. The IoT has enabled organizations with analytical discernments and perceptiveness. A large set of enterprises is planning this adoption in order to empower themselves in making better decisions and improving their growth rate. With the integration of IoT with their assets, the organizations can discover unusual patterns in terms of their performance and subsequently take preventive measures with the help of insights collected from the IoT ecosystem. The study indicates that a majority of organizations failed to deliver any operational value from their digital IoT adoption and could not meet their key objectives. A lack of an agile, iterative and incremental sprint approach was a major cause for a high proportion of failures. The proposed 7M framework helps to reinforce the thin traditional view of the change management process which is seen as a coherent process of applying modus operandi, assigning prescribed roles and responsibilities for all the individuals in charge, scheduling the whole transformation process, planning the implementation and evaluating the whole process. The framework proposes a rather thick view of the change management in a way that surmounts all factors that hinder the whole process and takes care of the foreseen complexities and challenges. The paper studies all the phases of the proposed strategic framework in the light of a statistical analysis of the information gathered from various industries and concludes with recommendations for future design and development.

Keywords
IoT, 7M IoT, IoTIL, IoT infrastructure library.

1.Introduction
Over the last few years, the "Internet of Things" (IoT) has become a well-known topic of discussion, and it is changing the way we live as well as the way we operate [1–5]. Through its various applications, it has a wide impact across businesses. According to a survey [6], there will be more than 41 billion IoT devices by 2027 which may produce an expected economic impact up to $11 trillion per year. Although the IoT technologies had been in use for quite a while, an assortment of latest advancements for example 5G technology, edge computing and various other innovations has made it a commonly adopted technology for the automation of most of the business processes.Thus far, the IoT has made a few impactful statements which are apparent from the presence of its applications in almost every segment of technological innovations and progress [7–10].

Alongside detection and collection of streaming information, IoT frameworks are immensely capable of providing intelligent patterns so as to assist in improved decision making. Despite the fact that IoT is only in its early stages and has a long way to go, as more people discover its advantages, its compelling and rational thinking implementations and effects can already be seen in a variety of businesses [11].

The rigorous requirements for Industrial IoT practices have tried to lay down a few standards for manufacturing IoT devices in the past [12]. These IoT gadgets are expected to regularly work in high-accessibility and crucial conditions which require versatility and modern security evaluation metrics with the objectives of achieving controlled administration, self-governance and adaptability. There has always been a trade-off between time and quality in manufacturing. It is a subject of critical worry for modern IoT practices since the enterprises are expected to zero in on both, i.e., usability and

*Author for correspondence

quality of products, at the same time so that the clients could be delivered rapidly and proficiently with reliable product or devices.

The main aim is to reinforce the thin traditional view of the change management process to improve the technological assessments in terms of industry prospective. The objective of this paper is to discuss and surmounts all factors in the light of a statistical analysis of the information gathered from the technological sources.

2.Literature review

Al-Sarawi et al. [13] discussed the complexities of applying IoT in the energy market, such as privacy and stability, as well as some potential alternatives, such as Blockchain technology. They provided the energy policymakers, analysts, and managers with a broad overview of the state of IoT in energy processes' optimization.

Yuehong et al. [14] looked at the development of IoT in healthcare services from the viewpoints of enabling technology and methodologies, IoT-based smart devices and systems, and a variety of IoT implementations in healthcare. They also cautioned about the difficulties and opportunities associated with the implementation of IoT-based healthcare systems.

Despite the tremendous efforts of standardization agencies, partnerships, companies, experts, and others, there is still a slew of issues to resolve in order to fully realize the IoT's promise.

Čolaković and Hadžialić [15] looked at a variety of factors, including enabling technology, implementations, and market models, as well as social and environmental consequences.

They gave a thorough review of open topics and problems that will be addressed in future research, as well as some insights into relevant new concepts that will aid future research.

Khanna and Kaur [16] outlined emerging obstacles faced when conducting agricultural operations, as well as potential study directions, in order to empower new researchers in this realm with the tools they need to determine current IoT standings and emphasize the importance of improving them with more inspiring and creative ideas. They delivered a systematic analysis of Precision Agriculture explicitly.

Brous et al. [17] investigated IoT acceptance by businesses and defined advantages and threats. The expected benefits and risks of IoT were classified using Large, Open, and Linked Data. They confirmed that the duality, while enjoying the advantages of IoT in asset management, resulted in unanticipated societal improvements, leading to organizational institutional transition.

