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Mike Celentano

A Proven Process for Technology Pre-Development

A Proven Process for Technology Pre-Development

Abstract:

Often, there is a substantial gap between what academia and industry call a mature technology. This can result in product development teams being burdened with unknown technology risks leading to project cost overruns, schedule delays, and product feature reduction.

Systems Engineering methodologies were applied to this problem at a medical device company which resulted in a new process for the pre-development of new technologies prior to project teams using them. This process was inspired by lean techniques, only adding work where there was value, and subtracting work where there was waste. This process also was inspired by agile techniques, setting the review cadence to 1 month, where projects could be killed, shelved or continued.

The process was implemented, refined and maintained successfully for about seven years. Over that time the budgeting process was also forced to become agile. The process also brought stakeholders together to discuss technology strategy, a forum that did not exist before.

Success was measured by the many technologies that failed before projects used them, the few technologies that successfully went on into successful projects, as well as the positive change in company culture that resulted. Now the global organization has changed to achieve these same outcomes in a more permanent, mandatory and comprehensive way.

A Proven Process for Technology Pre-Development

The Problems

The Initial Solution

Refining The Process

The Outcomes

Lessons Learned

The Initial Problems

- Insufficient Technology Maturity
  - “Mature” technologies from Academia are often too risky
  - Common cause for schedule & budget overrun
  - Once a new feature fails in a project, its poor reputation prevents it from getting to the customers
- Poor Connection to Business Value
  - “Skunk Works” projects are purposefully not communicated well so they are often solutions looking for problems with little to no business value behind them
- Erratic Funding of New Technology/Features
  - Discretionary funding is unreliable, causes incomplete evaluations and biased priorities
  - Traditional funding models are too fixed to allow for fast scouting & fast failing several yet to be discovered technologies within a budget year

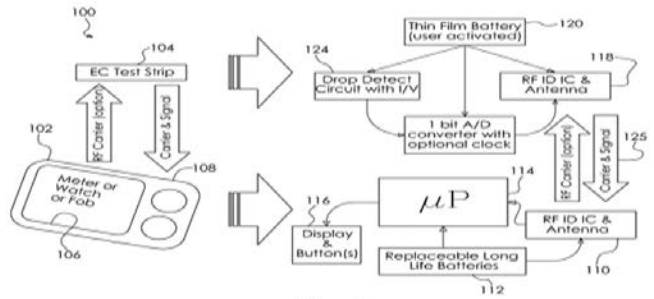
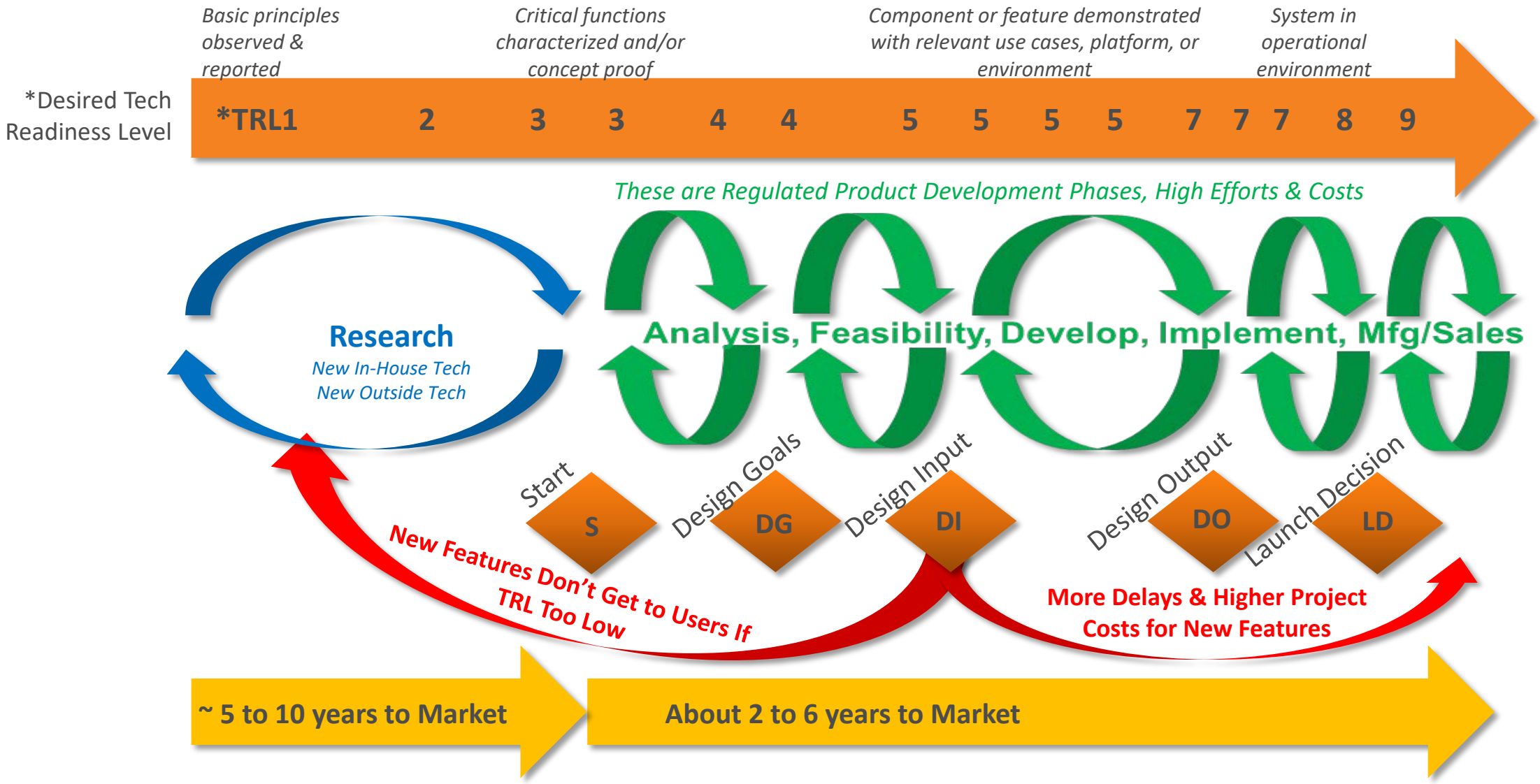


