

# Lessons Learned in Large-Scale Process Improvement

Erik Simmons, PNSQC 2009

# Contents

## Background for context

### The Lessons:

1. *Take time to learn about your culture*
2. *Understand how organizational change takes place*
3. *Start by establishing a life cycle for development*
4. *Use Evolutionary Delivery to drive change*
5. *Diffusion of Innovations provides important vocabulary and structure for change agency*
6. *Explicitly define and document success using measurable, quantifiable language*
7. *Employ an effective business model within the group that drives change*

# What is organizational change?

## Organizational Change is:

- A disruptive force
- A creative force
- Uncomfortable for many people
- Effective, organic adoption of practices
- Essential for sustained success

## Organizational Change IS NOT:

- Simple
- A transitory event or “program”
- A goal unto itself

Source: *The Change-Able™ Organization*

# The benefits of size

- Large companies have **more organizational slack**; they can devote greater resources to continuous improvement
- They have **more simultaneous projects**, so it can be easier to pilot new methods and practices in low-risk situations
- With so **many sets of eyes and ears**, many sources of new practices can be monitored at once and shared through communities of practice
- Larger companies are often **more mature** than smaller companies, and have lost the “start-up” atmosphere that can reject rigorous practices

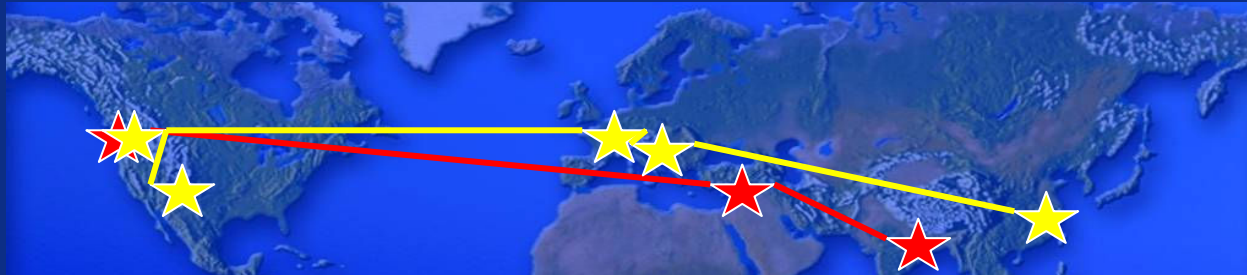
# The drawbacks of size

*Organizational complexity!* Decision authority, resource allocation, and program management are all tougher

A large potential audience for training, consulting, and related project work *stretches available resources*

Changing practices on a team can have *unintended side effects on large, multi-team projects*

*Geographic dispersion* means that face-to-face time could be impossible or impractical



# What is a change agent?

A change agent is someone who influences or facilitates change within a group

A change agent serves as a *catalyst for change* and a *lightning rod for innovation* by

- Illustrating gaps and areas for improvement
- Shaping the environment to improve change effectiveness and receptivity
- Providing subject matter expertise
- Guiding the group through the details and challenges of the change process
- Confronting facts and speaking the truth

# Change agent behaviors

## A change agent

- **Uses experience and judgment** to apply the practices of change agency
- **Communicates with groups and individuals**, going person to person if necessary to foster change
- **Keeps the interests of the stakeholders foremost** at all times
- **Remains unbiased and flexible**
- **Listens and observes** continuously
- **Helps people manage the anxiety** associated with change

Change agents are *not* “turn-around artists” – effective change is a lifestyle rather than an event

# Behaviors to avoid

Change agents must avoid behaviors such as

- **Rigid adherence** to a single model or approach
- Placing **personal interests** ahead of the group's interests
- **Bias** towards any group or individual
- **Inflexible implementation** strategies
- **Prioritizing change ahead of business** reality and results
- **Personal attacks** – whether actual or perceived
- **Violation of personal trust** granted them by team members
- Participation in **conformance-related activities**

# A balancing act

Irrelevant

Successful

Uninteresting

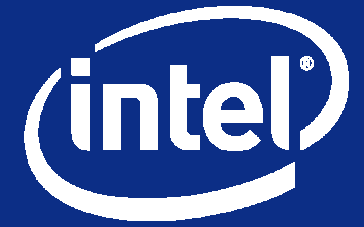


Change agents too different from the people they seek to change can be ineffective because they are “outsiders”

Change agents who balance insider and outsider status

Change agents too similar to the people they serve provide fewer innovations than those with very different backgrounds

**Change agents must find and maintain the proper distance from the groups they serve**



## Lesson 1:

*Take time to learn about your culture*

# What is organizational culture?

**Organizational culture** is “*the shared tacit assumptions of a group that it has learned in coping with external tasks and dealing with internal relationships*”. (Edgar Schein)

Organizational culture is a product of many things, including

- The **philosophy** of the company’s founders
- The **social learning** the company has accomplished
- Shared **experiences** (both successes and failures)

**Every culture contains *artifacts* – objects, concepts, and processes – with shared meaning to its members**

Source: *The Corporate Culture Survival Guide*

# The three levels of culture

## 1. Observed Artifacts



The objects, concepts, and processes meaningful to a culture

## 2. Espoused Values



Spoken or written strategies, goals, values, and philosophy

## 3. Tacit Assumptions



Unspoken, shared beliefs on which the culture is built

**Culture is complex; a superficial understanding can be at least as dangerous as no understanding at all**

Source: *The Corporate Culture Survival Guide*

# Elements of a culture - part 1

## Basic Issues

1. Mission, vision, strategy, etc. - *Who are we?*
2. Org structure, processes, etc. - *How do we work?*
3. Metrics and measurement - *What defines success?*
4. Language and concepts - *How do we communicate?*
5. Group membership - *What is my community?*
6. Leadership and authority - *Who is in charge here?*
7. Rewards and status - *What is promoted and rewarded?*

# Elements of a culture - part 2

## Deeper Assumptions

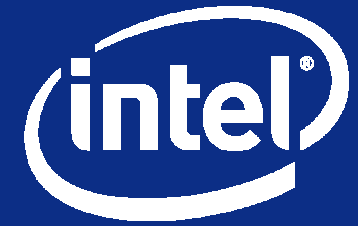
1. What is our relationship to the outside world?
2. What is real, and what is true?
3. What do we believe about human nature?
4. What kinds of human relationships do we foster?
5. How do we think about time and space?

