Technological Innovations in Healthcare Industry

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TIM methodology helps one outcompete change in a very scientific manner

Increasing service costs and the compulsion of providing healthcare to all sections of the society irrespective of their purchasing power are two major challenges that healthcare industry is confronted with. In a situation where costs defy the business logic of serving patients with generosity, information technology (IT) has come as a boon to the industry.

IT plays a core role in almost every healthcare area. Be it providing quality services to the patients at reduced cost, maintaining patient history, adjudicating payer claims, providing referral and pre-certification services, case management, digital imaging of paper forms or generating electronic medical records (EMRs) for speedy and accurate processing of information, IT is playing a commendable role in the healthcare industry. With IT, healthcare service offerings are becoming more predictable and manageable and thus the industry is experiencing stability and a steady transformation.

Uncertainty is a corollary of change. Even if the change is good and beneficial, its lack of acceptance by the relevant stakeholders can bring in uncertainty in the intended consequence of change. Every technological innovation brings with it some concomitant uncertainty due to the change in existing business workflow and processes.

Healthcare industry is no exception. The healthcare industry also faces the dilemma between pursuing the competitive advantage of cutting edge technology and the risk of uncertainty associated with it. There is a need to have a trade-off between bringing in sufficient level of technological innovations to provide quality services at lesser cost and managing the risks/uncertainties it leads to.

This paper will focus on various technology innovation trends in the healthcare industry. The paper also introduces a methodology to evaluate the appropriate level of technological innovations the industry should bring in to create a healthy environment for — faster adaptability of the advanced technologies, reduction of service costs and provision of quality healthcare at affordable prices.

IMPACT OF INNOVATION

During the 18th or 19th century, innovation cycle used to be very long. Be it water, power, textile and iron in the mid-18th century or the rail, steel and steam of the mid-19th, it took years to move from the stage of idea generation to mainstream commercial usage.

Today, the innovation cycle is compressed and is much shorter. This change can be ascribed to the advances made in software simulation, ready availability of venture funding and encouragement given by venture capitalists in commercializing innovative ideas.

Bringing about technological innovation is easier said than done. IT and funding support notwithstanding, organizations need to realize that it is a larger level of acceptability by relevant stakeholders that accelerate their innovation cycle.

If people, technology and processes that form the backbone of businesses are receptive to the inherent change that innovation brings about, the challenge of compressing innovation cycles can be easily countered. It is ironical though to see that it is the people, technology and processes that are the actual change agents but are the first to get impacted by the change that they bring about.

But who and what are these entities in the healthcare sector that impact and get impacted by innovation? [Table 1].

People include patients, providers (physicians/hospitals), business sponsors, end users, claim processors, clinical staff, clearing houses, software vendors audit/compliance personnel, underwriters, policy makers, plan sponsors/employers, insurance agents/brokers, etc.

Technology includes insurance company systems (member enrollment systems, plan sponsor information maintenance system, insurance product system, claim processing engines, patient management systems, provider services systems, patient/plan sponsor support applications, etc.); provider systems (physician systems, hospital management applications); vendor systems to submit claims on behalf of providers; government systems to regulate healthcare industry and perform audits of insurance companies and providers, etc.

Process includes member enrollment process, underwriting process, insurance product setup process, claim processing, claim submission process, claim intake process, patient services process, hospital management processes, etc.

NEED FOR INNOVATION MANAGEMENT

In the current state business where there are overlapping industries, technologies depend on each other. One innovation is dependent on another. Most of the times industries do not factor in the technological progresses while evaluating other technologies. For example, EMRs in healthcare cannot happen until the infrastructure is improved in terms of storage and performance. One innovative idea that might have seemed impossible at one point in time might become a reasonable commercial product with technological advancements in a couple of years as a result of other complementary innovations. Often the impact of an innovation depends on complementary inventions.

