15. 351 Managing Innovation & Entrepreneurship

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MODULE 2
Class Eleven
Module Two: Building Organizations for Executing Innovations

Five classes – insights into organization design choices such as structure & incentives

- The Bake-Off – structuring innovation methods
- Managing on Internet Time – structuring & experiencing flexible structures
- GSK – shifting from rigid to flexible structures, incentives
- D-Wave – structures incorporating external actors, incentives
- One Laptop per Child – structuring around communities
Executing Innovation
Key Design Choices

*Innovation architecture*
- Organization of tasks for concept (opportunity) development
- Organization of tasks for implementation

*Governance & control*
- Who allocates functional resources?
- Who controls projects & how are key decisions made?

*Incentives*
- How do you motivate people to participate fully?
- What types of rewards do they need?
Reflecting on the Bake-Off

- Difficult innovation challenge – a tasty healthy cookie that “travels well”!

KEY CHARACTERISTICS/ASSUMPTIONS

- Defined challenge – no unpredictability in the environment, no competition etc. => no need to keep concept “open”
- Ill-defined technical system – hard to predict which recipe variant will map to a good outcome => can’t model
- Integrated product => no opportunity for modular work in parallel
- Improvement critical => likely to find local optimum via incremental search from a good starting point
Difficulties with the Three Approaches

- Not clear whether XP and “Open Source” are innovation process architectures or specific methods
- XP – process architecture for implementation & iterations on a GIVEN concept
- Open Source – also a process architecture for implementation on a GIVEN overall product vision…
- Dream Team – might consider this as a concept generating “process” – wisdom of expert crowds
- Traditional – only architecture with specific process for concept development

Nonetheless, still possible to compare architecture “pre” & “post” concept freeze…
## Comparing the Three Approaches

<table>
<thead>
<tr>
<th></th>
<th>Traditional</th>
<th>Wisdom of Crowds</th>
<th>Open Source</th>
<th>XP</th>
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</thead>
<tbody>
<tr>
<td><strong>CONCEPT PHASE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Who?</td>
<td>Team</td>
<td>Experts</td>
<td>Visionary</td>
<td>Management</td>
</tr>
<tr>
<td>Decision?</td>
<td>Leader</td>
<td>Consensus</td>
<td>Individual</td>
<td>Leader</td>
</tr>
<tr>
<td>Motivation?</td>
<td>Employment</td>
<td>Interest voluntary</td>
<td>Interest career (?)</td>
<td>Employment</td>
</tr>
<tr>
<td><strong>IMPLEMENTATION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staged?</td>
<td>Yes</td>
<td></td>
<td>No</td>
<td>Not explicitly</td>
</tr>
<tr>
<td>Who?</td>
<td>Team</td>
<td></td>
<td>Anyone</td>
<td>Pairs</td>
</tr>
<tr>
<td>Motivation?</td>
<td>Employment</td>
<td></td>
<td>Interest community</td>
<td>Employment competition</td>
</tr>
<tr>
<td>Quality?</td>
<td>Testing, reviews</td>
<td></td>
<td>Community gatekeeper</td>
<td>Pair</td>
</tr>
<tr>
<td>Iterations</td>
<td>Moderate/serial</td>
<td></td>
<td>Multiplex</td>
<td>Rapid/serial</td>
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<tbody>
<tr>
<td><strong>CONCEPT PHASE</strong></td>
<td>Effective?</td>
<td>Understood problem in static environment</td>
<td>Hard problem to solve</td>
<td></td>
</tr>
<tr>
<td>Caveats</td>
<td>Only as good as team unless combined</td>
<td>Engaging experts avoid group think</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>IMPLEMENTATION</strong></td>
<td>Effective?</td>
<td>Complex product but where overall perf. matters</td>
<td>Product is modular &amp; changing - interfaces don’t matter</td>
<td>When quality is key but project small</td>
</tr>
<tr>
<td>Who?</td>
<td>Good for training, different levels of individuals</td>
<td></td>
<td>Allows for different levels but careers?</td>
<td>Compatible experts</td>
</tr>
<tr>
<td>Caveats</td>
<td>Rigid</td>
<td></td>
<td>Interest community?</td>
<td>Employment competition</td>
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</table>
In Practice

- **XP Team**
  - Concept
  - Implementation

- **Dream Team**
  - Concept
  - Implementation

- **Traditional Team**
  - Concept
  - Implementation
Comparing the Three Approaches

**XP TEAM**
- Little effective action at the concept phase but not really appropriate here.
- In the implementation phase, did many iterations but failed to engage in a more rigorous testing program. They could have done this repeatedly with “users” or with Gundrum.

