I-TRIZ and the Digitization of your Business

A Whitepaper by QAI Innovation Practice

January 11, 2006

Prepared By

Shree Phadnis
email id: shreep@qaiindia.com

Aditya Bhalla
email id: aditya@qaiindia.com

http://www.qaiasia.com/

For more information on how I-TRIZ can be innovatively used by your organization to realize tangible benefits, contact the nearest QAI office or our team of consultants

Shree Phadnis, shreep@qaiindia.com

Aditya Bhalla, aditya@qaiindia.com

TABLE of CONTENTS

Chapter 1.0 Executive Summary

In today's knowledge economy the debate on digitization within businesses is no longer on *why* to digitize. Instead the ongoing struggle is to accurately ascertain *what* to digitize.

And the answer proffered by IT consultants/ technology vendors would be: "It depends".

It depends on your willingness to junk your legacy systems and migrate to newer platforms and technologies and it depends on the budget sanctioned for the IT department.

Even if you were to momentarily suspend your judgment and follow the train of thought by pulling out all budgetary constraints, is there an iron-clad guarantee that the IT consultants/ technology vendors will be able to *right size* the digitization requirements of your organization? The answer, unfortunately, is in the negative.

And it is not because of any malafide intent on the part of the service providers.

- Right sizing the digitization requirements would require an understanding of the complex web of the cause and effect linkages within your organization including the *useful and harmful* impact of automation on different aspects of your business.

- Organizations, like any living system, continually evolve, making any exercise in right sizing appear like drawing lines on the shifting sand dunes

- The industry does not sufficiently equip the Business Analysts with a common language to effectively communicate with the client to elicit the *stated and unstated* requirements and with the internal teams to *effectively* scope those requirements.

Is there an alternative approach? Yes, there now exists a formal body of knowledge called I-TRIZ. *I-TRIZ is an advanced version of a technique called TRIZ* (a Russian Acronym for *Theory of Inventive Problem Solving*) that has been successfully tested over the past 60 yrs and that provides the Business Analysts, the technical team and the customers a common language to right size the digitization requirements – the language of innovation.

I-TRIZ also provides the CXOs and the business analysts with a systematic approach (called *Directed Evolution*) to foresee the evolution of the business and align the current digitization initiatives to the future requirements.

Perhaps because of the secrecy that surrounds individual I-TRIZ projects (similar to the early years of six sigma deployment) the vast majority of people in business have never heard of it.

This whitepaper will provide an overview of the body of knowledge of I-TRIZ and illustrate the application of the concepts through a simple case study of loan workflow automation in a bank.

Chapter 2.0 Automation as a strategic tool

Information is the currency of this economy. For agile organizations the smooth flow of information across the length and width of the organization significantly determines the strategic disparity with respect to competition.

Automation enables the smooth flow of information within organizations spanning geographies and business units. In the knowledge economy of today, automation is now viewed as a strategic tool to help sustain the information asymmetry with respect to competition.

2.1 The road to hell is paved with good intentions

While automation does provide the strategic advantage, it is not without its share of complexities.

The industry is replete with examples of successful deployments and abject failures. Despite this the probability of success does not appear to have improved over the years.

The established body of knowledge allows organizations to quantify the project metrics such as on time to go-live and the infrastructure specific metrics such as uptime. Organizations and their IT vendors, however, struggle to quantify the extent of diffusion of automation across processes.

The conventional approach of IT vendors is to convert all requirements into:

- Functional requirements (*what* is the *application* supposed to do) and
- Non-functional requirements (*how well* is the *application* supposed to do it)

Soft elements are couched in *application-centric* terms such as usability, maintainability, and so on.

The lack of a common language between the IT and the users is one reason for the hiatus that continues to exist between them. We are all too familiar with the stereotype images of IT staff as *geeks indulging in techno-babble* and of users as *neo-Neanderthals with the uncanny ability to crash systems*.

> ***I-TRIZ***
>
> Provides the users of IT, the Business Analysts, the technical staff a common language of communication – the language of innovation – that is easy to understand and at the same time creates a robust design in a systematic manner.

2.2 Defining the boundaries for automation

The fundamental challenge in any feasibility study on automation is to identify

- Processes that should be automated,
- Processes that should be re-worked without automation and
- Processes that should continue to operate in their current form.

The current body of knowledge does not encourage the Business Analyst to actively consider non-automation options that may actually benefit the automation initiative through a cause and effect linkage.

- Techno-economic feasibility studies focus on the cost/benefit trade-offs of automating an existing process and not necessarily on process simplification. Process simplification is primarily restricted to tinkering with processes where manual labor performs the non-value adding job of moving information between two groups/departments.
    - Many times automation may be an attractive but not the optimal or innovative solution for the business.

- The process-centric view considers an organization as an interconnected chain of processes with the output of an upstream process becoming an input to a downstream process. Automation is one way of speeding up the flow of the input/output of this chain of existing processes.
    - A process-centric view overlooks the complex web of cause-and-effect inter-linkages. This limits the ability to identify and manipulate the positive and negative cascading effects of any automation project. For example, an oft stated complexity of automation originates from the integration of software, hardware whether existing/developed in-house or purchased off the shelf. While the issue of system integration is complex, many times the pain has been self-inflicted because of the lack of clarity on the cause-and-effect linkages.