Fig. 1

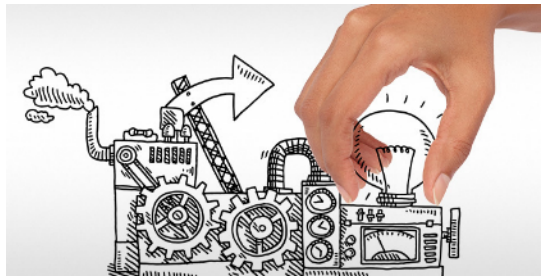
This particular patent came from a crack-pot named Celentano

The Problems - What Happens without Pre-Development?



The Initial Solution

Key Goals:



- Mature or Reject New Tech Before Giving to Project Teams

- Make the Process Robust to Unilateral Agendas

- Involve Stakeholders Directly to Help Assure Organizational Acceptance

The Initial Solution

Scope for the “Toolbox Group” in 2011

Mission 2011

The mission of the Toolbox Group is to help reduce meter system development delays & help increase value to the customers.

- *Delays will be reduced by addressing, before the project starts, some of the issues that a desired applied technology or a new feature may have if it were integrated into the systems of interest.*
- *Value to customers will be increased by providing more well understood technologies and features to projects, thereby increasing the likelihood of the project including the desired technologies or features in the final product.*

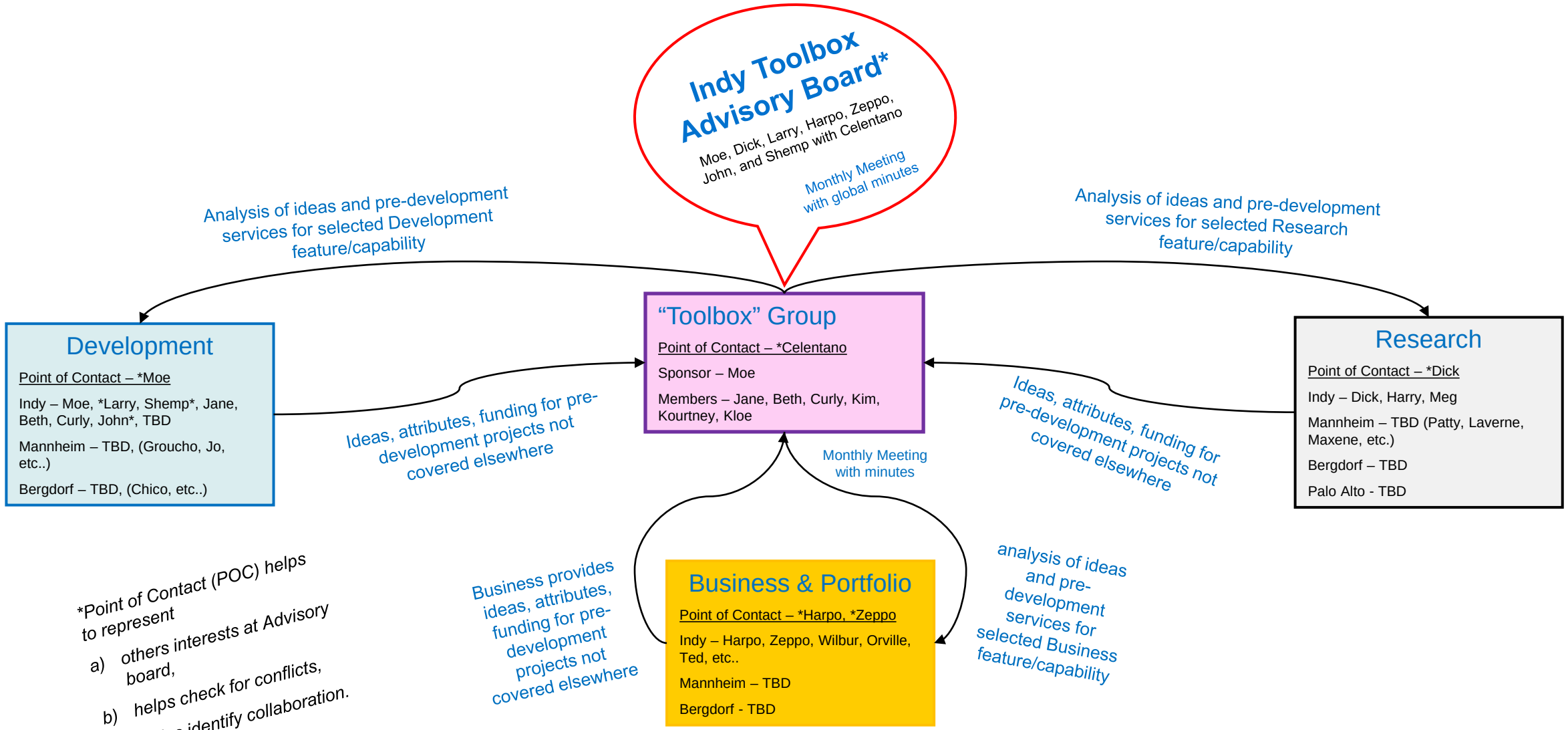
2011 Budget for Toolbox

- Limited Project Expense Funding was Available
- Each Pre-Development Project was Individually Funded

Extreme Tool Inc.