Region-wise IoT adoption

With 36% of respondents indicating that Industry 4.0 innovation was either "widely" or "fully" implemented in tasks, North America clearly leads Europe and Asia in terms of overall Industry 4.0 acceptance. This result is surprising in light of the fact that many European and Asian countries tend to be pursuing more regulatory initiatives to promote Industry 4.0 adoption [18]. IoT and IoT platform innovations involving cloud technologies were the offerings of a few North-American companies like Amazon, Google, Microsoft and IBM and they are still the leaders in this arena. And in fact, one of the big manufacturing units which led the IoT adoption on a big scale were Boeing and General Electric [12], luckily based in the United States as well. European manufacturers, which were already implementing and going for other Industry 4.0 innovations such as collective robots and edge processing, also demonstrated interest in cloud technologies [19–23]. European region made a cautious outlook for 2020, according to the market analysis. Asian companies showed a higher reception of robotic automation technologies however, and showed a much below interest towards cloud and IoT advances. Interestingly, although Asian organizations had initially shown not much of interest in the assortment of Industry 4.0 developments, they have made the most optimistic spending outlook for 2021[19–25].

Industry-wise IoT adoption

For the last couple of years, the automotive industry has counted on the competitions to drive innovation. As a result, automobile manufacturers have become initial adopters of both creative and executive developments that gave a shape to productive practices which further led to significant competitive advantages over their competitors [25–28]. Customers prefer customization and quick delivery and there is an imminent shift that could be witnessed by looking at them drifting away from ignition motors. Automobile manufacturers are required to be more compliant and this is the reason of addressing the key question i.e. why the auto industry, as compared to other industries, was more likely to

adopt Industry 4.0 innovations as in collaborative robots and automated guided vehicles. The adoption of Industry 4.0 technologies has not been limited to Tesla or BMW but the level 1 providers like Bosch is also ranked in this study for being marked as the early adopters. It is apparent that the car industry reported a faster return on investment business through the inclusion of practises laid down for Industry 4.0. The enterprises have shown a higher likelihood of investing more in future on Industry 4.0 innovative practices [21].

The list of leading technology adopters in Industry 4.0 includes GE, Boeing and Siemens and few others to reckon with but at the same time, the Industry 4.0 innovation adoption has differed between companies considerably. For example, Robotic technology was more likely to be accepted in the metals or energy industries than in the automobile industry, however, 3D printing has more competence in the automobile industry. This disparity in the appropriation for individual advancements [22] demonstrates that just because of the fact that a few businesses have a low overall industry acceptance score doesn't assert that they aren't growing.

Barriers to IoT adoption

Since there is so much excitement about the IoT, many businesses are waiting to see how the technology progresses before implementing it. According to a new Penton study, the IoT presents specific challenges for future users. Participants from a variety of industries shared their thoughts on the main roadblocks to IoT adoption at their companies [29–31].

Concerns about data privacy: Data protection is still a problem for the IoT in the post-Snowden period. Since IoT devices have the ability to collect massive quantities of data, security breaches are particularly dangerous. In order to confront these issues, there is already a broad range of reliable technologies driven with innovation such as proxy re-encryption and multi-factor authentication, which can alleviate the risks involved in privacy issues and are considerably compatible to IoT applications [31–36].

Concerns about security: Since the start, Internet, already being a chaotic place ruled by differentiated technologies and protocols, the IoT has further complemented to the chaos. Since many IoT enabled devices were traditionally designed to function in an isolated way and be protected by conceptual layouts, developing industrial IoT applications could be a significantly challenging task. Expected these systems to communicate with external networks in a safe and secure manner could be a vague idea and therefore higher security standards are needed to be adopted in designing these devices as well as building reliable applications on top of them.

High Implementation Costs: Putting the IoT in place can be costly. Many businesses have opted for a centralised cloud-based infrastructure when developing IoT devices and deployment of IoT applications. This approach may result in continuous expenditure with a lesser return on investment. More IoT infrastructure opportunities like edge computing can be further explored for cost-benefit analysis.

Lack of understanding of available solutions: As in the case of any emerging technology, many people, who are interested in it, prefer to sit on the side-lines and only observe how the technology is acknowledged in the real world and its early impacts. The reason for the same may be that several innovations or technologies are absolutely contemporary as compared with the existing solutions and implementation and maintenance of the same can be a difficult, resource-draining, and challenging process [32, 33].

In the IoT sector, there seems to be already an intense competition due to the diversity of devices and solutions, and an amassed group of vendors involved in the space are already promoting their IoT-enabled devices, solutions and maintenance and other cloud centric services. Although it is a fact that the number of emerging innovative technologies are accessible today which can lead to a state of perplexity in the minds, the IoT sphere is expected to shrink in the future and it will be easier to consider and decide about the technical alternatives available.

Inadequate and disseminated Infrastructure: Cloud service providers such as Amazon, Google, Microsoft and Mobile network service providers such as China Mobile, Airtel, AT&T, Reliance Communications are not the only ones who are working on building IoT infrastructure. End-to-end IoT solution providers like Intellia, Clovity, Pega and many more like the microprocessor company ARM which has recently launched the ARM® mbed™ have added to the chaos.