- Many times in the project life cycle, managers encounter contradictions that lead to compromises or trade-offs taking away many of the potential benefits.
    - I-TRIZ allows Business Analysts and users to explore innovative solutions to resolve contradictions without resorting to tradeoffs

I-TRIZ

Provides a powerful and systematic approach to

- Detail the complex web of cause-and-effect linkages of useful and harmful functions
- Develop innovative solutions to problems in the current and the proposed setup

TRIZ methodology used: *Inventive Problem Solving (IPS)*

2.3 Change Management

Greater complexities stem from the humungous change management efforts required to successfully rollout and stabilize any automation solution across the organization. Risk management typically involves the following activities

- Obtaining the official buy-in of the business unit head to drive the change
- Training a core team to evaluate the application, educate the users, evangelize the benefits of using application, provide first-level troubleshooting and channel application change management requests
- Mitigation of IT project risk factors pertaining to development, post-installation support, change of technologies, application change management and so on
    - One of the reasons why automation projects in many organizations fail is because of the averseness to plan for failure. Automation projects are planned to succeed. Employees are expected to conform to the new environment as *designed for them* by those who have the bigger picture of the organization. The failure to see *Smart Little People or SLPs* (classical-TRIZ terminology) managing your processes can sometimes upset the detailed calculations behind any initiative.

I-TRIZ

Provides a powerful and systematic approach to

- Predict the failure points in the proposed solution
- Provide innovative solutions to the identified problems in the proposed setup

I-TRIZ methodology used: *Anticipatory Failure Determination (AFD)*

2.4 Alignment with evolution of business

An unstated expectation from IT vendors/ consultants/account managers is to *align the automation of the process with the evolution of the business* so that the relevance of the earlier initiatives is not lost over time.

- Such expectations typically never find mention in the vendor proposals/System Requirement Specification documents because these are tough to quantify/evaluate.

I-TRIZ

Allows the business to predict the evolution of its different components based on established patterns of evolution. The automation efforts can accordingly be aligned to fulfill the evolving needs of the business.

TRIZ methodology used: *Directed Evolution (DE)*

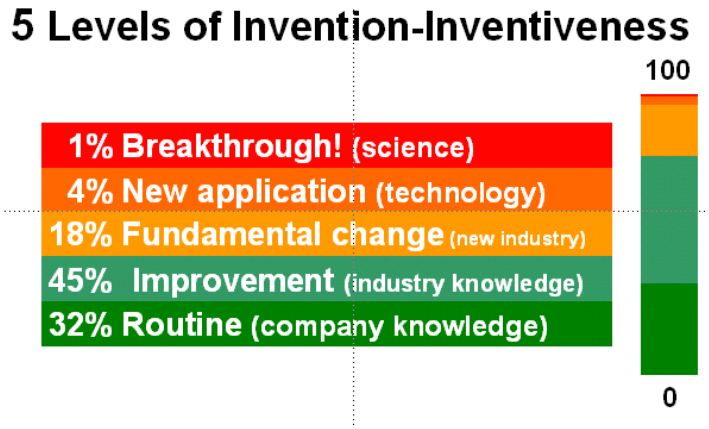
Chapter 3.0 I-TRIZ – an Introduction

3.1 Genesis of TRIZ

*In the 1950s Genrich Altshuller, a 22-year-old scientist and officer in the Russian navy, developed a theory he dubbed **TRIZ** (a Russian acronym for the **Theory of Inventive Problem Solving** - pronounced "trees") that could be used to help solve any number of problems, be they scientific, economic, or social.*

Altshuller's fundamental assertion was that innovation follows a finite set of patterns. Knowing those patterns not only can you solve seemingly unsolvable problems but also predict the challenges you'll face next. He further determined that the process of inventing could be significantly enhanced with a system that provides:

- **A systematic step-by-step procedure**
- **Guidance to the area of the best solutions**
- **Reliable and repeatable results**
- **Access to the accumulated experience of innovation**



3.2 Key findings of TRIZ

The findings of TRIZ (now called *classical TRIZ)* are that

- *All innovators are problem solvers - significant innovations embody solutions to complex problems.*
- *Strong solutions import knowledge from other industries.*
- *The same Problems and Solutions appear again and again but in different industries.*
- *Solutions come from a set of forty principles (Ideation-TRIZ the advanced form of classical-TRIZ has now discovered four hundred and forty principles called **operators** after researching over 2.5 million patents)*

TRIZ is based on the premise that problem solving is a skill that can be learnt. TRIZ researchers have also found that inventors are skilled problem solvers.

3.3 The making of I-TRIZ

I-TRIZ (the Ideation-TRIZ Methodology) is the advanced form of TRIZ that began evolving in the mid-1980s when TRIZ, in its so-called "classical" form, ceased development. Today, what began as a powerful set of problem-solving tools has evolved into a true **science of innovation** that allows for the control, prediction and management of innovation.

Research over the past 60 years has resulted in a formalization of the systematic approach of problem solving. The figure below highlights the evolutionary difference between Classical TRIZ and I-TRIZ.

Classical TRIZ and Ideation TRIZ Comparison

Tools for Supporting the Innovation Process

Innovation Stages	*Classical TRIZ*	*Ideation TRIZ (I-TRIZ)*
Revealing the problem		*ISQ, AFD, Lines of Evolution*
Formulating the problem		*Problem Formulation (software- based and manual)*
Developing the solution	*Principles, ARIZ, SF-Analysis, Standard Solutions*	*Ideation's knowledge-base tools – System of Operators, Lines of Evolution, etc.*
Evaluating the solution		*Criteria and Lines of Evolution*
Implementing the solution (solving secondary problems)		*IPS for secondary problems, include non-technological*

Stages necessary for successful professional problem solving

Good tools for an amateur

Tools for a professional

To understand how I-TRIZ simplifies the automation journey consider the challenges faced by a Business Analyst in their study of an organization.