Innovation is not only in the technology, but also in the use of the technology. Innovators are usually technology-focused and lack business visualization, though there can be exceptions. They fail to perceive the commercial possibilities of their innovation while they are immersed in the process of innovating. When Marconi invented the radio, he thought the end

Innovation	Innovation Usage/ Benefits	People Impact	Technology Impact	Process Impact
Provider liability estimation	To check the charges to be paid by insurance company and patient's liability. This will help provider to collect the payment from patient as per patient's liability at the time of service, instead of collecting the same at later point	MEDIUM (People will need training on new provider liability estimation software/ interface)	HIGH (To get real-time data and to integrate with provider applications)	HIGH (Change in process of collecting patient's liability at the time of service vs. collecting patient's liability after insurance company processes the claim)
Patient's liability estimation	Web tool to check patient's liability for particular service before actually taking the service. This will help the members not to deal with any financially burden which they had not anticipated earlier.	MEDIUM (Patients will need help information on usage of new web tool).	MEDIUM (Web tool will need to be integrated with patient's medical information. There will need to be sufficient security control to protect patient's privacy information)	HIGH (Change in process of patient's knowing liability before taking the service vs. knowing liability after insurance company processes the claim)
Use of Electronic Health Records (EHRs)	This provides interoperability to connect to external vendors, claim submitters, providers, etc., for speedy and accurate processing of information.	HIGH (People will need to deal with electronic transactions vs. paper forms)	HIGH (Use of new technologies, integration and interoperability of diverse technologies)	HIGH (Change in process of using paper submission vs. electronic transactions involving less manual intervention)
Automation of patient services, provider services	Patients accessing their heath/insurance information and provider accessing the information about claim processing automatically.	HIGH (People will need to get accustomed to the new software/web interface)	HIGH (Automation and integration of diverse technologies)	MEDIUM (Change in process to use new software/web interface to access the information vs. making calls to customer support).
Next generation real-time claim processing	Like credit card transaction, provider will submit a claim real time, get the payments along with member liability and charge the fee to member accordingly.	HIGH (Providers/claims vendors will need to get accustomed to new process)	HIGH (Automation and integration of diverse technologies)	HIGH (Change in process of claim processing)
Use of cloud computing for patient history	Record of all patient historical services will be hosted at insurance company web. Provider, before providing services to the patient, will connect to the cloud to look at the patient's history to provide prescription/treatment accordingly.	MEDIUM (People will need training on usage of cloud for retrieving patient's history)	HIGH (Require new infrastructure and technology)	HIGH (Change in process from capturing past patient's health information every time vs. using cloud in an automated fashion).
Mobile technology	Getting health records over mobile.	MEDIUM (People will need to get accustomed to new mobile technology)	HIGH (Usage of mobile operating system)	MEDIUM (Change in process of accessing health information electronically over computers vs. accessing over mobile phones).
Usage of COTS	Plug-in of COTs system for Efficient administration of business rules	LOW (Transparent to the end user)	MEDIUM (Plug-in of the existing systems to the COTS)	HIGH (Change in work flow for rule maintenance).

Table 1: *Healthcare Innovations and Impacts*   **Source:** *Infosys Research*

users would be Navy or shipping companies. He could not visualize the immense potential it had for communication across the globe.

Sometimes it takes decades to find out the new usage of the existing technology. Like Aspirin has been a very common medicine for years, but it is only recently that one discovered it's potential to prevent heart attacks.

It is therefore important to not wait till the innovation materializes to take it to commercialization but to program manage innovations to an extent that commercialization seems a cakewalk for the business stakeholders.

TIM METHODOLOGY

Technology innovation management (TIM) methodology detailed in Figure 2 will provide a step-by-step process from conception of innovation through innovation sustainability to successful management of technological innovations. A typical TIM organization will have structure as depicted in Figure 1.

Various phases of the TIM methodology are:

Phase I: Business Opportunity

This phase provides reason behind the innovations. If business opportunities or benefits are not identified, innovations cannot be identified.

Forming Management Committee

Executive council will form a management committee to oversee the practices of TIM. Management committee will be responsible for overall planning, tracking of TIM and formation of various teams and task forces to carry out operations. Management committee will meet with executive council on periodic basis to provide the progress of TIM and raise any issues that need inputs from executive council. Executive council will commit the resources needed for the execution of TIM. Also executive council will approve the overall plan created by the management committee.