Right now, the IoT sector is scattered, and more and more corporates are beginning to promote their network of partners. Few technology giants like Dell,

Microsoft and GE are collaborating together in order to help consumers find the technology mix they need in a less time-consuming manner.

Lack of Standards: There is no doubt that the current state of interoperability standards is an important concern [33]. To begin with, there are no widely agreed-upon standards, and then there are so many IoT standards in development that are gaining widespread adoption which clearly is making a single standard a difficult proposition. The overwhelming number of upcoming potential standards proposals can be confusing for the IoT industry, and it is fragmenting it unnecessarily.

Concerns about interoperability: An issue similar to the one mentioned above is interoperability which is featured when the devices fail to communicate and work together in the absence of universal standards. Since there are a large number of design and development platforms available, it becomes difficult for developers to find fundamental layer with standard protocols set for resolving communication issues. Similar sort of concerns arises when it comes to deciding which operating system to use. According to the study, interoperability in the IoT sector is gradually improving and also the fact that there are so many new collaborations in the industry is a positive sign.

Inadequate Workflows: It is true that the IoT market is still immature despite numerous technological developments, it's also no surprise that establishing consistent workflows for product development is demanding. Most businesses have little or no experience in adopting IoT technologies, apparently which could also be considered difficult looking at the high variability of the data that often involves a variety of sensors in the large device network. Companies, on the other hand, may find it difficult to generate structured documentation for all the existing work processes for the IoT because they end up feeling tied up in a building and using the processes only in their frequent run. In the industrial sector, the management of complex and heterogeneous data flows for the integration processes is challenging and demanding for the future of IoT practices especially.

It's difficult to build a network of unknown IoT devices in a fast, safe secure and scalable manner and managing it with the speed of the manufacturing devices. Documenting workflows is no doubt a lengthy and time-consuming process but equally needed at the same time. One of the most difficult tasks tends to analyse and document the data flows and managing the data integration process. A stable and reliable integration of heterogeneous and complex data being generated from multiple source devices is considered as one of the extremely major challenges the world is observing with the IoT.

Change management for business organizations

A large portion of the business foundations today are in painstaking conditions of transition since they have to respond quickly to the business climates outside that includes competitors nearby, general business sectors globally, and the industrial advancements overall. And the fundamental requirement for all this is that the work environment cycles, the frameworks, and inducted procedures should stay dynamic and progressive for an enterprise to win the competitive advantage over the key rivals in the business arena. The stakeholders in the industry have now concluded that IoT would induce the development of huge high-quality applications which will be directed towards refining the business processes, boost their economy and subsequently improve the quality of lives in the society. The organizations, irrespective of their sizes, need to receive Industry 4.0 culture and practices very quickly and IoT adoption, at present, is considered to have a big role in accomplishing their objectives [25]. They need to embrace this new innovation, and this appropriation is probably going to roll out a huge transformation in the overall business model.

With the purpose of formulation of this transformation process, the enterprises may have to rework their key objectives and the performance areas and form new strategies on financial as well as ethical fronts in order to lead in the precise direction. The whole business transformation process management should follow a well-constructed model which can be structured with a well-defined framework. The framework will ensure a continual evaluation of the impact of the transformation process and lay down the parallel procedures to develop complete adeptness in the model.

3.Methods

Proposed 7M change management model for IoT enabled digital technological transformation

When an organization reaches high complexity levels in the midst of various processes, it requires a well-defined framework which could result in improved monitoring of processes. Higher reliability and maturity facilitates the organization with an extensive indulgence and an improved assessment of processes.

With more productive and efficient process streams, the organization shall be able to expand, sustain, deliver and congregate superior and excellent services and key professional organisational objectives. To help the organizations improve their maturity level, we propose a 7M Model for the business transformation in IoT adoption (*Figure 1*).