3.4 Challenges faced by a Business Analyst/ IT Consultant

The Business Analyst is the best available resource to understand the current process and to make recommendations to the client on the scoping of the automation. The Business Analyst is also the best resource to provide inputs to the design and testing team on the requirements specific to the organization.

There are two hazards encountered by IT professionals in their automation projects

- Incorrect/incomplete capture of user requirements by Business Analysts
- Incorrect assessment of impact of changes to user requirements

Business Analysts/IT consultants encounter multiple challenges whenever they embark on any feasibility study.

- Vague or unclear requirements from the users. Somehow every user wants it faster, better and cheaper.

- Automation results in solving some business problem. Correct formulation of the problem is a key activity that underpins the success of the project. Many times the plethora of problems makes it difficult to pinpoint the business problem(s) being resolved. Additionally, it is difficult to identify if automation will create its own set of problems.

- Scenario based approaches fail to provide a comprehensive perspective on the intended usage of the system. Psychological Inertia kicks in and the effectiveness of the exercise gets becomes heavily dependant on the individual abilities of the Business Analyst.
    - Some vendors have developed templates, guidelines, and checklists to take care of the dynamics of the business but these do not provide assurance that the Business Analyst (and subsequently the design and testing teams) will be able to comprehensively envisage the usage environment specific to any organization.

- The existing body of knowledge does not equip the Business Analysts to allay the fears of the different stakeholders that the requirements captured are adequate and optimally aligned with business objectives.

- Perhaps because of the above factors, the final hurdle is the reluctance of the clients to sponsor detailed feasibility studies. This creates undue pressure to generate the findings so that the technical team can start working on the project.

3.5 How I-TRIZ overcomes the Implementation Hurdles

I-TRIZ provides a common easy to understand language (the language of innovation) that binds the client, the Business Analysts/IT Consultants and the technical staff.

I-TRIZ projects succeed in overcoming the implementation hurdles highlighted earlier on account of the following reasons

- Problems are worded in non-technical terms to prevent users from falling into the trap of working on pre-conceived notions of what the solution should look like. Focused questions trigger the mind to formulate the correct problem statement.

- Organizations are modeled as a web of cause-and-effect relationships of useful and harmful functions. The key concept behind this is that *functions remain the same, while the solutions change*. For example, transportation is a function while the modes of transportation (bus, car, train, airplane) are different solutions.

- Big problems are broken into a near exhaustive set of mini-problem statements using an algorithm to provide a comprehensive multi-faceted perspective to the same situation. This is to ensure that solutions are thought through in a systematic manner and not based on loosely directed efforts.

- I-TRIZ lays a strong emphasis on identifying and leveraging the existing resources in the system, the sub-system and the super-system to solve the problems. For many first-time I-TRIZ project implementers the identification of resources is by itself an eye-opening experience.

Computer Sciences Corporation is one of the early adopters of I-TRIZ. Consider the perspective of Howard Smith, CTO Computer Sciences Corporation:

…That's how TRIZ works…its systematic approach to innovation is the antithesis of unreliable, hit and miss, trial and error, psychological means of lateral thinking. Its scientific, repeatable, procedural and algorithmic processes surprise all who first encounter them....

Howard Smith, CTO, Computer Sciences Corporation

- Triggers in the form of focused questions (or *operators*) on the current/proposed set up can be used to predict the failure points. The operators are failure principles distilled from the documented experiences of failures spanning industries across the world over several decades. Measures can be then put in place to mitigate the impact of those failure points.

- Similar triggers based on established evolution patterns can be used to predict the evolution of the different components of the business. These will help the organization prepare for the future and align the automation efforts to the evolution.

Chapter 4.0 Case Study: Loan Workflow Automation in a Bank

4.1 Customer's verbatim requirements

Our current process for commercial loans is very manual because of which there is a very long turn around time in the selling of loans. Because of these delays, many times, we lose our prospects to other banks.

We want to automate the entire process from the time that a sale happens till the loan is disbursed.