**Dream Team**
- In concept phase, limited use of the experts, no really ability to work to consensus. Either need a strong leader or a clear process to come to decision, e.g. Delphi Methods, hone in on a few scenarios….
- In implementation could switch to Open Source. People can check in and out….iterate on their own if they want BUT need a way to test.

**Traditional**
- In concept had a gate and a decision maker but little thoughtful input.
- In implementation, set of gates: from overall recipe, to refining the sugars to selecting the crystals, etc. Think of this as more and more detail in design: review panels, experts etc. Results: slow iterations…
Ideal Model?

Dream Team benefitting from parallel cumulative efforts

Consensus building dm process

Traditional Team with a twist in methods

XP process for iterations between gates?
But...

- What about situations that are not like the X-Prize or the Bake-Off or the America’s Cup?
- What about when the situation is more like Iridium – there is a lot of uncertainty and novelty emerging in the environment
- Need ability to either:
  - Execute given concept very fast (autos) OR
  - Continually update the concept & still execute
Alternative Innovation Architectures

Two critical phases to the innovation process:
- Concept development
- Implementation

Both require experience, experimentation – all the methods that we examined in Module One.

Key question is how they are organized and work together.

- **CONCEPT TIME** - window of opportunity to include new information & optimize match between technology & market
- **RESPONSE TIME** – period with architecture frozen – not able to react to new information

Figure by MIT OpenCourseWare.
Example:
Evolution of the Computer Industry

- **1980s US**: Concept
- **1985 NEC**: Concept
- **1991 SGI**: Concept
- **1996 Netscape**: Concept
Flexible-Integrated Model

Ongoing flow of technology & market information into the project

Product Specifications maintained as fluid to allow for benefits to this information to be accrued.

**Does NOT mean that there are no reviews – there is STRUCTURE!**

**KEY DECISION** – When to freeze what element of the concept….easier for modular products

E.g. Team New Zealand – this is a flexible approach – BUT with some elements fixed at certain points in the process e.g. Hull (versus the keel)

Diagram of workflow removed due to copyright restrictions.
Another Flexible Process – for Concept Stage

Flexible process that incorporates cross-phase iteration:

Emphasis on comprehensive iteration - series of planned iterations that span several phases of development.

Requires managers to evaluate risk early in the project, when costs are still relatively low.

Allows glimpse into the future, which is not allowed by the stage gate process - yields information from later stages that can be incorporated in early concepts, requirement specifications, and architectures, thus reducing risk.

Can be followed by STAGE GATE
Limitations

Flexible processes are hard!!

- **Leadership**: puts a lot of emphasis on the project leader – easy to lose control

- **Governance**: Need to have strong leadership & empowerment – *won’t work in functional organizations*

- **People**: May get meeting “burnout” – time & efficiency issues

- **Size**: Really difficult to do very flexible projects e.g. Agile etc. in large scale projects

- **Documentation**: can be really poor unless project is well executed

- **Corporate implications**: Limited learning x projects so loss of functional expertise
**Link Innovation Process to Environment**

- **Novelty** – degree to which technology or market is unpredictable
- **Complexity** – time required to complete a project

**BUT also consider**
- What type of people?
- What incentives?
- What governance

<table>
<thead>
<tr>
<th>Unpredictability</th>
<th>Complexity</th>
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<tr>
<td>Reactive (organic)</td>
<td>Stage Gate (sequential)</td>
</tr>
<tr>
<td>Flexible (integrated)</td>
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</table>
Innovation Process Architecture & Type of Innovation

VERY DIFFICULT TO PREDICT….

- Much more useful to think about the environment, the complexity of the task (i.e. number of elements, interdependencies etc.)
- And, to consider the types of people – their quality and the types of motivations that they have…
Take Aways

- Key organizational decision for all innovation projects – concept versus implementation phases
  - Degree of overlap
  - Concept freeze?