Identifying Core Business Team

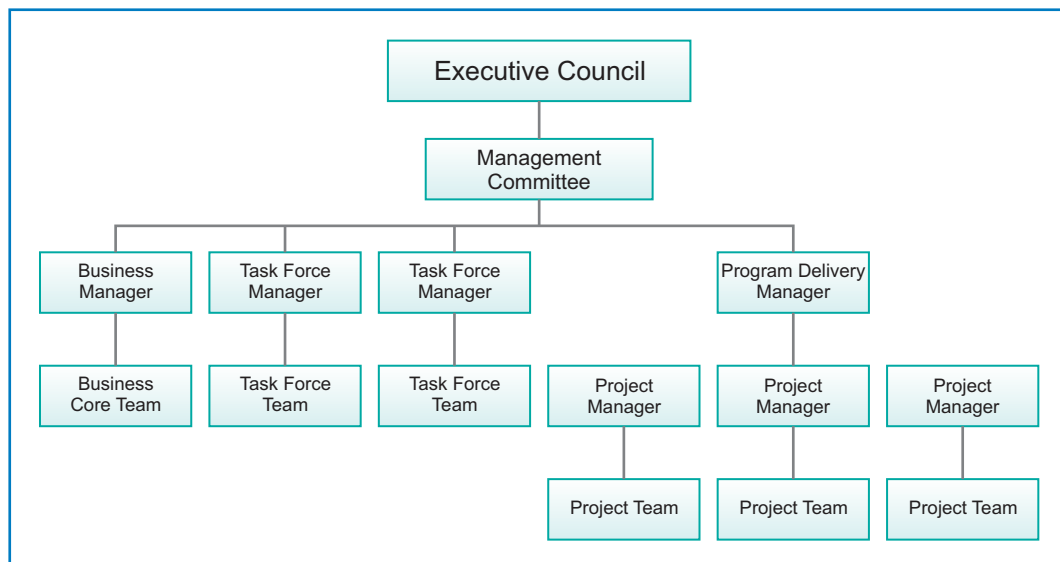Management committee will identify the core business team that will take the bottom line

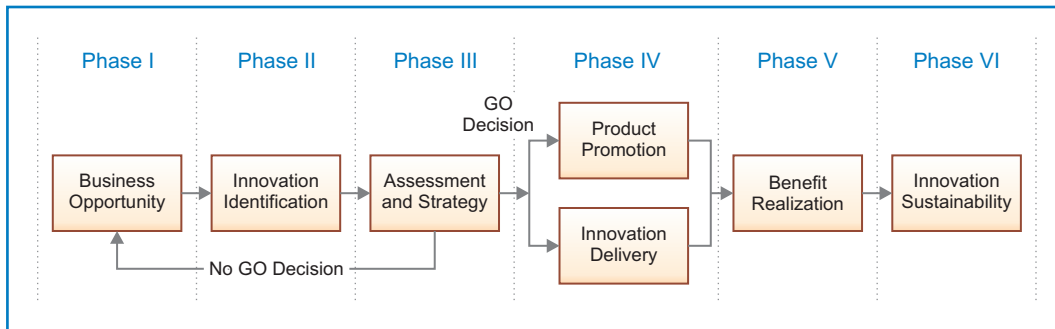*Figure 1: TIM Organization Structure*   **Source:** *Infosys Research*

Figure 2: *TIM Methodology*   **Source:** *Infosys Research*

responsibility and ownership of identifying business opportunities. This team will have sufficient business, market and customer exposure.

Identifying Potential Business Capabilities
The core business team will identify potential business capabilities and need for innovation. A business opportunity is claimed to be so if it has four primary elements that are available within the same timeframe, domain and region. The elements are — requirement, ways to fulfill the requirement, ways to apply the means to fulfill the requirement and a way to gain benefit.

Performing Benefit Assessment
The core business team will shortlist the final business opportunity to be used for innovation by performing benefit assessment. The core business team will also identify both tangible and intangible benefits, like savings over years, customer satisfaction, legal compliance, etc.

Case
A TIM management committee in a health insurance company formed a core business team to identify the business opportunity. One of the business opportunities identified and selected by the core business team was provider

satisfaction and the need to increase provider network by contracting more providers within a network.

Phase II: Innovation Identification
At the end of this phase, high level innovation idea will be identified and documented. The various steps involved in this phase are discussed below.