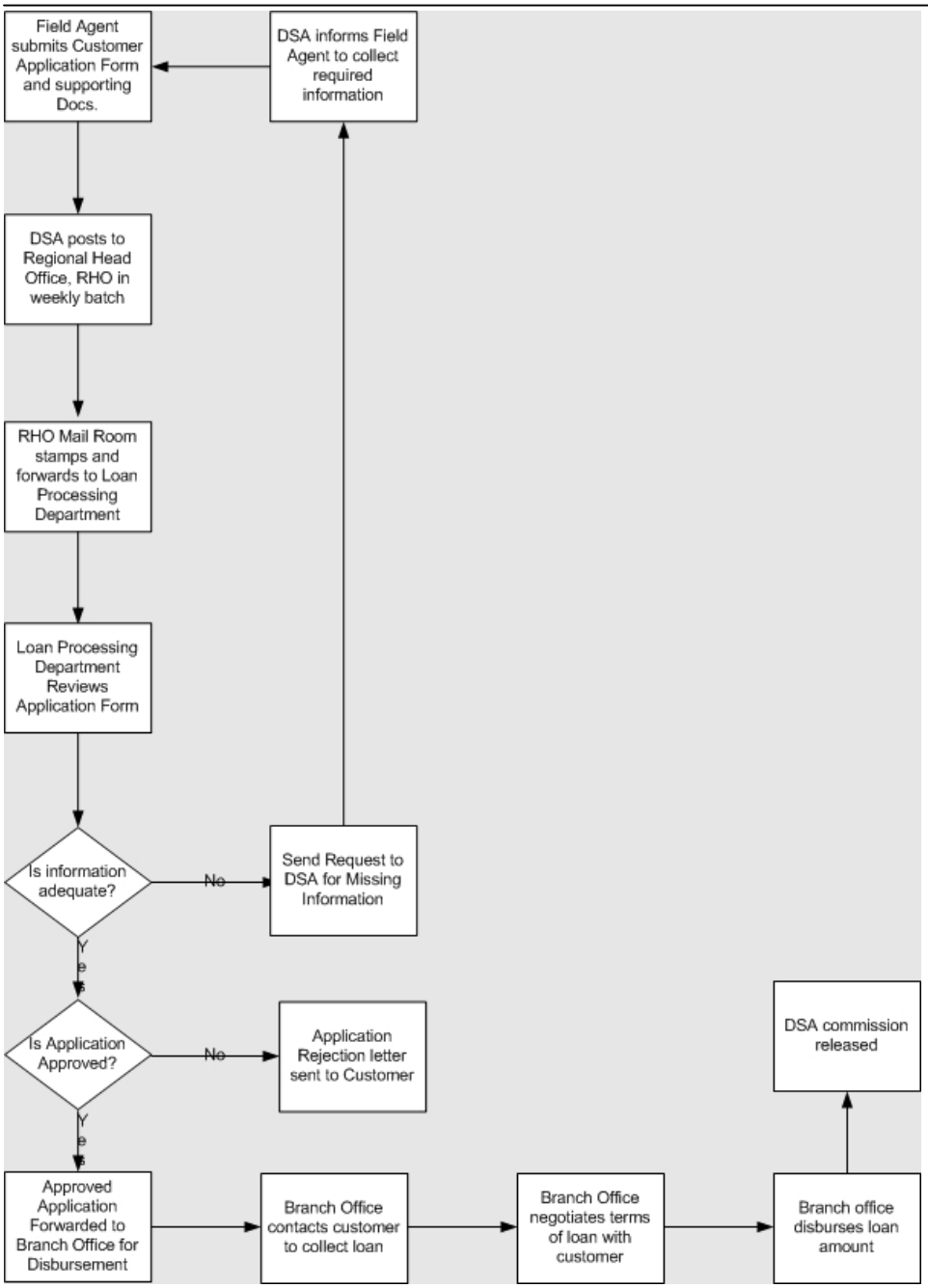
In the current process, our sales force agents employed by our agencies (called DSAs) meet the prospects and obtain the filled up loan application forms. The agencies consolidate loan application forms and send them through postal mail to our regional head offices on a weekly basis. At the regional head offices, the application forms with supporting documents are time stamped by the Mail Room and dispatched to the loan application processing department. At the loan application processing department the application forms along with the supporting documents are reviewed. In case the documents are in order then the loan application is approved. In case the documents are not in order, then the department either rejects the application or seeks more information from the agencies. All postal communications to the agencies are sent once every week

.

Approved loan applications are sent to the loan disbursement departments in the nearest branch office once a week. The branch office contacts the prospects to collect the loan from the nearest branch. The loan disbursement department reports the loans actually disbursed in a report that is sent once a month.

Agency commissions are released on a monthly basis on the basis of loans disbursed.

You can refer our AS-IS flow chart (reproduced in the next page)



We want to automate the entire setup and replace with workflow management software that manages the process electronically. The only exception is the replacement of the mailroom with an Indexer who will sort the electronic customer records and allocate to the processors of the loan processing department.

In the proposed automated setup the agencies will enter the customer data in the system. The supporting documents will be scanned and attached to the customer record. The application processing department will review the electronic records of requests lying in an electronic queue and perform one of the following three actions:

- *Approve the application and move to the loan disbursement queue in the system. The nearest branch office can access this queue. Additionally, the system will generate an email to the agency to inform the customer to obtain the loan from the nearest branch. The agency will be directed to forward the paper documents to the nearest branch.*
- *Reject the application. In this case an email will be sent to the agency stating the reasons for rejection*
- *Suspend the application for want of sufficient supporting documents. All such documents will be moved to the suspense queue that can be accessed by the agency*

Note: For the purpose of this case study we will be making use of the following two software tools from Ideation International Inc.

- Innovation Work Bench
- Ideation Failure Prediction

The above tools simplify the process of model creation, identification of suitable directions and the application of operators (or principles) in generating ideas for problem solving.

4.2 Introduction to Functional Modeling

According to I-TRIZ systems evolve towards increased ideality. There are at least two approaches to increasing system ideality: (1) increase the number or magnitude of the useful functions; and (2) reduce the cost, number, or magnitude of the harmful functions.

$$\text{Ideality} = \frac{\text{All Useful Functions}}{\text{All Harmful Functions}} \rightarrow \infty$$

To look for ways to increase a system's ideality it is necessary to create a **functional model** - a cause-effect diagram that describes the system's functions and the relationships between them.

Functional modeling is also a powerful method for "untangling" a complicated situation. The basic elements of a functional model are **functions** and **links**. A **link** defines the **relationship between functions**.

To build a functional model:
1. Identify the **useful** and **harmful** functions related to the problem.

A **function** is an **activity, action, process, operation or condition**. Functions are either **Useful** (green box) or **Harmful** (red box).

2. For each function defined, ask the **control questions** below. Based on the answers to these questions, continue creating the functions that contribute to the problem situation.

- **Does this function produce another function?**
- **Does this function counteract another function?**
- **Is this function produced by another function?**
- **Is this function counteracted by another function?**

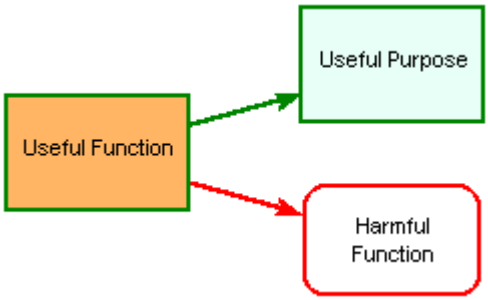
3. Identify the relationships between the functions by connecting the boxes with arrows.