The Initial Solution

Stakeholder Management Plan - 2011

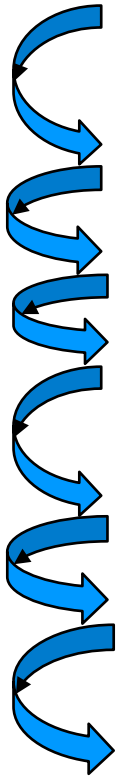


*Point of Contact (POC) helps to represent

a) others interests at Advisory board,
b) helps check for conflicts,
c) helps identify collaboration.

The Initial Solution

Toolbox Idea Life Cycle Process - 2011



1. Ideas are captured from P.O.C.s, Stakeholders, Ideation Network, IP Disclosures, International Marketing Team, PMs, etc..
2. Each idea is categorized in the same way
3. All ideas are compared to each other & reviewed with the Advisory Board (AB)
4. Depending on many factors such as: addressed already, estimated value, effort needed, funding available, and resources available; the AB selects ideas to turn into projects
5. Periodic, likely monthly, status reports will be given to the AB
6. Depending on many factors, projects may be deemed done, postponed, or cancelled by the AB
7. Ideas & artifacts from projects will be kept in an easy to use, but not yet ready to use, library

The Initial Solution

Standardized Technical Readiness Levels - 2011

1. Basic principles observed and reported.

Lowest level of technology readiness. Scientific research begins to be translated into applied research and development. Examples might include paper studies of a technology's basic properties.

2. Technology concept and/or application formulated.

Invention begins. Once basic principles are observed, practical applications can be invented. Applications are speculative and there may be no proof or detailed analysis to support the assumptions. Examples are limited to analytic (paper) studies.

3. Analytical and experimental critical function and/or characteristic proof of concept.

Active research and development is initiated. This includes analytical studies and laboratory studies to physically [test] analytical predictions of separate elements of the technology. Examples include components that are not yet integrated or representative.

4. Component and/or breadboard [tested] in laboratory environment.

Basic technological components are integrated to establish that they will work together. This is relatively "low fidelity" compared to the eventual system. Examples include integration of "ad hoc" hardware in the laboratory.

5. Component and/or breadboard [tested] in relevant environment.

Fidelity of breadboard technology increases significantly. The basic technological components are integrated with reasonably realistic supporting elements so it can be tested in a simulated environment. Examples include "high fidelity" laboratory integration of components.

6. System/subsystem model or prototype demonstration in a relevant environment.

Representative model or prototype system, which is well beyond that of TRL 5, is tested in a relevant environment. Represents a major step up in a technology's demonstrated readiness. Examples include testing a prototype in a high-fidelity laboratory environment or in simulated operational environment.

7. System prototype demonstration in an operational environment.

Prototype near, or at, planned operational system. Represents a major step up from TRL 6, requiring demonstration of an actual system prototype in an operational environment. Examples include testing the prototype in structured or actual field use.

8. Actual system completed and [verified] through test and demonstration.

Technology has been proven to work in its final form and under expected operational conditions. In almost all cases, this TRL represents the end of true system development. Examples include developmental test and evaluation of the system in its intended or preproduction configuration to determine if it meets design specifications and operational suitability.

9. Actual system proven through successful [intended use] operations.

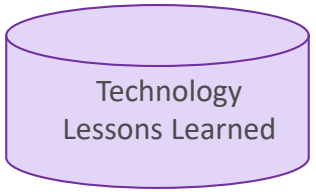
Actual application of the technology in its production configuration and under [intended use] conditions, such as those encountered in operational test and evaluation. Examples include using the system by operational users under operational [intended use] conditions.

The Initial Solution

Toolbox Library - 2011

- Toolbox SharePoint site with controlled but generous Read-Only access for Ideas, Decisions & Project Artifacts
- Toolbox Physical Library with prototypes & demonstrators available in showcase but under lock/key
- We assure that relatively mature (i.e.: TRL6) modules from Toolbox also end up in the global Module Library *(which later died)*
- Explored other potential synergies with company sites such as the Ideation Network

http://www.adaptivepath.com/ideas/the-adaptive-path-library/



http://narutoprofile.wikia.com/wiki/Uzushiogakure_Grand_Library

The Refined Solution

Key Goals:

- After about 3 years of operation, re-assessment was needed
- Improvements had been made along the way
- Needed More Robustness to Organizational Changes
- Better Global & New Stakeholder Alignment
- More Agile & Lean Methodologies
- Re-Brand from “Toolbox” to “Adaptive Technologies”

Adaptive Technology Process

- Monthly Reviews of Multiple Pre-Development Projects
- TRL Assessment & Status Updates
- Document Actions & Decisions
- Document Tech Lessons Learned
- Ongoing Assessment of Portfolio Fit
- **Monthly Cadence of Kill, Continue or Start**

The Refined Solution

Stakeholder Needs Elicitation

- Each Stakeholder was interviewed for needs to improve the process.
- Each need, problem or goal was indexed for analysis.

Stakeholder Needs Analysis

- Most stakeholders' needs were not conflicting and therefore were addressed directly by the refined process.
- However, there were a few that may have been contentious and required more attention.
- These were outlined with suggestions to mitigate the conflict, and then approved by the stakeholders.