# Learning about a culture

The best way to understand culture is through group activities, since culture is a group phenomenon

- Challenge: Even in structured group discussions, the shared, tacit assumptions of a culture are difficult to expose
- These basic assumptions influence all other elements of the culture and the organization
- Finding and understanding these assumptions provides tremendous leverage to a change agent

Use a multi-faceted approach to study a culture

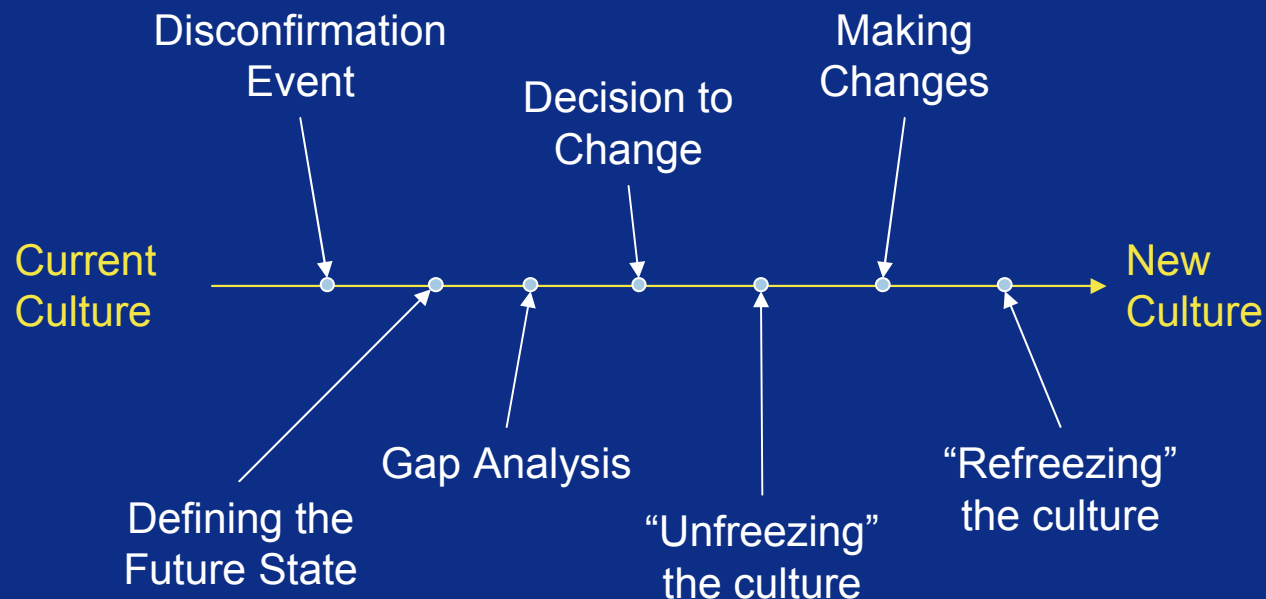


## Lesson 2:

*Understand how organizational change takes place*

# The organizational change process

- Change occurs in a somewhat predictable order (though the decision to change can occur earlier than shown)
- Organizational change frequently occurs via iterative steps, even when a clear end vision exists



# Evolution versus transformation

## Not all change is alike

Cultures **evolve** continually based on new experiences, external forces, etc.

- We can *influence* the evolution of a culture, but we cannot totally *control* it

Culture change can also be **transformational**, but this requires that we disrupt the status quo

**Our culture is a result of the company's successes as well as failures, and should be treated carefully - *it is a source of strength***

# The role of disconfirmation

In established cultures, change requires some powerful stimulus that disconfirms the current way of doing things

Disconfirmation can come in many forms:

- The competition's performance
- Degraded reputation with customers or end users, loss of market share, reduced revenue or profit
- Legal challenges, trade sanctions, monetary penalties
- Internal performance objectives, annual goals
- Mergers and acquisitions, outside hiring of upper management, etc.
- Education, training, and benchmarking
- Etc...

## Some examples

**“Tech Stocks Tumble as Intel Disappoints...”**

*“... a string of product delays and manufacturing glitches.”*

“CEO issues frank memo on performance”

“... today lowered the mid-point of projected Q3 earnings by \$450 Million...”

# A battle of anxieties

Disconfirmation creates *Survival Anxiety*, the fear that we will not succeed by following our current course

Then, when people consider change, *Learning Anxiety* is a natural result because they fear:

- Temporary incompetence while learning new skills
- Temporary lack of productivity (and the potential consequences)
- Loss of identity or group membership
- Loss of influence

Since disconfirmation can't always be controlled, *promote change by reducing learning anxiety* instead

# Reducing learning anxiety

Learning anxiety can be reduced in many ways:

- Obvious, continuous management **sponsorship** and support
- Clearly **stated goals and expectations** that allow for learning
- **Consistency** between what is promoted and what is rewarded
- Excellent **training** using a variety of formats
- “Sandboxes” where **practice** can occur without fear of severe consequences on real projects
- Use of **coaches and mentors**
- **Peer groups** for support and sharing

# New vs. established competencies

## New Competency

- Success is rewarded
- Failure is rewarded
- *Inaction is punished*

## Established Competency

- Success is rewarded
- *Failure is punished*
- *Inaction is punished*

In a low learning anxiety environment, nothing but inaction can be punished - *it must be OK to fail, but unacceptable not to try*