Task Force Formation
Management committee will form various task forces comprising of key representatives from various key areas who will have sufficient exposure, experience and level of authority to make required innovation selection. The task force will comprise of market research team that will analyze the current trends in the market and identify the means to satisfy business opportunities. It will also contain some consultants, domain experts, coordinators and technical, legal and compliance personnel.

Business Opportunities Presentation
In this step, the business core team will present the business opportunities to the task force team. Presentations will be followed by a question/answer session to ensure that the task force has a clear understanding of the business opportunity.

Identifying an Approach

After understanding the business opportunity, the task force will determine the approach to identify the innovation means/product to satisfy the business opportunity. The various approaches will be brainstorming, market research, competition reviews, previous lessons learnt, industry best practices, etc.

Idea Collection

In this step, innovation ideas will be collected using the approaches identified in the previous step. At the end of this phase, there will be a consensus on the innovation idea that should be used to satisfy business opportunities.

that one of the growing concerns providers have is about collecting payments from patients for patients' liabilities. Providers get the payments from insurance companies as covered by the plan and also get to know the amount to be collected from patient for their liabilities. But providers require multiple follow-ups or visits to collection agencies to recover the payment from patients. This consumes a lot of provider resources. In order to address this concern, the task force identified/selected the innovation idea that could provide a means to the provider to help collect patients' liability, conveniently.

Phase III: Innovation Assessment and Strategy

In this step, innovation idea will be reviewed

A task force dedicated to encourage innovation and gather ideas in an organized manner can prove to be of great benefit

Innovation Presentation and Selection

Task force will present the captured ideas to the management committee. The presentation will include a discussion on the pros and cons against each idea and the reason behind the selected idea.

After the presentation the task force will seek approvals from management committee on the idea and freeze the innovation idea. The idea selected will be pushed to the next level of the methodology.

Case

For the business opportunity stated above, a task force team conducted research and found

to gain a more detailed understanding of the innovation. There will be a joint application design (JAD) and discovery session conducted to expand the innovation idea and perform must haves, should haves, could haves, won't haves ratings to prioritize the innovation items.

Performing Enterprise Architecture Review and Impact analysis

High level solution will be prepared by a team of architects and technical experts to satisfy the detailed innovation idea. A prototype will be built, simulations created and feedback sought from stakeholders.

Strategy Planning and Estimates Gathering

Estimates will be gathered on the high level solution for the management to determine the cost. Strategy planning will be performed to determine the approach to implement the innovation idea. Also a need for a proof-of-concept (POC) will be determined.

Finalizing Assessment

The detailed innovation idea documented, the high level solution identified, the proposed strategy to implement innovation idea and the costing required to build the innovation idea would be reviewed in this phase by key stakeholders. Costing will be used to compare the project benefits to determine

Program Formation

Management committee will form the program(s) and identify the program delivery team structure to lead and execute the program(s).

Case

The task force engaged in discovery sessions to work on the high level innovation idea and decided to come up with a tool/web interface for providers to calculate the patient's liabilities upfront. Providers planned to use this tool/interface at the time of providing service to the patients. This will help providers collect the liability amount from patients upfront, reduce the hassle of follow-ups and avoid expenses

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It is important that a proper need analysis be done to choose the right approach to identify and execute innovation programs

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the feasibility. Sources of funding will be identified to provide for the innovation idea implementation. At the end of this step, a go or no go decision will be taken. If a no go decision is made, the innovation idea will be considered rejected and team will go back to the drawing board from Phase I of the TIM methodology. If go decision is made, then the next step will be executed.

Secure Funding

Management committee will reach out to executive council to get commitment on the resources and funding required to implement the innovation idea.

incurred on collection agencies. The task force detailed out the innovation idea; came up with high level solution; estimates were gathered to decide the costing; funding was secured; and a program was created to execute/implement innovation idea.

Phase IV-A: Product Promotion and Commercialization

This phase will be executed in parallel with innovation delivery phase discussed in IV-B.

Commercialize

Sales and marketing team will start working on strategy to commercialize the new product.

User Training/Awareness

Communications will be sent out to users to apprise them of the new innovation product. Also, the training lead will work with training team to start compiling training materials.

Pilot Group Identification

The core business team will help the task force team in identifying the pilot group to whom the new innovation product will be first rolled-out. These are set of customers who are known and with whom the company enjoys a good relationship. The core business team will work with these customers to decide the planned dates of roll-out of the new innovation product.