The Refined Solution

Stakeholder Needs Analysis - Example

IDs	Potential Conflict	Planned Mitigation
2.5 3.3	**Run committee by majority vote rules** **- versus -** **Escalate in case of conflicting priorities as well as on conflicting contents**	1. Key decisions will be made considering the input of all key stakeholders. 2. The Chair of the Adaptive Technology takes responsibility for driving key decisions. 3. If a quick consensus is not possible on strategic decisions, such as funding or stopping a project, a majority vote will be required from the following 3 stakeholders … Head of A, Head of B, Head of C 4. If/When strategic decisions are not possible then the final decision will be escalated to and made by … The Big Cheese 5. The Chair and Project Leaders are responsible for making all tactical (not related to starting or stopping a project) decisions and assigning actions based on the input they receive from the relevant stakeholders.
5.2 4.5,7,8 3.1.2 & 3.2 6.4	**Get input from Long Term Portfolio** **- versus -** **Also getting input from Short Term Portfolio, PE work, R&TI work and External Research ("Push")**	1. Assure the process is defined to take input from the long & short term portfolio (also known as "Pull"). 2. Also assure the process is defined to take input from internal & external sources ("Push"). 3. Define the process to consider all of these inputs with the same criteria including, but not limited to: desired balance of push vs. pull, budget, stakeholder priority, risk, opportunity, and timeliness.
2.4 6.6 7.	**Keep Adaptive Technology projects small** **- versus -** **Just work on a couple and fund them extensively to succeed**	1. Assure the process has several active projects with some others ready to activate in case a project is closed down. 2. Assure that projects are reviewed often enough to avoid significant waste of the total budget. 3. Assure that all projects that are activated fit the criteria for Adaptive Technology projects such as, but not limited to, being quick adaptions that can bring small but differentiating features fast or be feed quickly into pre-development.

Refined Process - Adaptive Technology Process Summary

Refined Mission Statement with Advisory Board:

Reduce development time at the same time as increasing the value of our products to our customers.

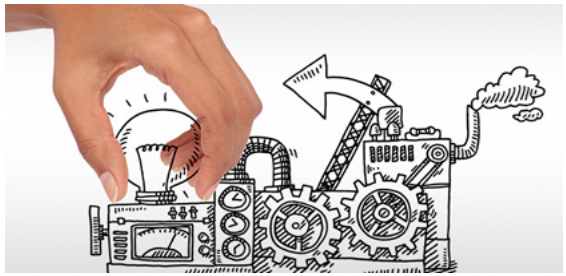
- *We will do this by quickly selecting, adapting, evaluating, maturing and transferring new external "shell" technologies to our systems that help solve problems our customers have in the near term.*
- *Customer problems will be determined with input from the stakeholders (advisory board) who have knowledge of the product and technology portfolios.*
- *New technologies will be selected with input from the advisory board and by matching these potential solutions with the emerging problems & new features desired.*
- *Pacing of these solutions will be determined by the pacing of new features planned in the portfolio and by the complexity of both the problem & the related solution.*

Refined Process - Adaptive Technology Process Summary

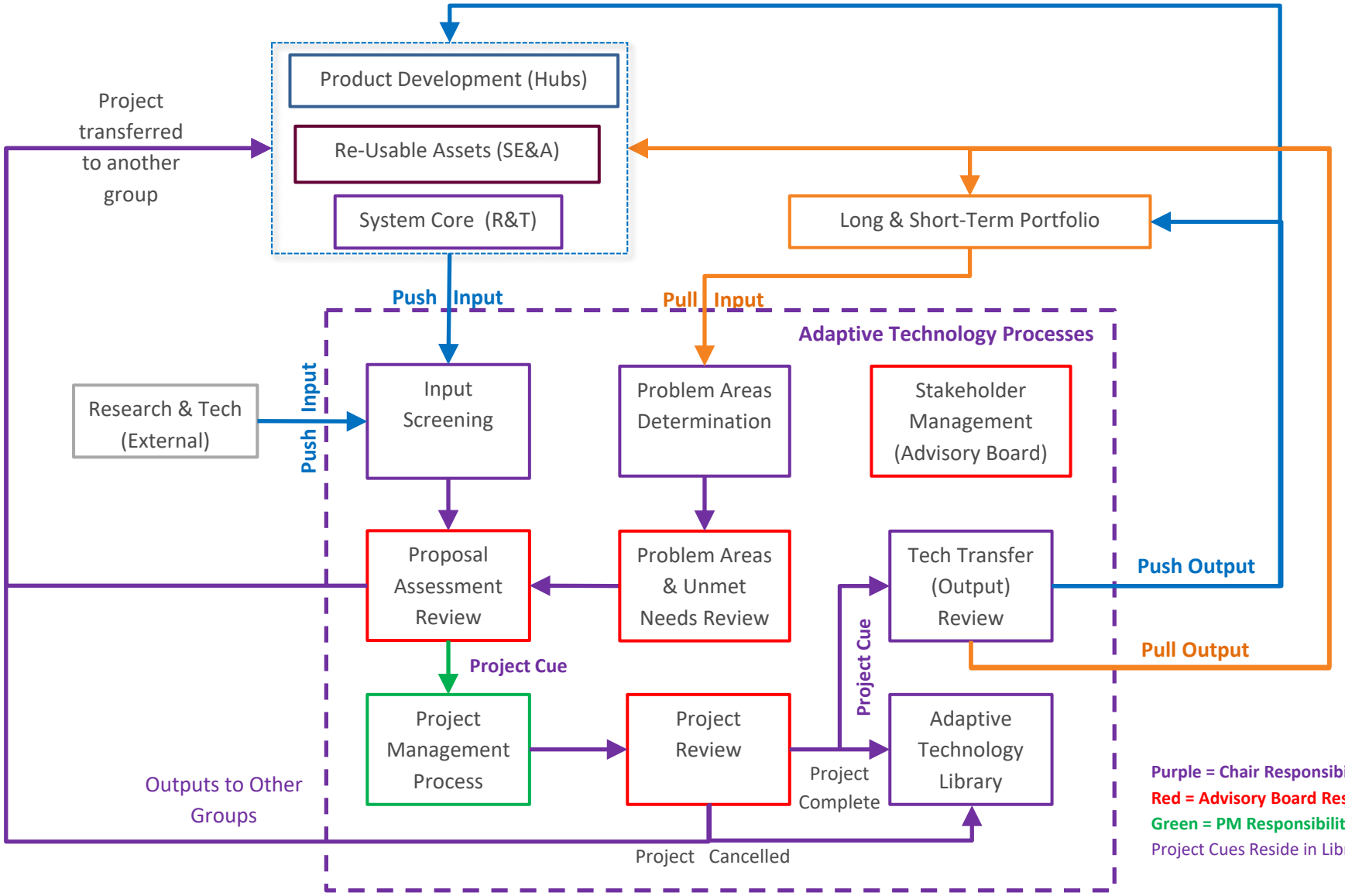
Refined Scope of Adaptive Technology with Advisory Board:

- Includes the Use-of or Application-to Shell Technologies
  - *Examples of Shell includes displays, buttons, batteries, plastic molding technologies and data communication technologies.*
- Does Not Include our Core Competencies/Technologies
- **If it is not clear whether a technology is in scope or not, the Advisory Board will decide.**
- **The key is that we make sure the work for new features/ideas is getting done someplace.**

Refined Process - Adaptive Technology (black box view)

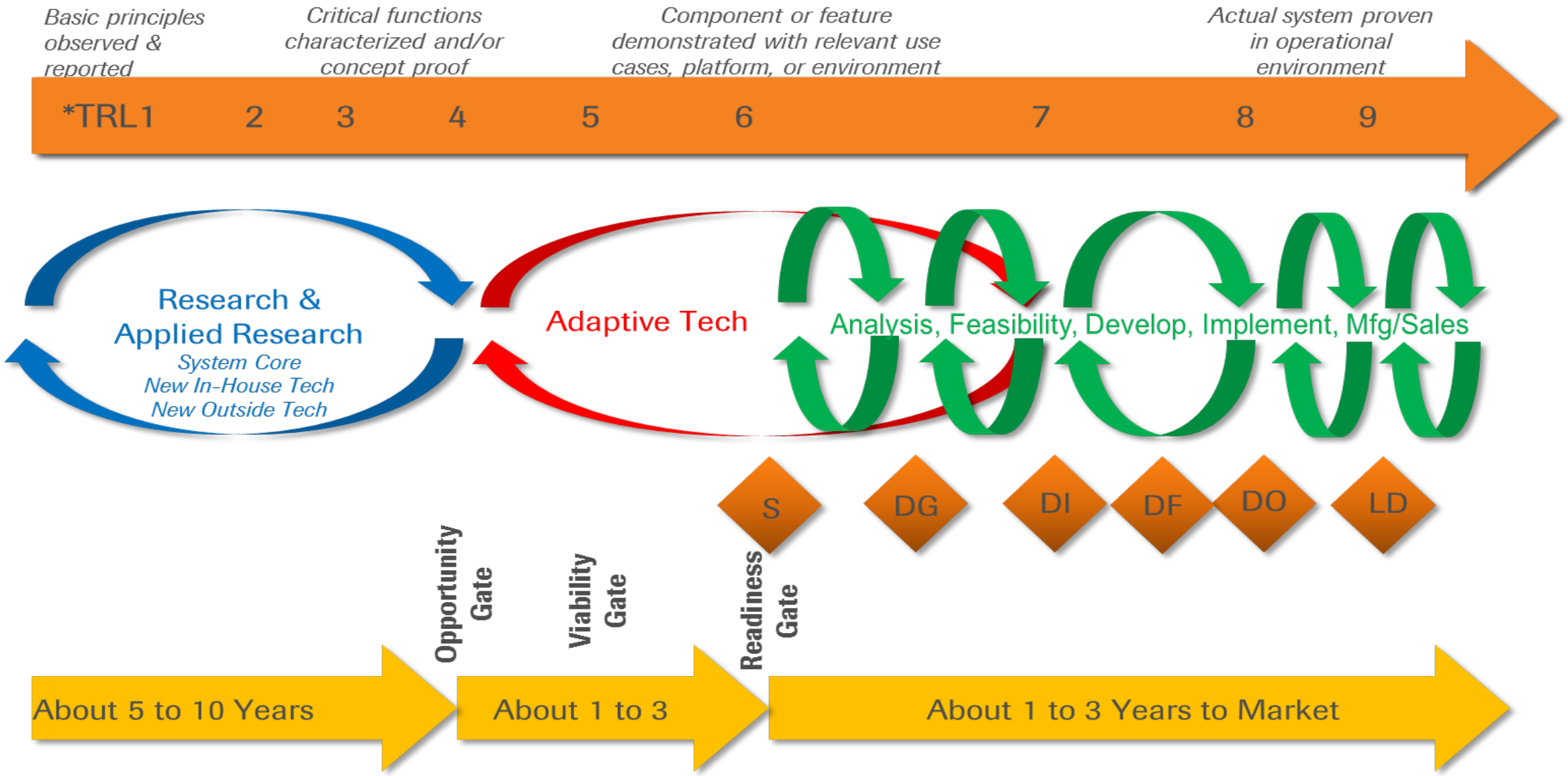


Refined Process - Adaptive Technology Process Diagram (white box view)