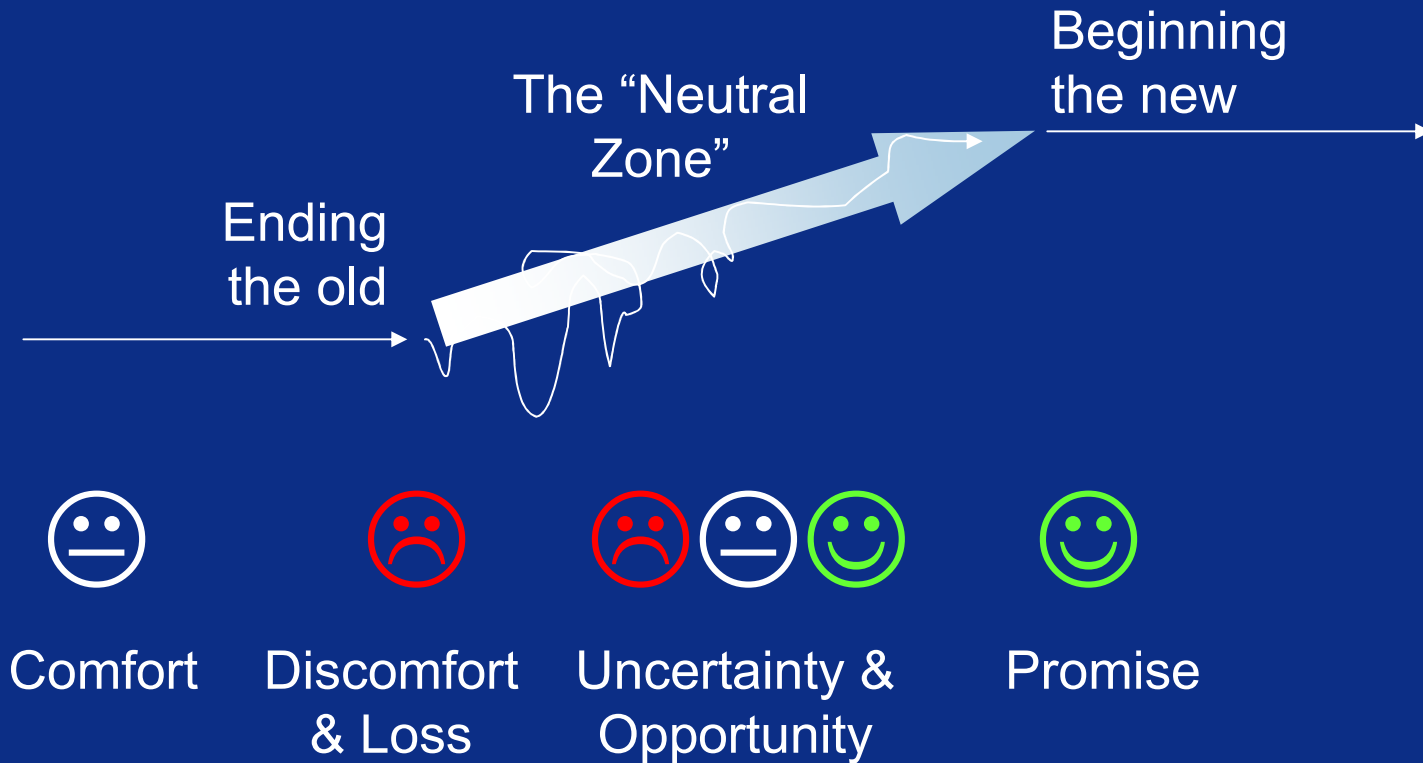
# Transition management

A change is just a point in time; the real *transition* follows

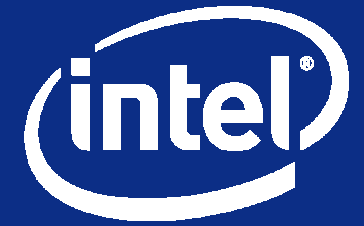
For example, issuing a new organization chart is a **change** – the *transition* follows and includes all the work to do in adjusting to new roles, loss of old identity, etc.

**Acknowledge the feelings present throughout the transition process, but emphasize that a transition is a place where creativity and innovation can thrive**

# Transition management



Source: Adapted from *Managing Transitions*, 2<sup>nd</sup> ed.



## Lesson 3

*Start by establishing a life cycle for development*

# Life cycle vs. process

## A life cycle is not just a process

A life cycle is a **framework** that organizes methodologies, activities, practices, and processes in a specific and useful way

A life cycle provides a common vocabulary, common concepts, and a set of common milestones and work states

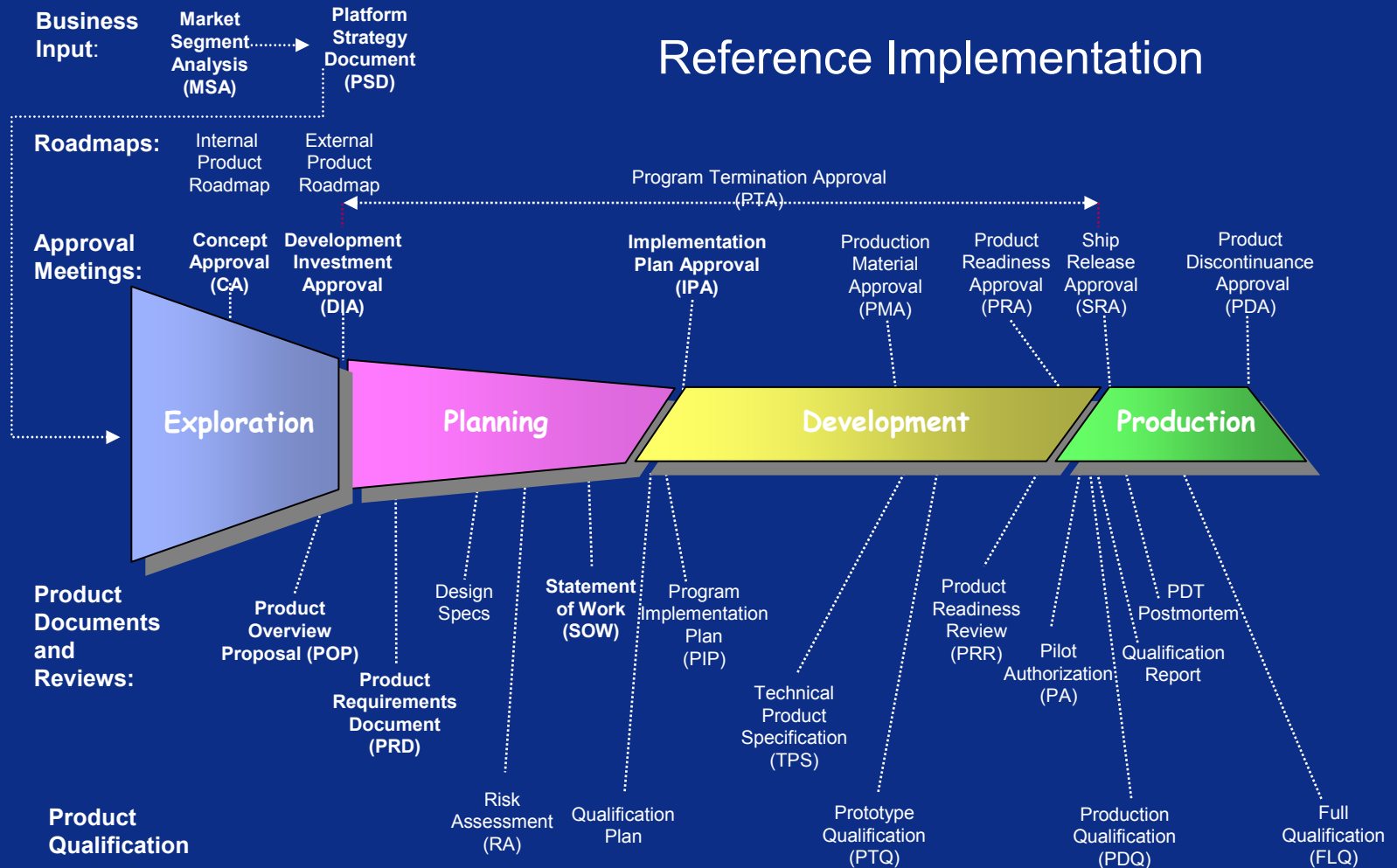
- These elements enable communication across teams and projects to occur more easily, with greater comprehension

Without a documented life cycle, it is difficult to impossible to make improvements in a predictable, controlled fashion