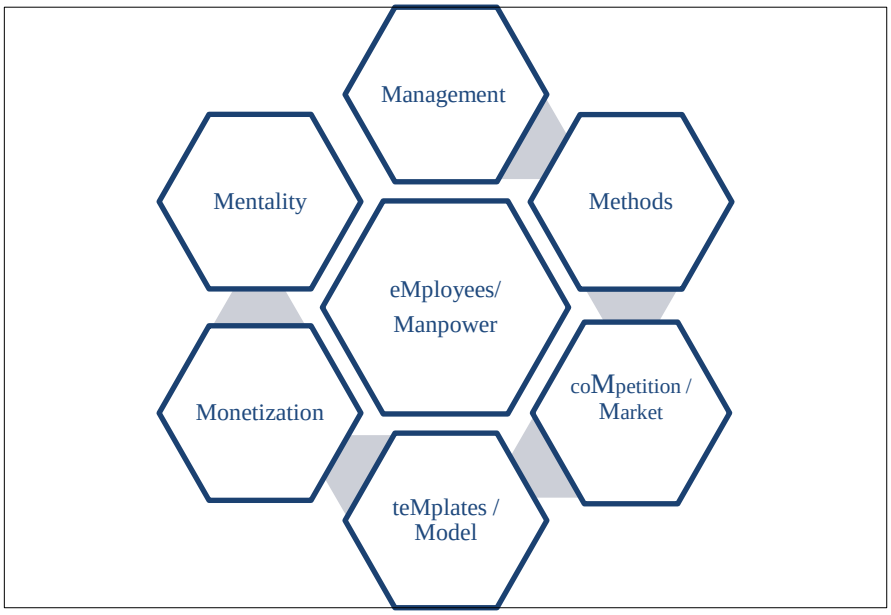

Figure 1 7M Model for the technological business transformation in IoT adoption

The seven phases for the effective IoT adoption strategy have been conscripted and listed as below.
Phase I: Organization's mindset for IoT Adoption
Phase II: Setting up key corporate objectives and aligning employees of the enterprise accordingly
Phase III: Operational management of all resources
Phase IV: Structuring of all methods and policy management
Phase V: Monetization using e-commerce practices
Phase VI: Templates/Model for all procedures
Phase VII: Evaluating competitive market advantages

Phase I: Organization's mindset for IoT adoption
Like evolution in human beings, change in technology is inevitable. Therefore it is suggested that the organizations should adopt a proactive approach to prepare their progressive mindset for the IoT adoption. There are certain factors that usually pave way for newer technologies to bring practical and functional value to businesses.

- Industries inherently have natural forcefulness towards bringing constant changes in business movements and operations and technological revolutions simply because the fundamental nature of industries is always about gaining economic advantage.
- Prevalent technological and business concepts and practices in web/mobile e-commerce don't show anymore capability or scope to get explored further in the ever-expanding business opportunities and strategies.
- Prevailing technologies are experiencing limitations in captivating the interests of the researchers, developers, and technocrats anymore.
- Money making bandwagon like e-commerce suddenly finding itself in the financial zones of no-promises and minimum-scope scenarios.
- It is a natural process that as systems begin maturing over time, automated systems find their roles more active in replacing existing skills.

When placing e-commerce under the same light, it seems an immediate change is due unarguably. IoT, and its allies and their armouries are sounding begul to dethrone the present-day deep-rooted systems of e-commerce. As change can happen anytime, the companies have to make imperative decisions. Either take leap of faith in the new concept and technology or certainly follow it until the time is apt for technological investments. In both the scenarios, the companies have to take a proactive approach and plan ahead accordingly. But if the approach is missing at all, then the indecisive mindset today may

prove fatal to the company's progress in IoT adoption in the future. The mindset along with approach, plan, and all other relevant perspectives need to develop a checklist having details about resources currently available as in assets, staff, technology, skills, business strategies, processes, funds, stakeholders trust etc. to define companies' readiness to accept changes. The fields requiring both steadfast growth in development or manufacturing as well as the quality of products and services which are the significant components for a better return on investment [28]. Manufacturing businesses are an example of such fields which has been transformed significantly by Industrial Internet of Things (IIoT). Artificial intelligence, big data and machine learning applications and services have augmented the manufacturing processes and led them towards automation. With assortments of applications in manufacturing plants, IoT has facilitated the production flow with loads of innovations. Monitoring of industrial development cycles and managing warehouses as well as inventories for the sake of smart stock management, can be very well automated with introduction of IoT applications (*Figure 2*). These reasons have drawn the concerns of industries and investment in IoT devices and applications has risen steeply over the past few years. Still, there are numerous organizations that have failed to innovate during the course of time, have reportedly resulted in business failure. Such case studies have taught enterprises to remain vigilant about future-proofing their entire business models.