Process descriptions are in appendix for reference

Refined Process in Context to TRL & Other Processes



Refined Process in Context to TRL & Other Processes

Minimum TRL Achieved (without Justification)	Business Gate Reviews	Adaptive Technology	Reusable Asset Development	Regulated Product Development
TRL1 Achieved: Basic principles observed and reported	N/A	Research (R&T) only	N/A	N/A
TRL2 Achieved: Technology concept and/or application formulated	N/A	R&T or Adaptive Technology (A.T.)	N/A	N/A
TRL3 Achieved: Analytical and experimental critical function and/or characteristic proof of concept	N/A	Research, A.T. or System Engineering & Architecture (SE&A)	*SE&A (with justification)*	N/A
TRL4 Achieved: Component and/or basic prototype tested in laboratory environment	**Opportunity Gate**	R&T, AT, or SE&A	SE&A	*Justification Needed For Start*
TRL5 Achieved: Components and/or functional prototypes tested in relevant environment	**Viability Gate**	AT or SE&A	SE&A (and/or Project Team with justification)	*Justification Needed For Start*
TRL6 Achieved: System/subsystems or prototypes demonstrated to perform in a relevant environment	**Readiness Gate**	AT or SE&A	SE&A and/or Project Team	**Check Point Start**
TRL7 Achieved: System prototypes demonstrated to perform in an operational environment	N/A	N/A	SE&A and/or Project Team	**Milestone Design Input**
TRL8 Achieved: Actual system completed and verified through test and demonstration	N/A	N/A	SE&A and/or Project Team	**Milestone Design Output**
TRL9 Achieved: Actual system proven through successful intended use operation	N/A	N/A	SE&A and/or Project Team	**Milestone Launch Decision**

Refined Process - Adaptive Technology Problem Areas for Focus

A Problem Area Table is a good proxy for a detailed long term portfolio

Pull Input: Problem Areas (our guide while scouting)

ID	2017* Problem Areas	Business1	Business2	Business3
1	**System Cost**	x	x	
2	**User Experience** (easy, discrete, comfortable)	x	x	x
a	Power	x	x	x
b	Communication Interface	x	x	x
c	Displays	x	x	
d	Getting User Input	x	x	
e	True Time	x	x	x
f	New Data Sources			x
g	Robustness	x	x	x
h	Behavior Change	x	x	x
i	Assimilation of Big Data			x
j	Waste & Sustainability	x	x	

Refined Process - Proposal Review Template Example

Chair will review proposals that pass the initial screening with at least the voting stakeholders to confirm the following criteria and to determine the following dispositions:

- **Criteria includes but is not limited to**:
  - Is the project better proposed as a Concept Phase, Core Development, or Potential Product Element project?
  - What is the pacing strategy associated with this project?
  - Is this a Push or a Pull
  - Problem Area(s) being Addressed
  - Portfolio Area(s) that may Benefit
  - Starting TRL
  - TRL Goal
  - Funding Needed to Actually Achieve TRL Goal
  - Funding Sources Available
  - Additional Stakeholders Suggested for Review
  - Urgency & Timing of Need
  - Priority Relative to Other Active & Ready-to-Activate Projects
  - Project Review Frequency
  - Project Leader Assignment
  - Internal & External Capabilities
  - Noteworthy Legal Implications
- **Dispositions include:**
  - Reject Proposal with Reasons
  - Re-Direct Proposal to other Stakeholders
  - Accept Proposal for Adaptive Technology Cue (Ready-to-Activate)
  - Accept Proposal Immediately (bump another project or reallocate funding)

This template evolved from the typical questions asks by the Advisory Board.

Project proposals were welcome from any stakeholder or customer.

Proposals to scout a new technology were welcome, but those were not considered project proposals.

Instead, project proposals were based on a problem to solve or a new feature to enable.

The Outcomes

Official KPI assigned was Number of Project Proposals per Quarter (Avg. ~ 2)

But the Key Outcomes are Really Related to the Original Problems

- *Assessed about 50 new technologies and/or features in 7 years*
- *Decided to NOT to Fully Mature about 60% (bullets dodged)*
- *About 30% Matured & Cued Up for Projects but Not Used*
- *About 10% Transferred Successfully to Development & Customers*
- *Yearly Budget was Typically within 10%*
- *None Failed During Development nor Caused Significant Delays!*

The Future

Now, after about 7 years, we have a …

- *well-staffed (from 1 to 12 full time positions),*
- *well-funded (budget about 10 x),*
- *official & mandatory,*
- *Global Pre-Development Organization & Process*

… and a Global Systems Engineering & Architecture Organization!

The Lessons Learned

- Processes Can be Robust to Organizational Change
  - *Made the process a service of value, with diverse oversight*
  - *Assembled an Advisory Board or Steering Committee*
  - *Changed the attendance as the organization changes*
  - *Monthly cadence kept stakeholders involved and minimized surprises*
- Non-Mandatory Processes Suffer from Apathy
  - *Global voluntary engagement was especially difficult to maintain*
  - *"Sold" the value and tailored the value propositions as an important first priority*
  - *Trying to force compliance too early caused unnecessary battles*
  - *Next time, I will try selling a new process as mandatory soon after the value is agreed*
- Agile Budgeting is Very Valuable & Sellable with the Right Model
  - *After some initial wins I sold a model of 10 small projects per year*
  - *On average each project was slated to cost a certain fixed small amount*
  - *About half of that budget was internal and the other half external*
  - *Gained trust to allocate between projects & between external & internal*
  - *Made hitting budget within 10% each year manageable*
- Lean Approaches Really Helped
  - *Focused on riskiest or most unknown aspects first, one TRL at a time*
  - *Prioritized documenting the Lessons Learned for future teams*

Agile Budgeting

- Use a fixed model for annual approval
- Set cadence of usage/plan review
- Swap monies from/to internal & external
- Swap monies between projects
- Keep several projects active
- Kill one and Start another

Fail Fast

One TRL at a Time

Many Thanks!