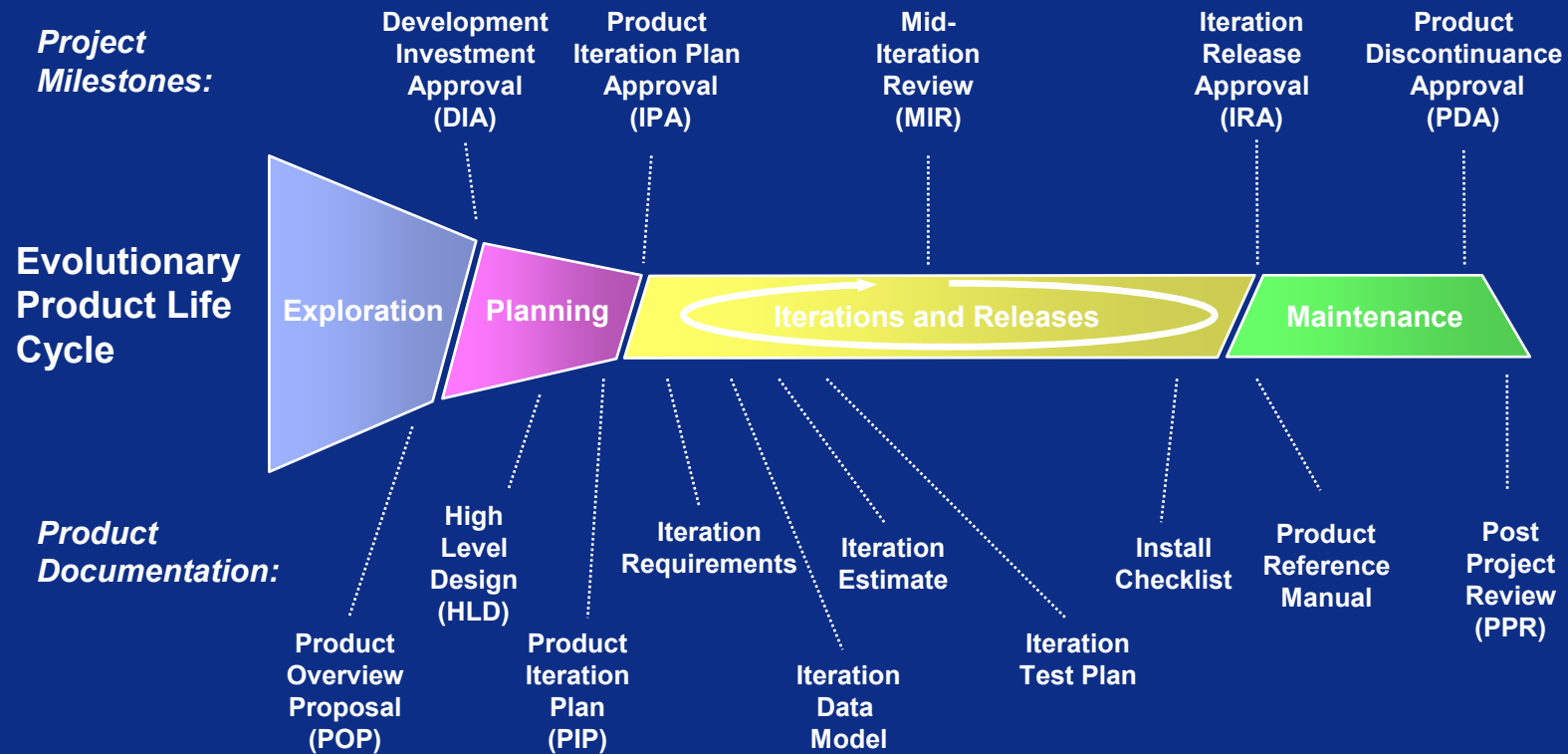
# Example: The Intel Product Life Cycle

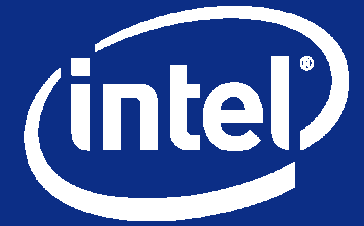
## Version 3, ca. 2004

### Reference Implementation



# Example: PLC tailored for iterative software development Ca. 2002





## Lesson 4

*Use Evolutionary Delivery to drive change*

# Evolutionary Delivery (Evo)

## Evo

- Is a program and project management process that **emphasizes early learning and adaptation**
- Is part of Competitive Engineering, along with *Planguage*, *Specification Quality Control (SQC)*, and *Impact Estimation*
- Uses a **series of small steps** to deliver **useful results to stakeholders early and often**
- Measures success by the **value of results delivered** rather than adherence to checklists and processes
- Has been **practiced successfully for 30 years** in various disciplines, and works exceptionally well on fast-paced, large projects

**Evolutionary Delivery helps manage and optimize finances, deadlines, and delivered benefits simultaneously**

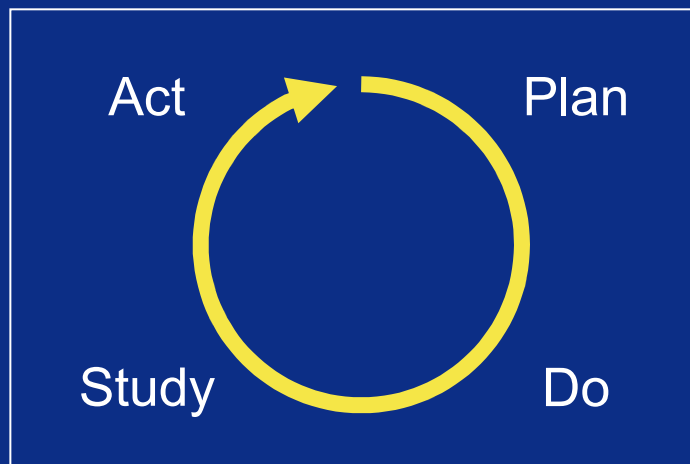
## What Evo is *not*

- **Phased development:** Evo uses much smaller increments, dozens of steps, not 3 or 5
- **Prototyping:** Evo delivers final cumulative results to users in stakeholder priority order, not development team order
- **Staged delivery:** Evo allows – even encourages – downstream change to requirements and design
- **Conventional critical path methods:** Evo ‘critical paths’ are improvements and results, not just costs or time
- **A "waterfall" method:** Evo is more like a series of many small waterfalls

Source: Adapted from Evo course materials by Tom Gilb. ©Gilb@acm.org. Used by permission.