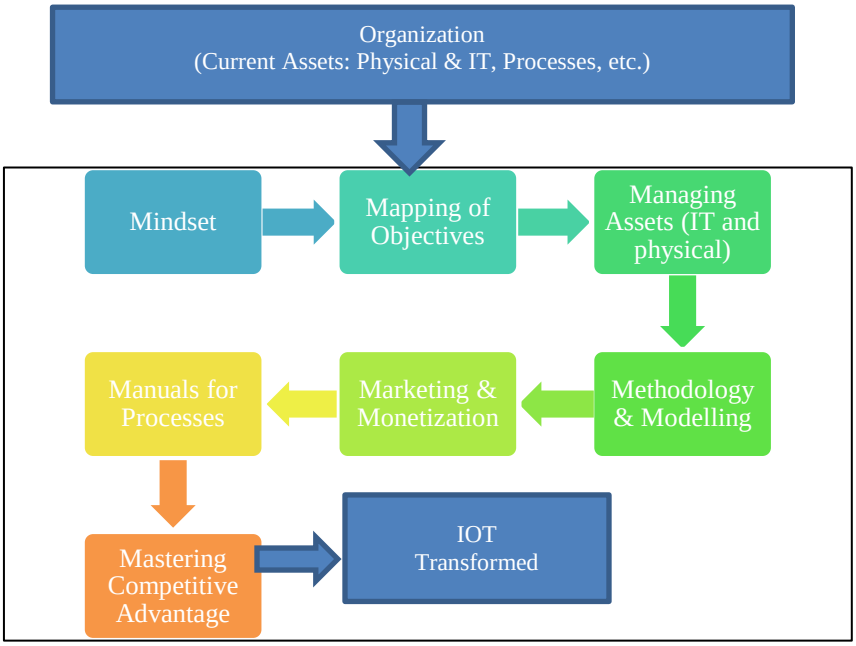

Figure 2 Organization of the technological assessment and its mapping

Phase II: Setting up key corporate objectives and aligning employees of the enterprise

With the IoT ecosystem in vision, the enterprises would begin considering additional business avenues of making money. As the avenues would suggest forming alternative business models, the overall set of objectives, current and future, might also undergo some possible amendments. This explanation of amendments in objectives must demand mapping of objectives as a must exercise for any enterprise as soon as they declare their IoT transformations. It lets the top-tier management have insights into the business propositions that would exist in the future. The mapping of objectives is considered to have a two-stage process:

The first phase allows a meeting with the departments and their heads to have an insight into the current objectives. The primary aim of this step is to find out how well the departments understand their business models along with their roles & responsibilities in achieving business growth. Before announcing the IoT changeovers, this exercise will get the staff aligned to the IoT transformations that will form a part of change management. Further, it will give staff ample time to get involved in the

transformation from the beginning and share their ideas and inputs.

The Second phase differentiates between the existing and the projected objectives. The staff and the IoT advisers collaborate in this stage to identify the ideal future objectives. Through the discussions, "projected objectives" are determined, which explains the future business cases. These discussions not only have the change of objectives in hand but also a list of items required bringing in deeper research and better understanding. Output to this exercise is the map that provides a holistic illustration of the current state as well as the state listing probable & potential future objective.

Phase III: Operational Management of all resources

This is the third phase in the model of transformation and also the beginning of the stage of jumping into intensive work. As operational management of all resources is all about keeping a point-to-point record of business and technical properties, it becomes the most critical phase in the revolutionary IoT transformation of any organization. It defines the company's assessment from the perspective that where it currently stands in terms of physical structures, tangible and intangible assets, legacy systems, research and innovation, trademarks, clients and markets, funds, grants and finances, conglomerate and consortiums etc. To define in simpler terms, this process is like taking stock of an organization that not only includes recording tangible assets verifications and their conditions but also intangible assets such as goals-to-customer satisfaction to form a precise inventory status. Once the mission of evaluation is completed and records of stock are in hand, it becomes easier to continue weighing the requirements for the desired state. The degree of change & improvement needed in business is measured based on of these evaluation records. A roadmap is generated with area maps depicting the degree of IoT commitment needed by the departments and the milestones of the progress to be achieved in the timeframes allocated. The entire spectrum of the workforce including the company management and IT executives, supervisors and workers, must become an end-to-end part of this phase of managing assets so that it is correct and precise to the diminutive level.

Phase IV: Structuring of all methods and policy management

For efficacious execution of IoT, the first main thing is that all the groups engaged with the IoT activity require a core understanding of how the current business cycles of organization work and how it directs its business. As the information about cycles gets depicted, the groups would be instructed with various approaches to improve the illustration of current cycles which prompts higher effectiveness, noteworthy profitability, better outcomes, and significant benefits eventually.

It goes without doubt that the firms seeking out the IoT transformation are bound to experience changes in their business processes and in their interactions to bring the desired productivity and efficiency in the business. For identifying the potential improvements in the underlying processes, modelling has been labelled as being an extremely critical stage in this paper. It is the logical representation or in other words a diagram of an organization's business processes. The complete picture of modelling shall consist of analytical representation (expressed through flowcharts, programs, hypertext, or scripts) of what processes exist 'as-is' in an organization and compare it with how should they would be 'to-be' processes that make them more efficient in outputting better results.