Questions & Discussion Welcomed

Contact for more info:
Mike.Celentano@INCOSE.Org
+1-317-521-7617

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www.incose.org/glrc2018

Process descriptions are in appendix for reference

Mike Celentano, ESEP

Roche Principal Systems Engineer
INCOSE Technical Director

Office: +1-317-521-7617
Mike.Celentano@incose.org
Mike.Celentano@roche.com
http://www.linkedin.com/in/indianamike

Mike Celentano has been influencing the Medical Diagnostics field since 1987. He has experience in systems engineering, advanced research, engineering management, product development, and technology management.

Mike has dedicated his career to developing multi-disciplined instrumentation used to diagnose & monitor disease to ultimately help improve the quality of healthcare globally. He has worked for Technicon, Miles, Bayer, Seradyn, UMM and Roche. Mike is currently the Program Leader for Global Adaptive Technologies at Roche Diagnostics Diabetes Care in Indianapolis. His charter is to evaluate and expedite new technologies and features that could benefit Roche's diabetes patients, caregivers, and payers.

Mike has a B.S. in Electrical Engineering from N.Y.I.T. He achieved SE certification at the highest level in 2017. Mike has been granted many global patents related to medical diagnostics. Through his involvement in INCOSE Mike is striving to make Systems Engineering practices more common-place in the Biomedical Industry. Mike founded the INCOSE International Healthcare Working Group. He currently serves on the Board of Directors for INCOSE at the international level.

Refined Solution – Process Diagram Description

Adaptive Technology Process Inputs

- Proposals inspired by Long-Term Portfolio Needs from Portfolio Group
- Proposals inspired by Short-Term Portfolio Needs from Portfolio Group
- Proposals inspired by Concept Phase Needs from Portfolio Group
- Proposals inspired by Re-Usable Asset Work from SE&A
- Proposals inspired by System Core Work from R&T
- Proposals inspired by External Technology from Commercial Industry
- Proposals from Internal Sources such as Invention Disclosures

Refined Solution – Process Diagram Description

Adaptive Technology Process Outputs (destination to be assessed at each project review):

- Technology Transfer to Product Element Project Team with SE&A group
- Technology Transfer to Product Development Team in the Product Development Group
- Technology Transfer to Product Concept Phase Team in the Portfolio Group
- Holding Pattern Until Ready for Technology Transfer
  - Short Term or Long Term Portfolio Plans
  - Adaptive Technology Library maintained in the Product Development Group

Refined Solution – Process Diagram Description

The Chair & Deputy Chair Roles

- The Adaptive Technology Advisory Board will have a Chair who is responsible for stakeholder management.
- The term of the first Chair will be 18 months to allow for process definition and stabilization.
- The term of subsequent Chairs will be 1 year.
- The Chairs will alternative from Site 1, from Site 2, from Site 3, etc.
- The Advisory Board will nominate the Deputy Chair 6 months prior to the end of the current term, so the Deputy Chair term is 6 months.
- The Chair will delegate responsibilities to the Deputy Chair slowly over time to assure a smooth transition.
- The Chair is responsible for finalizing Adaptive Technology decisions after considering the input from the stakeholders.

I was re-assigned as Chair
Politics? Apathy? Other?

Refined Solution – Process Diagram Description

Stakeholder Management

- The Chair of the Adaptive Technology takes responsibility for driving key decisions.
- Key decisions will be made considering the input of all key stakeholders.
- The Board membership includes all stakeholders, some have voting rights on strategic decisions such as project funding decisions, and all have welcomed input.
- If a quick consensus is not possible on strategic decisions, such as funding or stopping a project, a majority vote will be required from the following 3 stakeholders: Head of A, Head of B, Head of C.
- Process changes will be reviewed by Head of A, the Head of B, the Head of C and the Global Head of Z.
- Customers & Functional Management Stakeholders will be invited into and out of the board by the Chair based on the projects being advised by the board.
- The need to escalate decisions and any grievances beyond the board will be minimized by the Chair and related actions taken. However, if a need arises to escalate then the Global Head of Z will be asked to decide.
- Recurring monthly meetings of the Adaptive Technology Board will be scheduled in advance with all stakeholders invited in order to maximize the limited opportunities stakeholders have to engage.
- Minutes will be taken with emphasis on actions, decisions and fast distribution to all stakeholders. Fast minutes will be a higher priority than perfect minutes since the main purpose is to get everyone on the same page as soon as possible. Corrections to minutes will be encouraged and re-distributed to all as needed.

Refined Solution – Process Diagram Description

Definition of "Problem Areas"

The desired way to define unmet needs is by discovering the problems our external & internal customers have. Defining solutions as unmet needs is not optimal because it skips the rigorous processes needed to find optimal solutions such as: Problem Analysis, Brainstorming, Trade-Analysis, Feasibility, etc.. The Long-term & Short-term Portfolios are currently the primary inputs for this process.