# Evo and PDSA

Evo embodies the **Plan, Do, Study, Act** cycle as taught by Shewhart and Deming



1. Plan a change or improvement
2. Carry out the plan
3. Study the results
4. Adopt the change, abandon it, or run through the cycle again

# Evo Cycles

<b>Strategic Management Cycle</b> (the “head”)	Step identification, prioritization, sequencing, dependencies, evaluation vs. goals
<b>Task &amp; Delivery Cycles</b> (the “body”)	Detailed step planning and execution, result measurement

The “head” of the project is defined up front, but even high level objectives can change based on stakeholder values and what the team learns about reality during the project

# The Strategic Management Cycle

The Strategic Management cycle establishes and maintains the **overall goals and direction** of the project

Strategic Management Cycle data includes a list stakeholders, their goals, potential Evo steps, and the results of each chosen step against goals

PDSA guides the Strategic Management Cycle through selection, requirements definition, execution, and evaluation of each Evo task and delivery cycle

# Task and Delivery Cycles

Evo relies on delivering value to stakeholders in frequent, semi-regular intervals using **Delivery Cycles**

- Typical cycle time is one or two weeks

But there are many things that take more than a week or two to complete; for this reason, Evo also contains **Task Cycles**

**Use Task Cycles to prepare things for later rapid delivery in a Delivery Cycle – think of a restaurant’s kitchen, for example**

**Don't abuse Task Cycles – you still must deliver results frequently to stakeholders**

# Defining and Planning an Evo Project

1. **Identify Stakeholders and Document Stakeholder Values**
2. **Specify top-level requirements** (*ends*, not *means*) that define success
3. **Generate design ideas** that can be accomplished in less than a few weeks:
  - 3.1 **Analyze** top-level requirements, stakeholder values, delivery order dependencies, and project scope
  - 3.2 **Find and specify design ideas** to meet the requirements based on RE best practices, research & development, experience reports, etc.
  - 3.3 **Evaluate the design ideas** against requirements using Impact Estimation
  - 3.4 **Repeat steps 1-3** until a reasonable balance between costs and requirements is achieved
4. **Select design ideas** and produce Evolutionary Delivery plan

Source: Adapted from *Competitive Engineering*



# Executing and Managing an Evo Project

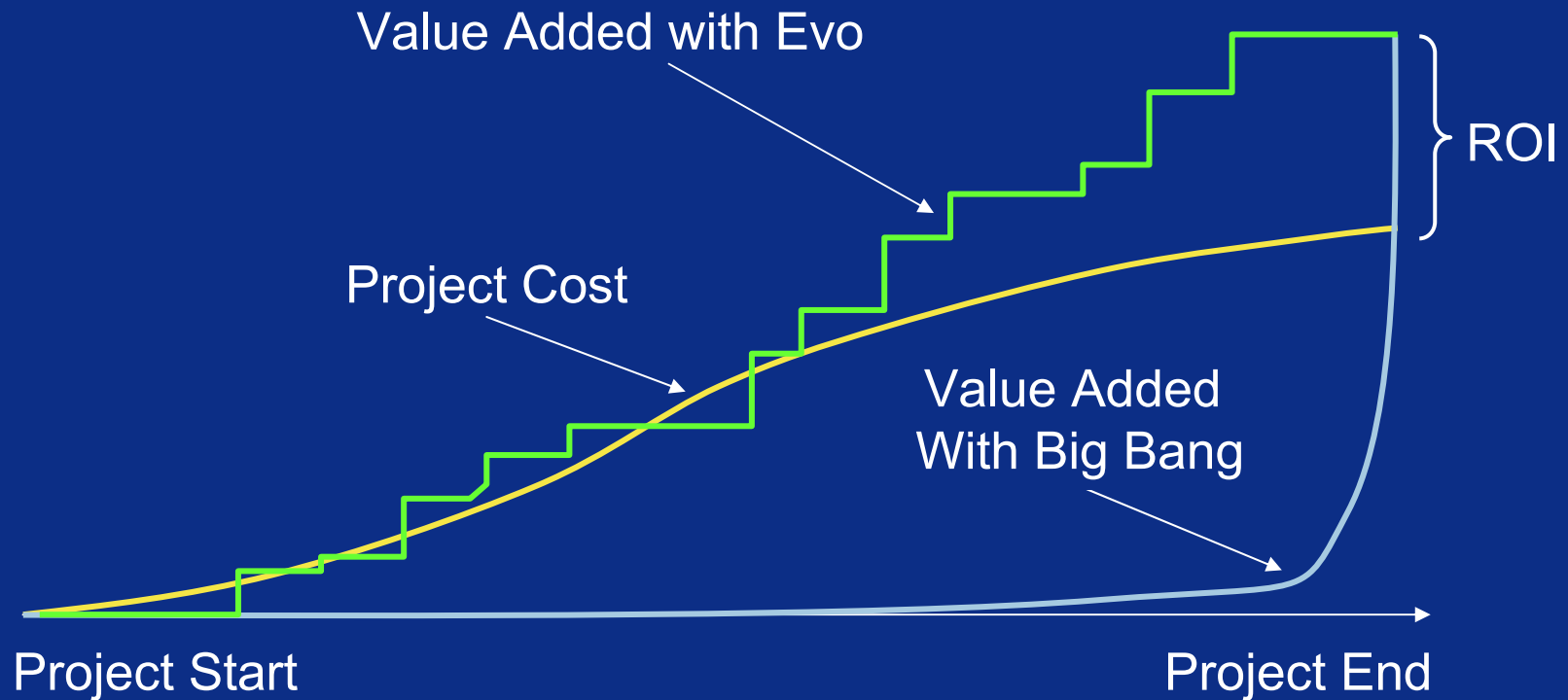
1. **Validate with stakeholders** that the chosen step is the correct next step
2. **Execute the chosen next step and capture the results**
3. **Review the results against planned results**, and assess the true value achieved against objectives
4. **Share the results** with stakeholders
5. **Revise the Evo Plan** as needed to reflect what was learned on this step – add, change, remove, or reorder steps if necessary
6. **Designate a next Evo step** based the updated plan and project objectives, and return to Step 1 until the project is complete

Periodically:

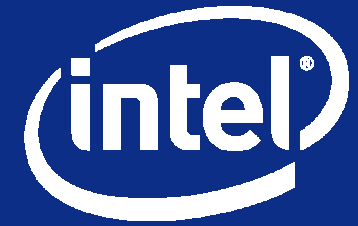
**Revisit** the stakeholder list to ensure it is complete

**Revise** objectives to ensure they are complete, current ,and accurate

# Evo versus the 'Big Bang' life cycle



**Value usually comes late in the cycle for Big Bang projects; Projects using Evo deliver value (through results) early and often**



## Lesson 5

*Diffusion of Innovations provides important vocabulary and structure for change agency*

# Diffusion of innovations

**Diffusion of innovations** is “the process by which an *innovation* is communicated through *channels* over *time* to certain members of a *social system*.” – Everett Rogers