Modelling is essential in this process as it is imperative to create a best practice design for everyone involved in the IoT initiative to clearly understand the processes and how they work. It shall provide standardization to processes as different teams might be executing the same process differently and also it will bestow uniformity, reliability and control over the processes. Modelling, not only brings accountability to processes, for example, who owns what processes and what's its goal, and how it operates but also it leaves no room for redundancies, inconsistencies and inefficiencies. Above all, the stakeholders can easily comprehend end-to-end details of the whole process.

Phase V: Monetization using E-Commerce practices

With the new avenues offering exclusive services, any company bearing the huge investment costs in establishing IoT systems can justify its ROI by making its web services profitable. Web services which are considered as the communication endpoints among entities in the businesses in the IoT ecosystems will be fed with numerous types of information from different electronic sources (intelligent sensors, RFIDs, etc.) and software

applications (cloud computing, network topologies, ERP's, SAP, etc.)[21]. Some of this information collected by the web services may not be a part of a current business strategy or useful in the current information system of the company, but within the IoT ecosystem, this extra information could be provided to the clients in the shape of exclusive services. The primary focus of this phase is how to strategize this additional data harvested by web services profitable for the company. The concept of web services bringing more profitability comes from the fact that the web services in the IoT ecosystem would definitely get packets of additional data while communicating with each other continuously and that data will be readily available for enterprises for monetizing purposes. For example, a web service can be monetized by asking its clients to pay an extra cost for purchasing superior customized services.

Phase VI: Templates for all procedures

Since IoT is evolutionary concept, the enterprises looking forward to adopting it will have to keep redesigning their processes recursively to find a productive result each time. Processes that are functional today may not get executed for a very long time again or on the contrary, a process is tapped which stayed elusive since its inception. With manuals, it is very convenient to understand the key points of working on processes and avoid all the hassle of researching about its construction. Manuals also work as a staff knowledge base – a point where anybody can go with a query to find relevant information.

Standardization: Manuals provides an efficient method that allows processes to execute well time and again, making it easy to find solutions whenever an issue arises. Besides increasing the efficiency of processes, the manuals let businesses have the power of consistency. As manuals also demand processes to have complete documentation, it paves way for standardization which is the vital need of IoT compliant processes as of now.

Scaling: Since companies venturing into IoT concepts will look for expansion at any opportunity given, scaling could be looked at as an inherent property to the IoT models. Without a consistent and reliable business model, it will be ambiguous for the companies to scale up their businesses. By having a manual containing standard operating procedure (SOP) and internal data, the developers can easily look for opportunities to grow or identify the growth impediments limiting the business ability to scale.

Phase VII: Evaluating Competitive advantage

The companies would succumb to the IoT initiatives if they do not evolve to the radical opportunities thrown by the IoT shift. With a broader scope and the dramatically changing landscape, the projections for changing business models and strategies will not rest in solitude. There is no likelihood for companies to stay complacent on their static models; rather they will embrace a systematic change to their strategies and business models at any time or during the IoT transformation phase itself. Like ecommerce, it is naive for any company to understand IoT transformations as one time change, it will expect companies to reposition themselves randomly and recursively in the rapid progress of IoT transformations so that they don't miss the runway at any point of touchdowns. To pull this off, companies would need strategic professionals, who will take their boat ashore in every critical current of change they experience. To stay in the race, the companies need to master every change that took place with the help of strategists who know how to fit every piece of information in the transformation stages in the changing business scenarios. Without mastering the existing business model, the strategists would find it futile to exercise their control on different departments or business components to support the company's progressive efforts in going for business tie-ups, building consortiums, conglomerations, acquisitions & mergers, stock sharing etc.

IoTIL Framework for 7M business transformation model

In order to provide a structure to enclose the conceptual methodology explained in the prescribed 7M Business Transformation model, we propose a contextual paradigm called Internet of Things Infrastructure Library (IoTIL) which is an intent to provide an overall boundary to the model and lay down well-defined templates for all the business processes.

Organizations that will execute IOTIL effectively are resolved to get significant advantages, like a viable arrangement to business objectives, and abatement of innovation costs, among others. Along these lines, it is important that all participants in the business realize the most significant components which can affect the IoTIL achievement.

IoTIL is designed as a process centric framework which is concentrated upon the seamless evaluation, ceaseless enhancement and optimized execution of business processes. IoTIL implementation, integrated

with the process management strategies, would support the businesses to achieve customer satisfaction and performance enrichment.

As IoTIL is a bunch of exhaustive publications giving illustrative directions on the Information Technology Service Management measures, capacities, jobs and duties. IoTIL has been demonstrated in the comparable way. Nonetheless, IoTIL structure will not enforce the process cycle implementation and instead businesses will be required to choose an implementation request for their critical processes when starting an IoTIL implementation in their domain.