- Choose structure that maps to the context – what are the key risks
  - complexity & implementation (Challenger)
  - changing context (Netscape)
  - problem in Iridium was both!

Several other elements

- Ability to take greatest advantage of novel experimentation techniques
- Consider the type of people that you have in your team & the appropriate incentives & governance
- Take advantage of product design – modularity, minimize interdependencies etc.
APPENDIX

More details on stage gate
Traditional Approach – *How it Works*

Often referred to as the “stage gate process”

First introduced by Cooper in the IEEE 1983

Consists of phases and gates:
Start with a phase, meet gate requirements, move on to next phase

Involves significant upfront design


Courtesy of Paul Hoadley. Used with permission.
Traditional Innovation Process Architecture

- **Concept Generation (Pure Ideas)**
  - Few accepted methods, chance, employee suggestions

- **Concept Exploration**
  - Product design
    - Resolving key technical performance characteristics and interdependencies
    - Preliminary market intelligence

- **Product Development**
  - Prototyping & Refinement:
    - Manufacturability Issues
    - Choosing the customer

- **Launch**
  - (Commercialization)
  - Production & Distribution
    - Marketing / Brand-name recognition
    - Challenging Downstream bargaining power

CONCEPT FREEZE

Diagram: Arrow pointing from Concept Generation towards Concept Exploration, then dropping down to Product Development, with arrows indicating vertical movement towards and away from CONCEPT FREEZE.
Phase Gate Model Allows for Structure, Clarity & Common Understanding of Project Progress

✓ is a formalized, project management process that can overlay over more detailed existing divisional product development processes

✓ allows a project to be defined, tracked and reviewed according to predetermined decision criteria and a series of key business decisions

✓ enables project visibility across divisions and corporate with standard terminology and simplified reporting

✓ anticipates that some projects will be terminated or shelved if they do not meet expectations

✓ integrates the enterprise, spanning the business functions
Example:
The Key Questions Answered by Each Phase

Phase progression indicates increasing investment and decreasing risk.

Portfolio Review

Phase 1: Concept Investigation
• Does the idea fit roughly with our strategy and resource availability?
  If yes, then concept document approved & sub-team allocated

Phase 2: Feasibility
• Does the product make sense from marketing, technical & financial perspectives?
  If yes, then concept approved & full team allocated
• What is the product spec?
• Can we develop it within budget and schedule?
• Can we produce it at the required cost & volume?
  If yes, then prototype approved & full team allocated

Phase 3: Development
• Has the product been fully verified and validated?
• Have production objectives been met?
  If yes, then full manufacturing approved & sub-team allocated

Phase 4: Post Release
• Is the product meeting safety, efficacy and business targets in the market?
  If yes, then closeout approved & handoff to product support

Current Product Support

Idea Generation
Key Gates & Documents (Milestones)

Idea Generation

Initial marketing and technical concepts

Feasibility

Concept refinement and prototype creation

Capability

Product optimisation

Launch & Rollout

Commercialisation Production & Distribution

Charter

One page description of proposed project including objective, rationale and development routes. Early Commercial Assessment

Contract

Cross-functional development plan including project plan as contract between team and Gatekeeper.

Launch Proposal

Launch Plan including CEP approval request.

Post Launch Review

Tracks success of and key learnings from launched products

KEY

=GATE

= DOCUMENT
Innovation Structure, Milestones & Risks

Funnel Progression (each project type has a different timescale)
Strengths/Weaknesses

**Strengths**

- **Costs:** minimizes need to costly last minute changes – if up-front work is well done
- **Estimates:** Great for funding and time estimates
- **Focused requirements:** minimal scope creep
- **Documentation:** Good documentation & knowledge management/ transfer
- **Structured approach:** generally how people are trained

**Weaknesses**

- **Rebuilds costly:** Costly to rebuild product at end of phase, if necessary
- **Hard to change req’s:** Requirements take significant upfront time and are difficult to change midstream
- **Ramp-up time:** Original author most knowledgeable – takes time for new people to ramp up
- **Response to change:** Does not respond well to changing market conditions, stuck in cycle