The Internet

New antibiotics

Improved seeds & farming methods

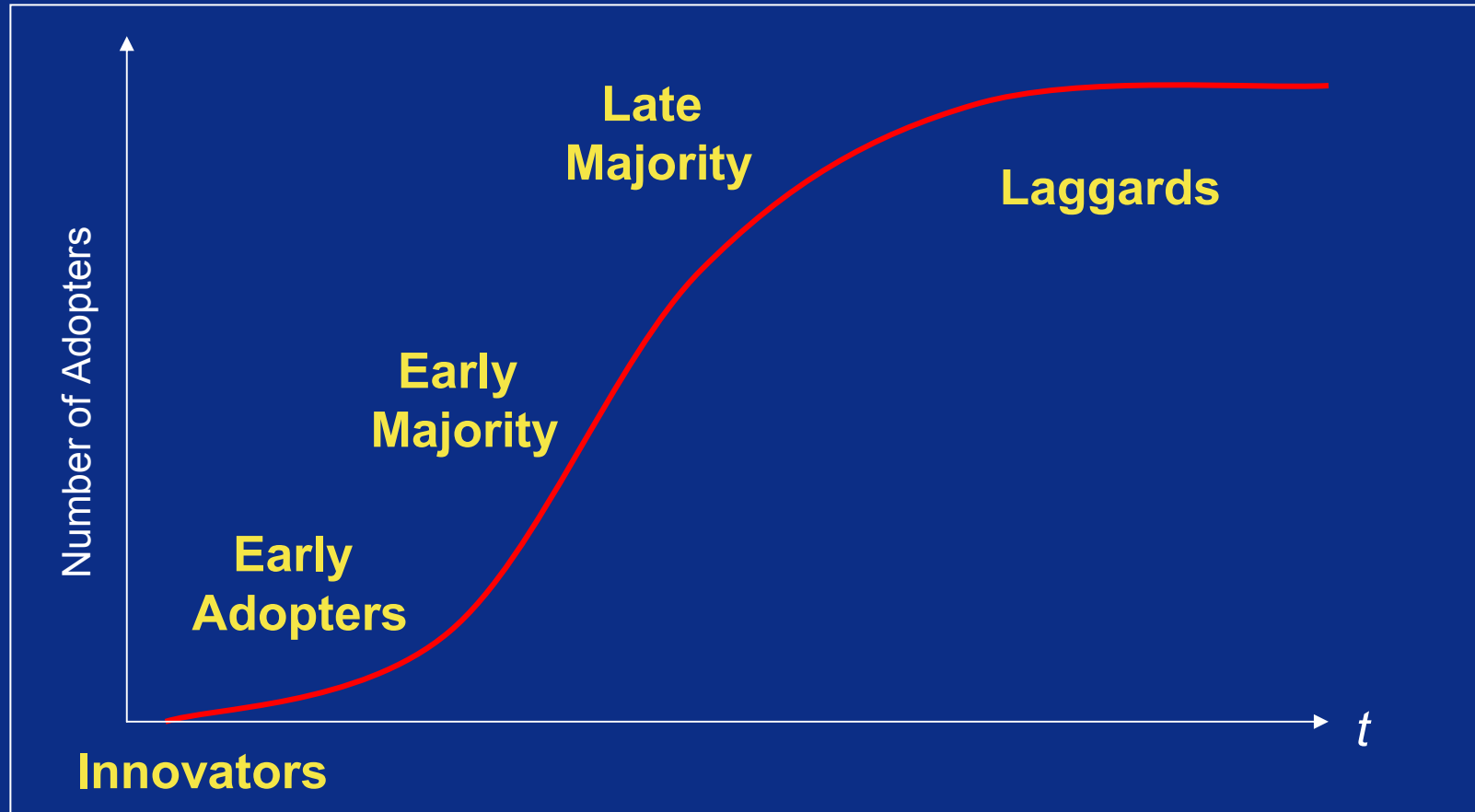
Cell phones

PDAs

Dvorak keyboard

BETA format video

# Five innovation diffusion populations



# Diffusion population characteristics

<b>Innovator</b>	<i>Daring:</i> Desires new functionality and ownership as an end unto itself
<b>Early Adopter</b>	<i>Respected:</i> Opinion leaders who often adopt as an influence tool
<b>Early Majority</b>	<i>Cautious:</i> Desires a competitive advantage, but requires a complete, reliable solution
<b>Late Majority</b>	<i>Skeptical:</i> Adopts on the trailing edge, based on price, convenience, and peer pressure
<b>Laggard</b>	<i>Traditional:</i> Adopts only when it can't be avoided, such as when older models are no longer available

# Five models for diffusion

<b>People Mover</b>	Personal contact between the change agent and the adopter
<b>Communication</b>	Use of “mass media” to communicate, rather than people
<b>On-The-Shelf</b>	Innovation packaged by experts as a complete solution for non-experts to use
<b>Vendor</b>	Outsourced innovation diffusion
<b>Rule</b>	Imposed innovation from another source based on authority, often accomplished through policy or standards

# Diffusion model examples

**People Mover:** A change agent influencing an individual by mentoring her in a new scheduling methodology

**Communication:** A corporate website for the product development lifecycle, containing templates, practices, and case studies

**On-The-Shelf:** A “package” for risk management that includes methods training, templates, software tools and training, and consulting hours

**Vendor:** A contract with a consulting house to establish an innovative recycling program across the company

**Rule:** An Employee Bonus goal related to sign-off of requirements baseline specifications across an entire business unit

# Five innovation attributes

<b>Relative Advantage</b>	Potential improvement to the current situation if adopted
<b>Compatibility</b>	How well the innovation fits with the culture and past practices of the organization
<b>Simplicity</b>	How simple the innovation is to learn and use
<b>Trialability</b>	The degree to which the innovation can be sampled or tried in part
<b>Observability</b>	How visible the innovation is to other groups or individuals

# Innovation attribute examples

**Relative Advantage:** Reduced Time To Market, greater efficiency, cost savings, or improved quality; greater standing in the company, conformance to standards

**Compatibility:** Fit with existing processes; reuse of concept or vocabulary; new infrastructure required; fit with company culture

**Simplicity:** Amount of training required before use; educational prerequisites; depth and breadth of information, and fit with mental models

**Trialability:** Feasibility, risks, and cost of partial or temporary implementation; degree that trial reduces uncertainty