***Link* – a relationship between functions**
Two types of links are defined: **produce** and **counteract**. (We will use an arrow and crossed arrow, respectively.)

Image	Type	Name	Verbal example of utilization	Graphical example of utilization
→	Useful	Produce	Useful function produces another useful function	
⊣→	Useful	Counteract	Useful function counteracts harmful function	
→	Harmful	Produce	Useful function (or harmful function) produces harmful function	
⊣→	Harmful	Counteract	Useful function (or harmful function) counteracts useful function	

Reveal the **Contradiction** by looking for functions that have both a **useful** and **harmful** outcome.

4. Formulate the following **Tasks**:



- **Modify a Useful Function** - Determine how the system can be changed to improve its characteristics, functionality, etc.
- **Resolve a Contradiction: A Useful Function should *exist* in order to fulfill a Useful Purpose and should *not exist* in order to avoid a Harmful Function**. - Change the system so that the desired results are achieved while the associated undesired results disappear or diminish.
- **Eliminate a Harmful Function** - Change the system so that an undesired factor is eliminated or reduced.

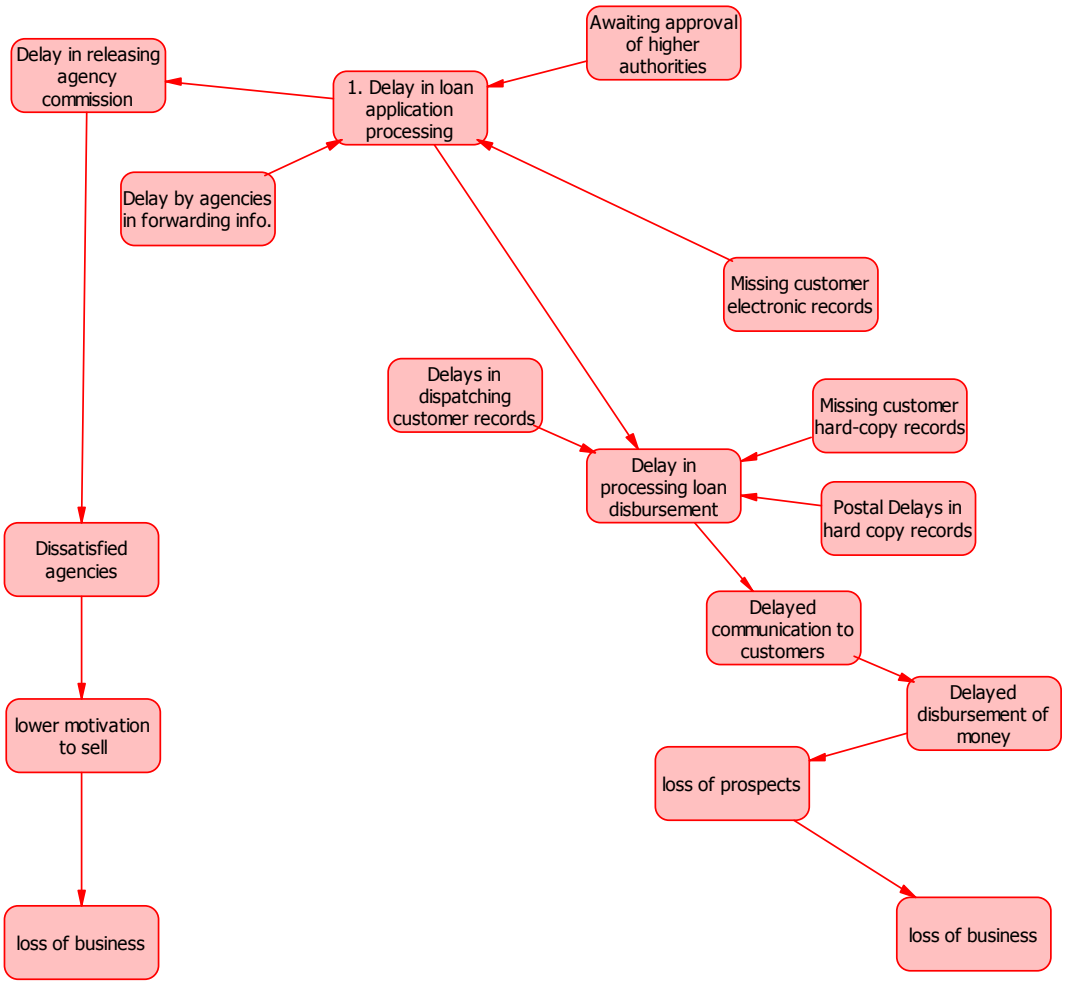
5. At this stage one can now **Generate Ideas** using **Directions** and **Operators**.

A Functional Model provides both the customer and the Business analyst an easy to understand approach to

- Identify areas where automation can be a useful function.
- Identify areas where non-IT solutions would be much more effective.

4.3 Functional Model of Sales to Loan Disbursement

If the Business Analyst were to create the AS-IS functional model of all the harmful elements on the basis of the verbatim inputs, the following cause-and-effect relationship emerges.



Brief Explanation of the model: For any bank, disbursement of loans is one of the critical success factors in generating higher returns from employable funds. In the given scenario, delay in the processing of loan applications is one of the identified core bottlenecks to be addressed through the automation process.

Accordingly, *delay in processing of loan applications* has been identified as the first **harmful function** in the creation of the model. Thereafter, at every stage of the model building the four control questions on whether the particular harmful/useful function produces/is produced by another harmful/useful function are asked.