Problem Areas Determination

- Problem Areas will be determined at least yearly
- Proposed by the Chair and reviewed at least by the voting stakeholders
- Based on the Long & Short Term Portfolios and other Market Intelligence
- Will indicate which business area(s) they apply to: Business 1, Business 2 and/or Business 3
- Will try to be free from a particular solution or specific technology

Problem Areas & Unmet Needs Review

- The Chair drafts the problem areas based on the Long & Short Term Portfolio
- The Chair review the draft list with Head of Portfolio and at least the voting stakeholders to solidify the problem areas list
- This review occurs at least once a year or when a significant update is made to the portfolios
- The Chair & the Advisory Board keep an eye out for technology to consider as potential solutions in these problem areas, and as such, be considered input to the Adaptive Technology Process
- Ideation will be encouraged to meet these needs once they are agreed upon

Refined Solution – Process Diagram Description

Input Collection & Screening

- The Chair will encourage global ideation specifically to help solve Adaptive Technology problem areas
- Industry data will be collected (i.e.: Consumer Electronics Show) to globally search for potential solutions
- Inputs will be initially assessed based on a lean 1-page proposal & a discussion between the proposer & Chair
- Information for the 1-pager that will be requested by Chair includes, but is not limited to:
  - Project Name
  - Technology being considered for adaptation
  - Proposed Portfolio Fit & Problem Area Being Addressed (if known)
  - Initial Categorization of Push or Pull
  - Business Needs & Problem Statement
  - Brief Description of Project
  - Initial TRL Assessment (refer to appendix for NASA tool which will be adapted)
  - TRL Goal
  - Risks & Opportunities
  - Estimated Project Costs & Resources
  - Estimated Project Timeline and Major Deliverables
  - Estimated ROI (if possible)
- Chair will pre-screen if proposal could be considered as an Adaptive Technology or something else:
  - Is the technology already being matured elsewhere for us?
  - Does the project involve Core Technology?
  - Is the project budget too high for the Adaptive Tech portfolio?
  - Is the TRL too low to start as an Adaptive Tech project?
  - Is the project better proposed as a Concept Phase, Core Development, or Re-usable Asset project?

Refined Solution – Process Diagram Description

Proposal Assessment Review

- Chair will review proposals that pass the initial screening with at least the voting stakeholders to confirm the following criteria and to determine the following dispositions:
  - Criteria includes but is not limited to:
    - Is the project better proposed as a Concept Phase, Core Development, or Potential Product Element project?
    - Is this a Push or a Pull
    - Problem Area(s) being Addressed
    - Business Units & Portfolio Area(s) that may Benefit
    - Starting TRL
    - TRL Goal
    - Funding Needed to Actually Achieve TRL Goal
    - Funding Sources Available
    - Additional Stakeholders Suggested for Review
    - Urgency & Timing of Need
    - Priority Relative to Other Active & Ready-to-Activate Projects
    - Project Review Frequency (at least at each TRL)
    - Project Leader Assignment
    - Internal & External Capabilities
    - Noteworthy Legal Implications
  - Dispositions include:
    - Reject Proposal with Reasons
    - Re-Direct Proposal to other Stakeholders
    - Accept Proposal for Adaptive Technology Cue (Ready-to-Activate)
    - Accept Proposal Immediately (bump another project or reallocate funding)

Refined Solution – Process Diagram Description

Project Review

- Projects are reviewed by the Advisory Board with at least 2 of the 3 voting members in attendance
- Reviews could be triggered by the Chair for the following reasons:
  - If the project team feels they have matured the technology to the next level
  - If the project team needs more time or money than planned
  - If the team thinks the goal is not achievable
  - If the project team feels they have reached the TRL goal
  - If the Advisory Board wants a status update
  - If it is a planned milestone review
- The following decisions will be expected at reviews:
  - TRL: present TRL agreed, TRL goal confirmed or changed
  - Scope: stays the same, re-directed to other group, or scope changes
  - Funding: increase, continue, decrease or stopped
  - Project Schedule: increases, continues, or decreases
  - Customer: current customer confirmed, added or changed
  - Law: need for invention disclosure, need for IP review with IPL, desire for CDA or service agreement

Refined Solution – Process Diagram Description

Adaptive Technology Transfer Review (Output)

- A Technology Transfer Review is triggered by the Chair after the Advisory Board approves a project as successfully meeting its goals
- The attendees include at least
  - Chair of Adaptive Technology
  - Project Leader of the Technology
  - Select members of the Advisory Board who primarily supported this technology
  - The primary customers for this technology
  - Technical Leaders from the primary customer
  - Technical Leaders who matured the technology
- The decisions to be made include but are not limited to
  - Access to all documents & prototypes related to this technology
  - Start date of the technical transfer
  - Finish date of technical transfer
  - Technical Leaders who will be assigned to deliver the technology
  - Technical Leaders who will be assigned to receive the technology

Refined Solution – Process Diagram Description

Adaptive Technology Library

- The library is used to help put adaptive technologies in cue for upcoming projects and is also an important information sharing tool for the Adaptive Technology teams
- Key artifacts from the Adaptive Technology Projects are stored for use by future projects
- The location of the digital artifacts from each project is shared globally on the Adaptive Technology SharePoint site
- Key digital artifacts include but are not limited to presentations, reports, minutes, requirements, design files, drawings, specifications and data
- The key physical prototypes are stored at local site where the work was done, available to each site by request from the Chair
- Key physical prototypes include but are not limited to custom parts, breadboards, demonstrator models, functional models, prototypes and retro-fitted products

Refined Solution – Process Diagram Description

Project Leader Process

- The Chair is responsible for assuring that sufficient project management processes are being used by each Project Leader depending on the size and complexity of the project
- Methodologies will be based on
  - PMI best practices (i.e.: PMBoK)
  - Our specific techniques (i.e.: APROMPT)
  - Lean Methodologies (i.e.: Lean Innovation)
  - Agile Methodologies (i.e.: Agile Innovation)
- The assigned Project Leader is responsible for implementing the project management process which includes, but is not limited to
  - managing project scope
  - project budget
  - identifying project resource needs
  - project schedule
  - monitoring tasks of internal & external team members
  - status updates to Chair & Advisory Board