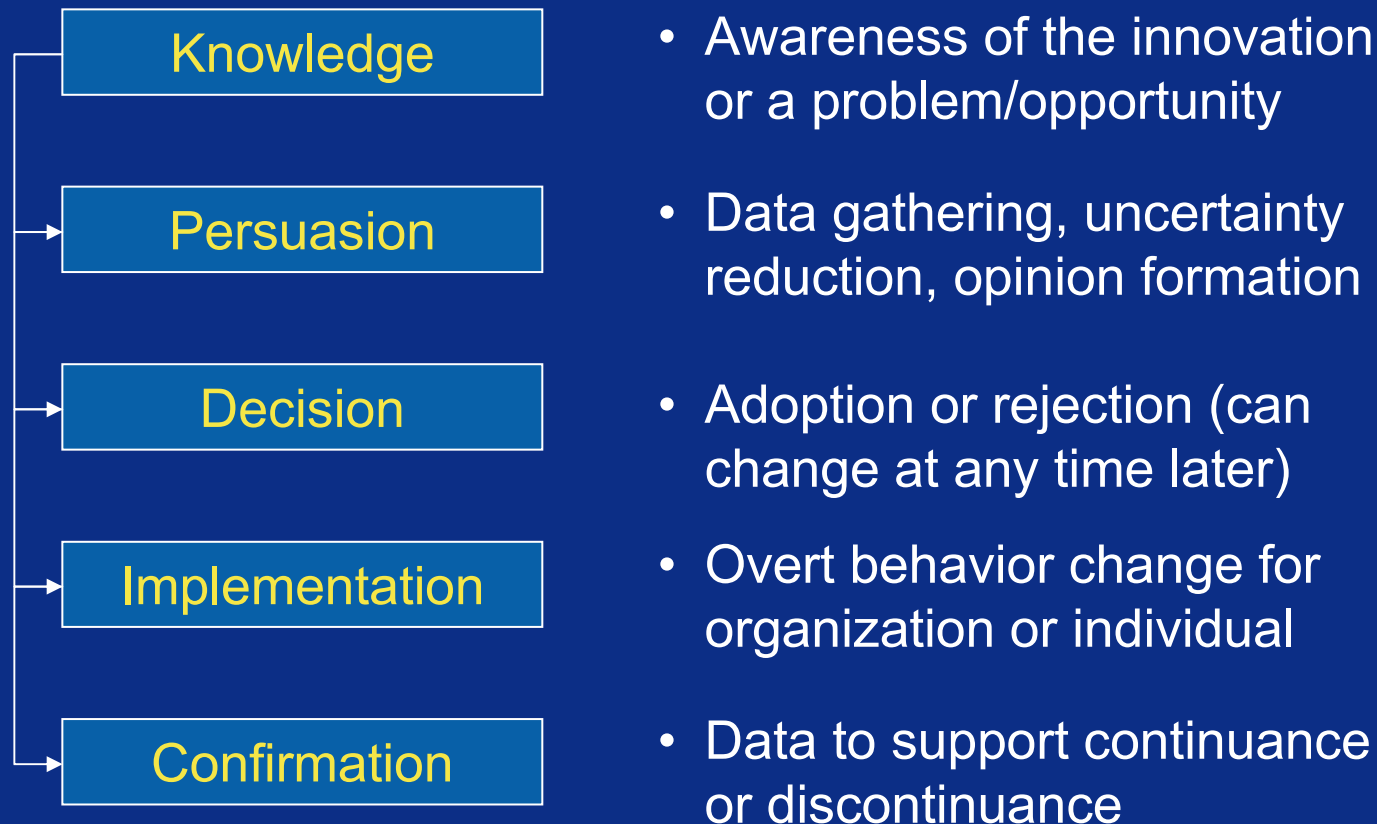
**Observability:** Presence of tangible, intelligible results; breadth of results' application

# Adoption barriers

**Innovation adoption can be slowed or even halted by many factors, including**

- Delayed or insufficient adoption rewards
- Required behavior changes
- Interdependent innovations that must be adopted together
- Lack of access to experienced adopters or training
- High initial adoption cost
- Availability of alternatives and substitutes
- Threat to an existing stakeholder group

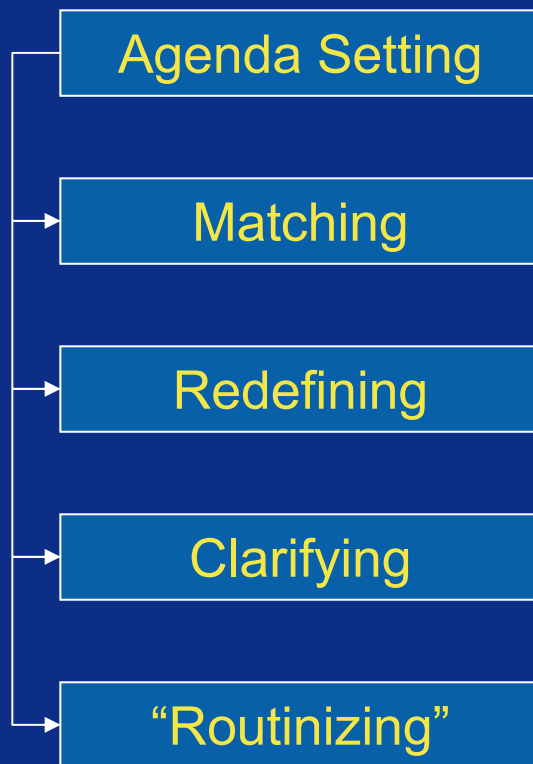
# The innovation decision process



Note: This order can vary, and steps are sometimes revisited or skipped

# Organizational innovation decisions

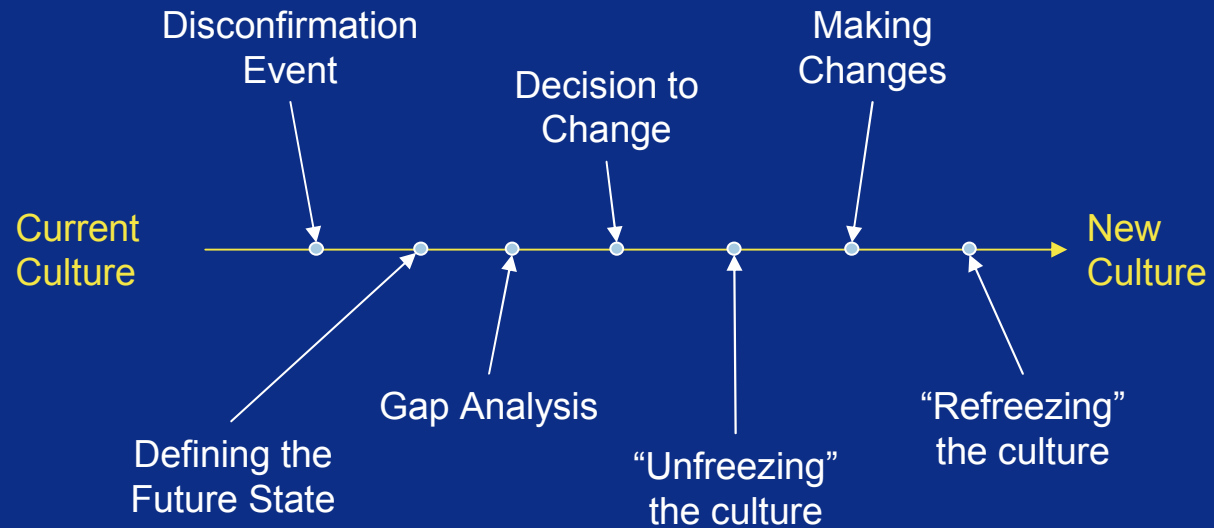
Organizations use a slightly different innovation decision process than individuals