In this paper, we propose a strategy for actualizing IoTIL (*Figure 3*). The strategy has been formulated utilizing an approach whose excerpts have been inherited from "action configuration research" philosophy. IoTIL strategy has been directed towards accomplishing a qualitative research of design processes in data frameworks. The philosophy behind "action configuration research" is an exploration technique in the data frameworks discipline where the requisite information is delivered by the development and implementation of pieces of artefacts. The artefact can be a software, composite frameworks of programming, clients and use measures, data frameworks related hierarchical techniques or mediations.

The processes earmarked for the conducting the design research and used to build up the strategy proposed in this work are listed in the figure. The whole strategy behind IoTIL focusses on the lifecycle of business process management modelling which includes process identification, process investigation, process decomposition, execution, and control.

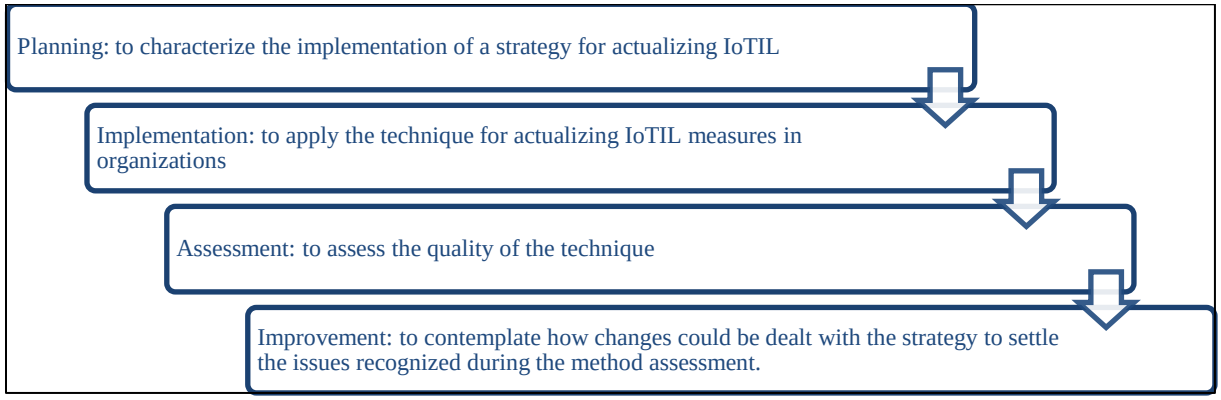

Figure 3 IoTIL Framework for 7M technological business transformation model

IoTIL execution is governed by a process management lifecycle and this lifecycle has been laid down on the basis of following standards.

Process awareness: an interaction ought to be recognized, named and recorded. Additionally, the cycle partners ought to have the fundamental information and abilities for a suitable interaction usage.

Process ownership: an interaction ought to have a proprietor who is answerable for planning the cycle effectively and guaranteeing the consistency of the interaction execution outcomes. The ownership has a list of duties and responsibilities tied critically with the owner.

Process measurement: Each process ought to have a stable execution resulting a few outcomes which ought to be deliberately estimated. A major part of any process centric organization shall be the assessment of the whole process execution cycle for the consistency of the key operational objectives.

Process upgradation: The execution control path and the outputs ought to be continually assessed and whenever a sign for improvement is signalled, mark ups ought to be communicated accordingly [18].

In order to aid the process design management, we propose to assemble the simulation of whole process cycle and perform simulation exercises on the model with predefined test cases. The simulation modelling is extremely desirable as it will lead to productive outcomes as at first this process modelling permits the stakeholders in investigating the cycle with more details since the model construction addresses the interaction control stream (action chain, action timings and the outcomes proceeded as a feature of the actions). Secondly, with conducting model simulations we can empower the stakeholders to contemplate the process interactions conducted and

its exhibition over the long run considering the various situations that may happen. Also, the simulation model testing permits administrators in analysing the after-effects of various outcomes without bringing about the expense, time and danger of exploring different avenues regarding the genuine communication. And the last benefit is that the cycle reproduction model is not even difficult to correspond and to change since it is created with existing visualization tools.

The process modelling task can be further classified in playing out the accompanying two subtasks:

1) Describing the whole process cycle that is going to be actualized in the industry in terms of its scope, objectives, process sequencing, the executive strategies, key assets, design boundaries, and outcomes like process flow diagram, the raw outputs, and key performance indicators. This subtask has been marked to be conducted considering the specific qualities of the organization and the suggestions provided by IoTIL towards the objective process.
2) Building a legitimate and trustworthy recreation model using a methodology defined over a strategic flow chart. The major exercises in this methodology will accompany the underlying sub-processes.