Analysis of the functional model
The analysis of the functional model yields 15 directions for solving this problem.

For each of the direction, I-TRIZ suggests the applicable operators or proven principles of problem solving. Operators help overcome the psychological inertia inherent in any problem solving.

The power of the methodology lies in the ability of the Analyst to use it to determine the areas where the optimal solution is automation and areas where the optimal intervention is in making changes to the business logic.

Let us consider one Direction as an example and illustrate the concept by taking a few of the many applicable Operators or principles.

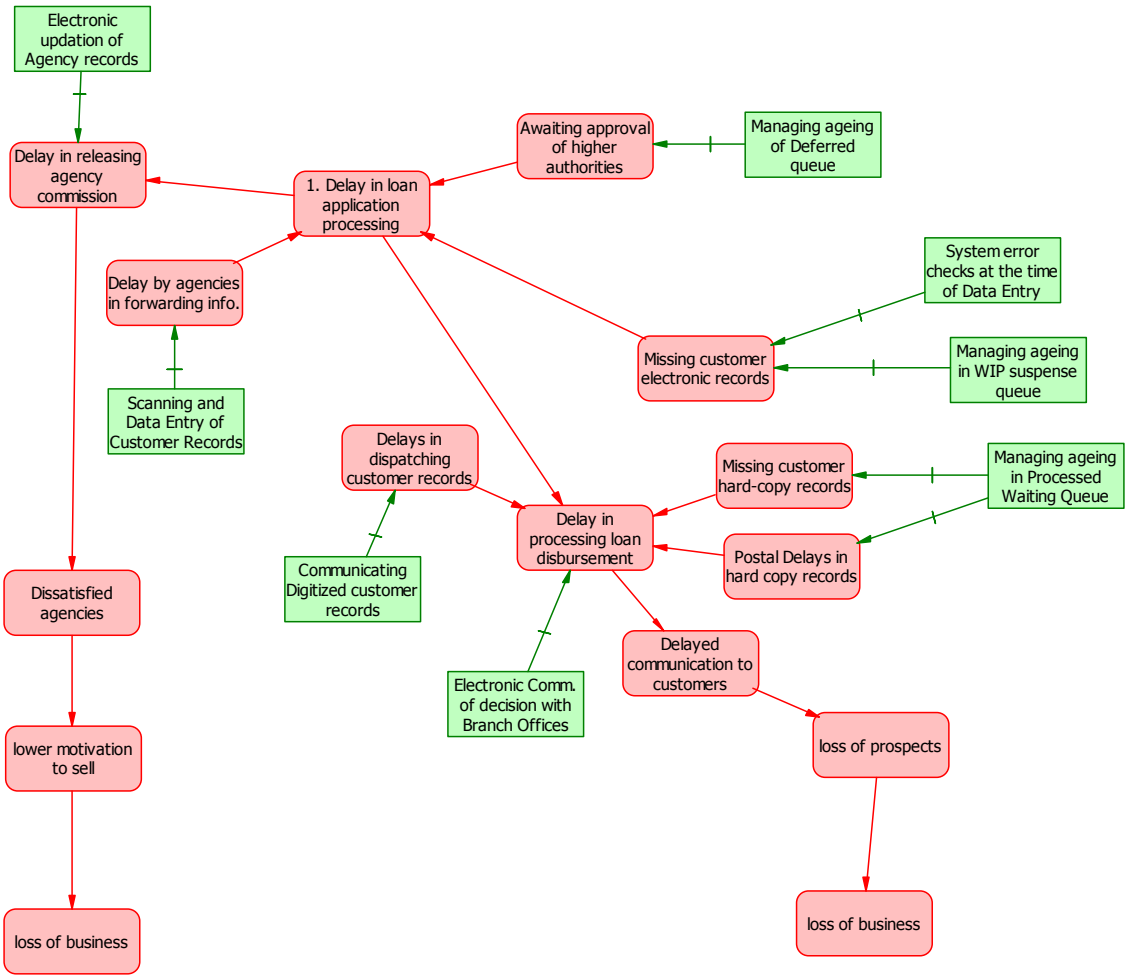
Direction from I-TRIZ analysis of the functional model

Find a way to eliminate, reduce, or prevent *Missing customer hard-copy records* in order to avoid *Delay in processing loan disbursement*.

S.No.	Operator Major Category used	Operator sub-category used	Idea category	Sample Idea generated
1	Find a way to eliminate, reduce or prevent Harmful Function: *Lower Harmful Parameters -> Time Wasted (utilize time resources)*	Use post-process time *Consider using time toward the end or after an operation to carry out a finishing or correcting process.*	Automation specific	At the time of scanning and uploading of documents, create a flag with a time stamp. The time stamp will track the ageing of the documents till the complete set of documents reach the branch office
2		Concurrent operations *Try to combine homogeneous or neighboring operations and replace a step-by-step operation with simultaneous, parallel operations.*	Business specific	For every application obtained and scanned by the DSA, ensure the originals are dispatched to the branch office in the daily mail
3.		Preliminary action *Consider completely or partially performing a needed activity in advance.*		• Define a minimum list of documents to be collected by field agents at the time of filling up of application form • For priority customers and for A-category agencies consider document verification at agency level to be sufficient for loan disbursement

It is not uncommon in I-TRIZ based focus group sessions to generate a large number of ideas. The rules of brainstorming apply at this stage – not to shoot down any idea howsoever unreasonable it might appear.

Given the above analysis the reworked functional model with areas requiring automation are given in the figure below.