Case

While the program delivery team started working on implementation of the innovation idea, the business and marketing rolled out their communication and advertisement campaigns. A separate team began drafting and compiling training material. Also, a core team was identified to handle the providers' comments, concerns, and grievances.

Phase IV-B: Innovation Delivery

This is a program execution phase to convert and implement an innovation idea into innovation product. This phase will be executed in parallel with product promotion and commercialization phase discussed above.

Program Management Planning

Program management will identify individual projects and identify the project goals. Multi-year/multi-release planning may be needed to identify the next cycle projects to address the gaps/fall-outs from previous cycle projects and to build the innovation idea in an iterative

and incremental fashion. Project risk and issue management process will be set up.

Contingency Planning

There will be a need to have a contingency plan in place to ensure business continuity and zero impact to production transactions after a roll-out of new innovation product. Contingency will include multiple back-ups of data, reporting at various points at regular intervals, faster turnaround fix and go supports and roll-back of a new innovation product as a disaster control.

Project Execution

Projects will follow a lifecycle to implement individual project goals. Project management and program management teams will track the progress and measure the adherence with the goals. This step will be executed for all the projects to build the innovation product incrementally.

Tracing Project Goals

Program management will validate that the individual projects have satisfied the goals and are ready to close out. The core business team will perform user acceptance testing of the individual project goals and sign off. For any open defects/fall-outs, program management will either keep the project open or identify the next release project to include them, with appropriate change management processes.

End-to-End Product Validation

This step will ensure if the overall needs of innovation have been met and innovation product is in line with the inputs provided during program management planning. The core business team perform user acceptance testing of the overall innovation product and

sign off. This step will be supported with presentations at various management levels and approvals from key stakeholders to ensure that the innovation product has been built successfully.

Case

To implement the innovation idea discussed above about a tool/web interface for provider liability estimation, the program management team split the functionality logically into projects. Project managers/resources were secured. Each individual project executed its lifecycle phase and ensured that its goals were met. The core business team was involved in performing user acceptance tests of the individual project goals and provided the signoffs. After the implementation of all the projects and functionalities, an overall user acceptance testing was performed to validate end-to-end and successful implementation of provider liability estimation tool/web interface.

Phase V: Benefit Realization

This is the phase to realize the benefits and validate against the benefits identified in the Phase I. The steps involved are —

Pilot Roll-out

In this step, innovation product will be rolled out to the pilot customers. Customer/end users feedback will be gathered and surveys will be performed to validate usability. Any risk/issues from the pilot roll-out will be resolved before moving to the next step.

Communication For Across the Board Roll-out

After successful pilot roll out, decision will be taken to roll-out the innovation product across the board. In this step, all the end users, stakeholders, customers will be communicated with details of the innovation product. There will be help lines and customer support set up and information about the same will be provided in the communication.

Full Migration

In this step, all the communication lines will be kept open to ensure smooth transition to the new innovation product. All the risks/uncertainties/issues will be looked at on high priority and will be resolved with quick turnaround time. Management council (with executive council's support) will ensure that all required resources are available for this step.

Lessons learnt from the execution of TIM for an innovation idea implementation will be captured and best practices will be documented. This step will provide documentation on what could have been done better.

Phase VI: Innovation Sustainability

Capture the Lessons Learnt

Lessons learnt from the execution of TIM for an innovation idea implementation will be captured and best practices will be documented. This step will provide documentation on what could have been done better.

Maintain Innovation Product

Program management will identify the strategy to regularly maintain and enhance the innovation product. There may be some improvements/enhancements needed based on business need or customer feedback. Program management will identify the projects and resources to address such future developments. After the warranty period is over, program management will transition the innovation product to operations for day-to-day maintenance and query resolution.

CONCLUSION

Change is the only constant in today's world and every industry has to innovate and invest in new technologies and ideas in order to grow and sustain in the ever changing markets. Healthcare is no exception to this. However, successful technological innovations cannot be managed like ordinary business functions with traditional management controls. They should be fostered and nurtured in an environment which is radically different from the existing business settings. TIM methodology provides phase-by-phase process to nurture technological innovations and address risks, issues and uncertainties as a standard process.

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