- Process abstraction: In order to portray reproduction models, the process abstraction is formulated focussing on the scope and reason, input boundaries and KPIs for the obtained results.
- Process formalization: characterizing the process utilizing a particularly conventional language. The simulated process methodology will be relied upon using this language utilized for model structure.
- Process Implementation: actualizing the process utilizing any of prescribed list of simulation tools.
- Process authorisation and validation: verifying the process for its accuracy, consistency and stability and finally the process is declared to have a stable behaviour and documented accordingly.

4.Results and discussion

An inside and out investigation was performed through a broad, top to bottom reviews collected based on the questionnaire to cognize the status of IoT-practices among a sample of different type of industries across the boundaries. The objective of this survey was to bring forward few major factors or drivers which have led the business units to incorporate IoT practices and transform their business model to innovate. Before we performed factor analysis, we needed to evaluate the factorability of our dataset. We performed Bartlett's sphericity test that examines the state of inter-correlation between observed variables and is conducted after calculating the observed correlation matrix and matching it against the identity matrix. P-value output of Bartlett's test came to be 0 which signified that Bartlett's test was statistically significant and it also signifies that that the output correlation matrix does not match with the identity matrix. We also performed Kaiser-Meyer-Olkin (KMO) test, which determines whether the data is suitable for factor analysis. The KMO test is used to establish that each observed variable is adequate and also the complete model is in proper shape. The estimation of the proportion of variance was done amongst the observed variables by KMO test. The overall KMO resulted for our dataset is 0.81, which is sufficient to indicate that we can proceed with our planned factor analysis. We used Kaiser criterion based on eigenvalues to choose the factors which greatly influences our study objectives. The factors having eigenvalues greater than one were selected for being the best influencers (*Table 1*). A complete list of abbreviations is shown in *Appendix I.*

Table 1 Factors and Eigen values

Factors	Eigen values
Driving Cost savings and operational adeptness	5.134322
Refining asset servitization with predictive maintenance and reducing inadvertent downtime	2.762341
Achieving process automation	2.513653
Enabling digital workforce and refining mobility	2.234514
Refining schedule optimization	1.765389
Refining health, care or environmental supervision	1.894534
Creating new coupled products, services or business models	2.345612
Refining product quality	3.457843
Refining customer engagement	4.864362

5.Conclusion

The IoT has a bright and exciting future. With all of the projections and ideas in progress, whether it's navigating our communities, innovating manufacturing processes or other operations at work, or making our homes smarter, our lives are about to get a lot simpler and more effective. The true value of IoT is found in the insights and automation that come from having automated access to real-time data from the device network on everything that matters to any of the business operations. Seeing IoT's capabilities and strengths, it is the right time to have real-time visibility into every aspect of the organization.

Data and the derived observations will continue to evolve and flow in the background in an automated fashion, till a need for human intervention or feedback is felt. This innovative business model equipped with IoT design technologies will ensure that decision-making and plans remain data-driven and become accessible to all the stakeholders in the organization, resulting in an improved business model in manufacturing, hospitality, healthcare, retail and many other types of industrial sectors. IoT adoption is expected to grow in future and undoubtedly it will redefine the way the industries operate and innovate, resulting in an increased revenue and efficient operations across all business units.

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Conflicts of interest

The authors have no conflicts of interest to declare.

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Satish Kumar Sogi is an experienced professional working as Head of Strategic Marketing in a global enterprise and has years of demonstrated history of working in the information technology and services industry. He is skilled in Marketing Management, Talent Management, HR Consulting, Business Development, and Marketing Strategy. He has already published a couple of papers as a research scholar at Rayat Bahra University and has a solid academic background with a Master of information technology (E-business), Masters of Computing (Software Engineering), and Master of business administration (Project Management).
Email: Sogi@Sonicorn.com

Dr. Sudesh Kumar Mittal is currently working as a professor at Chitkara University and has worked at a very prestigious position of Chief Scientist in the CSIR-CSIO Chandigarh for 35 years. He has worked in multiple projects sponsored by many renowned departments such as DRDO, DST, Ministry of Railway, IMD, DOE, CWC etc. He is an M.Tech in Computer Science & Engg from IIT, Roorkee and a PhD in Instrumentation Engineering. His areas of expertise are Artificial Intelligence, Neural Network & Machine Learning, Hardware & Software development (Sensors & Systems), Digital Image Processing, Cryptography & Forensic Science, Data Analysis & data mining, and speech recognition. Along with winning many awards and registered patents, there are many publications in his name as author and co-author in various scientific, mathematic, engineering, and technology journals.
Email: sudesh.mittal@chitkara.edu.in

Appendix I

S. No.	Abbreviation	Description
1	IoT	Internet of Things
2	IIoT	Industrial Internet of Things
3	IoTIL	Internet of Things Infrastructure Library
4	KMO	Kaiser-Meyer-Olkin