Having identified the areas where automation can play a useful role, the next challenge is to identify the opportunities of failure of the proposed system. This is where another I-TRIZ tool called Ideation Failure Prediction (IFP) comes handy.

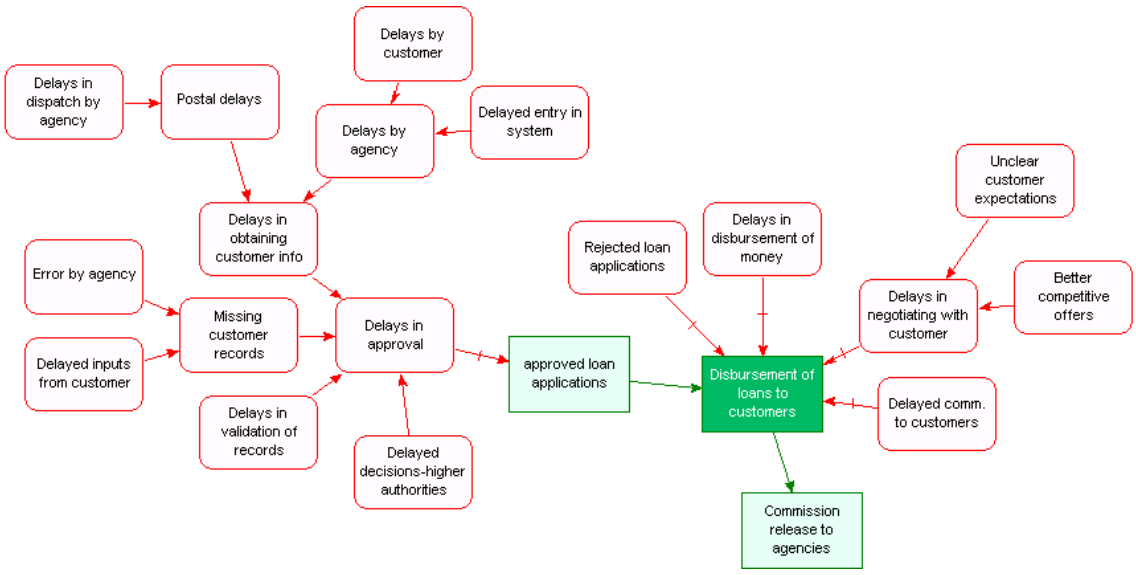
4.4 Creating the Failure Prediction Model

The Failure Prediction mode of the Anticipatory Failure Determination methodology is the following principle: Instead of "guessing" about potential failures, ***the problem is inverted and formulated in the following pro-active way:*** **Find a way to *produce* the failure**

This approach is realized through automatic problem formulation, called *Failure Prediction Modeling*. After this step, all the tools available in the AFD Knowledge Base – the Checklists and Operators, Resources, the Innovative Guide – can be applied to create *Failure Hypotheses*.

In any system, the most dangerous harmful effects are those that can intensify and/or do not appear until later. Therefore, it is important to consider methods for ***intentionally intensifying a failure and for hiding a failure.***

The Failure Prediction Model for the loan workflow automation is given below.



The analysis of this model throws up 46 directions of failure prediction. Sample directions are listed below

8. Consider utilizing the resources of [the] (Disbursement of loans to customers) to deteriorate [the] (approved loan applications).

16. Consider utilizing the resources of [the] (Disbursement of loans to customers) to intensify [the] (Delays in approval).

25. Consider utilizing the resources of [the] (Unclear customer expectations) to

deteriorate [the] (Disbursement of loans to customers).

41. Consider utilizing the resources of [the] (Error by agency) to deteriorate [the] (Disbursement of loans to customers).

4.5 Failure Hypotheses

As before let us consider one of the Directions to generate the sample failure hypotheses.

8. Consider utilizing the resources of [the] (Disbursement of loans to customers) to deteriorate [the] (approved loan applications).

Interpretation of the above statement:

- The loan application-processing group has approved the loan application.
- The loan disbursement group has to act on the recommendations of the loan application reviewers and
    - Intimate the customer the decision
    - Fix an appointment to sign the contract
    - Negotiate the final terms of the loan
    - Sign the contract
    - Disburse the money

Resources of the Disbursement of loans to customers

The list below provides the resources of the Disbursement of loans to customers

- People
    - Indexer of Disbursement of Loans Group at Corporate office
    - Supervisor at Corporate office
    - Loan Disbursement processor at Branch office
    - Supervisor at Branch office
    - In process Quality Checker
    - Loan approving Group processor
- Documents
    - Department specific Policies
    - Department specific procedures
    - Department specific checklists
    - Department specific templates
    - Inter-departmental communications/updates
    - Product specific information
    - Email communication for loan approval
    - Scanned images of customer records
    - Hard copy of customer records
- Other Departments/Groups
    - Loan approving Group
    - Branch office
- External entities
    - Direct Sale Agencies

- Individual agents employed by company
- Customers

- Time: *Time resources* include partially or completely unused time intervals that occur before the start, after the finish, or between the cycles of a process.

- Space
  - Location for fixing appointment
  - Location for dispatch of supporting documents

Creating the Failure Hypotheses

The table below provides sample failure hypotheses generated.