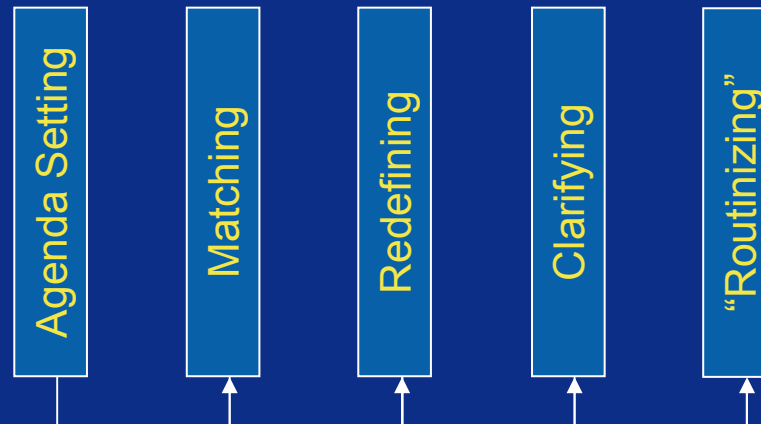
- General problems that create the need for innovation
- Matching a known problem with an innovation
- Re-invention of the innovation and modification of processes
- Better defining the organization's relationship with the innovation
- The innovation is integrated and loses its identity

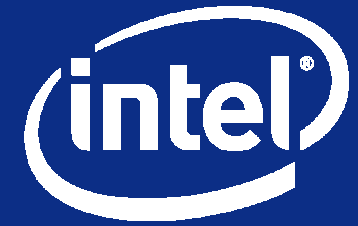
# Two models of organizational change

Schein:



Rogers:





## Lesson 6

*Explicitly define and document success using measurable, quantifiable language*

# Specifying success criteria

To specify success criteria for a change agency project:

- Start by specifying high-level objectives and a Statement of Work
- For each objective, develop one or more quantified measures to serve as criteria
- Use a balanced scorecard approach to measurement

In some cases, you will have to rely on indirect or surrogate measures as criteria

Many success criteria are not Boolean, but rather measure success over some interval

## Words we like to hear...

*"I am CERTAIN that were it not for the profound learnings that I received from you in your Requirements Engineering curriculum, these results... would not have occurred. I recently learned that the increased sales projections due to XYZ (of which ABC is just the first deliverable) are estimated to be between two and three billion dollars!"*

- Post-engagement review, 2004

# Scorecard overview

There are several categories of success criteria to consider:

1. Reaction and Satisfaction
2. Knowledge and Skills Transfer
3. Application and Implementation
4. Business Impact
5. Financial Benefits & ROI
6. Intangible Benefits

It is *not* necessary to use all categories on a single project;  
choose a subset based on needs and opportunities

Source: Adapted from *The Consultant's Scorecard*

# The Landing Zone

For larger projects, a Landing Zone may help summarize the detailed goals and serve as a general definition of success. Here is an example Landing Zone for a new car:

Criterion	Minimum	Target	Outstanding
Seating	4 adults	5 Adults	5 + 1 child
Mileage (city/hwy)	> 20/25	> 25/30	> 30/35
Price	< \$27,000	< \$22,000	< \$20,000
Features	A/C, Air bags, CD	Min + GPS system	Target + heated seats

# Landing Zone Usage

Landing Zones are useful for several things:

- Gain explicit consensus at the start of a project on the definition of success
- Quantify the achievement levels required as an input to feasibility and risk analysis
- Drive tradeoff discussions and decision making throughout the project
- Define decision authority limits for the team
- Monitor and communicate product attribute status to decision forums and management during development

# Planguage for success criteria

Planguage is an informal but structured keyword-driven planning language created by Tom Gilb

- Planguage is very well suited to specifying success criteria for projects
- Its strength is its ability to create measurable, concise statements
- Planguage pairs naturally with Evolutionary Delivery

**Planguage aids communication about complex ideas**

# Example engagement objectives

Objectives:

1. **Improve the quality of requirements for project X**
2. Train project team members in requirements review techniques
3. Assist in establishing group policy for requirements engineering practices and process

Let's look closer at the first objective... How would we quantify it so it is measurable?

# From objective to success criterion

**Requirements Quality:** Improve requirements quality on project X.

**Scale:** Total major defects per page remaining at time of requirements baseline.

**Meter:** Inspection of a sample of requirements, 1 hr. per page rate, assuming 50% effectiveness.

**Minimum:** No more than 5 major defects per page

**Target:** No more than 3 major defect per page

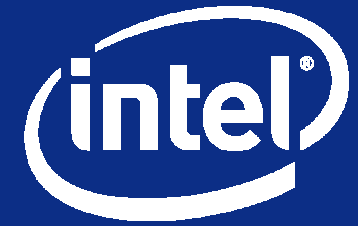
**Outstanding:** Less than 1 major defect per page

**Past:** [Sample of first 20 requirements] 20 majors per page

For more details on Planguage use, see *Competitive Engineering*

## A bit of advice...

- Be conservative in claiming causality for improvement in some quantity; give credit to other sources when they exist
- Get others (your stakeholders, for example) to state the value of your work
- It will take some time to establish a measurement system in a group where none has existed before; don't expect too much too soon
- It is best to have a written policy on valid and invalid uses for measurement data, reinforced frequently and enforced rigorously by senior management.



## Lesson 7

*Employ an effective business model within the group  
that drives change*

# The opportunity

A relatively small team of change agents can have a large positive effect on an organization if they:

- Work on expressed business unit problems, not their own agenda
- Manage opportunities via portfolio management to ensure they are addressing the most important needs first
- Deliver meaningful results early and often
- Have a clear exit strategy for each engagement, and emphasize knowledge transfer rather than staff augmentation

# Sample vision and mission

**Vision:** Product development at <company or group name> is repeatable, competitive, and continuously improving

**Mission:** We create and deploy methods and tools that improve product development practices

We engage with teams to work on their problems, and measure success by achieved business results

# Basic business model

- Projects are planned, managed, and executed according Evolutionary Delivery principles
- Change agents work directly with teams using the People Mover model, assisted by other models as needed
- Resources are allocated and reallocated to projects using portfolio management process with defined prioritization criteria
- Change agent resources are provided to teams at little or no cost as an incentive to adopt new behaviors
- Every engagement must have a statement of work, measurable success criteria, and a documented exit strategy

# Summary

1. *Take time to learn about your culture*
2. *Understand how organizational change takes place*
3. *Start by establishing a life cycle for development*
4. *Use Evolutionary Delivery to drive change*
5. *Diffusion of Innovations provides important vocabulary and structure for change agency*
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# Questions?

“There is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order of things.”

- *Machiavelli*

“After you’ve done a thing the same way for two years, look it over carefully. After five years, look at it with suspicion. And after ten years, throw it away and start all over.”

- *Alfred Edward Perlman*

“It is not necessary to change. Survival is not mandatory.”

- *Deming*

## For more information

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