S.No.	Function	Resource category	Specific Resource	Sample Resource activity that can lead to failure – Failure Hypotheses (Input for Automation Design and Testing highlighted in Red font)
1.	Disbursement of loans to customers	People	Queue Indexer	• Indexing of customers of different loan products to wrong queues o Doing away with manual indexing. o Use of standardized notation by loan approval group processor that can be subsequently used by the application to direct customer records to appropriate queue. o Error checking routines to handle incorrect usage of notations by loan approval group processor
2.			Supervisor at Branch Office	• Failure to manage the timely disbursement of loans at branch level • Failure to manage the disbursements of loans to high-priority customers • Failure to track fulfillment of commitments made to customers, e.g. instructions on release of payment, rescheduling of appointments on account of exigencies controllable by branch etc o Tracking of queue by ageing and by different customer types. o Establish threshold values for ageing leading to escalation to Supervisor at Corporate Office o Calendar with alerts on upcoming commitments, missed deadlines

4.6 Failure Scenario

Once the Failure Hypotheses have been created, the next step is to create Failure Scenarios for each of the Hypothesis. The table below provides a sample output for one of the Failure Hypothesis pertaining to the people resource *Supervisor at Branch office*.

S.No.	Function	Failure Hypothesis	Failure Scenario (in Blue font)	Inputs for Automation Design and Testing teams (in Red font)
1.	Disbursement of loans to customers	Failure to track fulfillment of commitments made to customers, e.g. instructions on release of payment, rescheduling of appointments on account of exigencies controllable by branch etc	*Failure Hypothesis type: Instructions on release of payment* Sample failure scenarios are given below: Failure Scenario # 1: Hiding failures in places that are never checked • Not entering the instructions in the system • Entering incorrect instructions in the system • Entering incomplete instructions in the system • Routing instructions to the wrong queue • Not entering the instructions Failure Scenario # 2: Making any correction of the failure impossible • Creating situations such as entering incorrect/ incomplete details, misrouting of requests that results in the records being put as irresolvable in the suspense accounts queue Failure Scenario # 3: Decreasing the sensor's ability to perceive a failure • Entering the bulk of the	• Make some fields pertaining to payment instructions mandatory - payment amount, payment mode, payment date, pay to • Obtain the customer's signoff on the payment instructions in hard copy • Scan the document and attach soft copy to the records. • OCR check performed at the time of scanning to verify authenticity of signatures, information inputted • Create a summary view of the payment instructions on the computer • Error-checking routine to check for errors before auto-routing documents and instructions to the appropriate loan disbursement queue • Allow for Supervisory override in case of any detected error/ rework performed post signoff • Include such exceptions in the Exception Tracker report routed to Branch office and Corporate office at the following frequency: • Branch office: Daily, weekly summary, monthly summary • Corporate office: weekly summary, monthly summary with drill down capabilities at the branch level and the processor level

S.No.	Function	Failure Hypothesis	Failure Scenario (in Blue font)	Inputs for Automation Design and Testing teams (in Red font)
			instructions in the free *text form* (notes) and not in the *drop down* or *check box/ radio button* options available in the system	

From the above examples, it would be apparent by now that I-TRIZ provides a very systematic, scientific and comprehensive approach to solve any problem – innovatively.

4.7 Next Steps

The whitepaper has deliberately restricted the analysis at the high level to illustrate the power of the tool in generating a robust design even with vague or unclear customer requirements. As demonstrated, the approach can be used and understood by customers, end-users, Business Analysts, Design team, Testing team and so on.

In a real scenario the detailing can be taken to the level desired depending on the requirement of the concerned stakeholder. Additionally, I-TRIZ is not bound to a specific industry or domain or function.

Customers, IT vendors and IT consultants now have a powerful approach to align the automation efforts where they will matter most and to stay away from the cookie-cutter approaches to automation.

About QAI

Incorporated in 1994, QAI's charter is to facilitate enhanced competitiveness amongst software, IT enabled and knowledge intensive organizations through multi-faceted interventions. QAI is Asia's largest and the world's third largest firm in enterprise wide deployment of process initiatives that contribute to `Operational Excellence'

QAI focuses on the triad of People, Processes, and Technology and offer services through Consulting, Training, People, Process and Operational Assessments, Benchmarking, Certification, Conferences, Resource provisioning, e-Learning to over 200 clients in India, China, Malaysia, Singapore, Middle East, Hongkong, US, South East Asia, Australia, Europe and Russia.

QAI's consulting service draws its strength from almost a decade of experience in research, training and facilitation in the areas of Process Improvement, Process Engineering, Quality, Change, Innovation and Knowledge Management.

About QAI's Innovation Practice

QAI's experienced team of I-TRIZ consultants can be engaged in the following interventions.

A) Establishing a Center for innovation in your organization
The intervention will involve the following

- Assessment of the AS-IS Innovation capabilities of the enterprise
- Defining the SHOULD-BE Framework for strategic innovation
- Formalizing a System for institutionalizing the process of innovation

B) Imparting competences on Innovation

- Certification based training programs for individuals on ITRIZ methodologies
    - Ideation brainstorming
    - Innovative problem solving
    - Anticipatory failure determination
    - Directed evolution

C) Consulting

- **I-TRIZ Project Intervention** Our experienced consultants will team up with your team to work on solving any management or technical problem that your organization is currently facing. The intervention can be in any of the following forms
    - **Hands-on intervention** – Our team works with you to solve the problem.
    - **Facilitation** – We partner with your organization, combining your organizations domain expertise and QAI's expertise on the Ideation/TRIZ Methodology, and ITRIZ software tools to systematically attack and resolve the problem.
    - **Coaching**– Ideation/TRIZ specialists provide post-training assistance to your subject matter experts, ensuring that their work stays focused, success criteria are met, and maximum benefits of the Ideation/TRIZ Methodology and its tools are realized.

For more details on how **Innovation and other innovative approaches** can translate into tangible benefits for your organization, please send an email to our team of consultants:

Shree Phadnis, shreep@qaiindia.com
Aditya Bhalla, aditya@qaiindia.com