IIT Kharagpur

Innovation Engineering – a short Introduction

Innovation Engineering encompasses the process and ability to

- identify problems and generate solutions,
- communicate these solutions effectively, and
- to test and implement them successfully through a systematic approach to creativity, the foundation for generating innovative ideas and
- ultimately to bring in to reality through the ability to Create Communicate, Commercialise and
- to visualize and analyse systems, while also
- assessing the Risks and the Benefits for reducing the former.

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A possible Definition of **Innovation Engineering**

- **Innovation Engineering** is a **systematic approach for solving technology and business problems,** from the **idea stage to delivery**, for enterprises that intends **to create innovative offerings** in the **target markets**, using appropriate **technical expertise** for **optimal assimilation of solution methodologies,** following secure development engineering principles, encompassing **risk mitigation** for **improved predictability** of projects, expedient as a repeatable model.

(the definition is based on literature review, interaction with stakeholders and experts and through inductive ratiocination from observance of innovators and students immersed in innovation endeavours and projects.)

A definition of Innovation: **Executing** an **idea** which **addresses a** specific (real) **challenge** and **achieves value** for both the **company** and **customer** *(summarised by N. Skillicorn)*

Program (inductively developed) for Innovation Engineering

1. To **Choose a problem-solving idea that aligns with innovator's professional competence and personal passion**

   (So that time is not wasted later due to just hanging about, which is the most irretrievable and precious commodity)

The background (inspiration) has been the Design Challenge (problem); that 'Y' ("Y" may mean 'You') is trying to solve

- To frame the issue as a Design Question -- How might we (HMW)…..
- To note the Impact 'Y' is trying to obtain
- To note some plausible solutions to 'Y''s problem
- To verify if 'Y' has checked the TRIZ Contradiction Matrix, if applicable?
- To list the germane context and salient constraints
- To modify the Questionnaire, if so necessary for the next round

2. To, Re-Define the problem, carry out Background Research and preparing a Goal

(Background Research --

- prior art search,
- literature review,
- targeted interviews with users, stakeholders, partners and experts)

3. To Use a 360˚ evaluation of the problem-solving idea from all realistic angle for reassessing and reconfirming for Concept Development:

- Who are the customers?
- [and], Why would they pay for the product ?
- [and], Is the market large enough?
  (to justify the time involvement and commitment, the opportunity cost involved and the investment needed?)
- [and], Is the expected return on investment large enough?
  (to justify the effort and sacrifice required to see the fruition?)

4. To finalise the Concept for designing considering Functional Requirements & Design Parameters

(to list a number of independent functions that the design ought to fulfill, including the parameters to achieve so.

- At the concept development stage the feasibility aspects are considered and is screened from many ideas.

5. To Seek candid and honest opinion from the truth-tellers for constructive feedback, who

- have first-hand market knowledge,
- understand what business models would work,
- can spot the drawback of the proposed solution idea, as compared with competitions due to intimate and credible experience.
- are the prospective customers; to share their thinking about the problem-solving ideas.

6. To prepare a detailed action plan to be followed with disciplined focus.

(Including identifying the mission-critical quarterly or half-yearly goals and milestones, spanning for about a couple of years.

(Addressing the Risk Benefit issues; to reduce unknown quantities for minimize uncertainty factors – in terms of

technology gaps,

customer preferences and market dynamics,

attrition of competency in team,

input cost fluctuations,

failure in supply chain,

change in regulation and general economic condition associated with temporal factor, etc.

- **7. Design (to realize the decided concept)**

  (Breaking it down into modules)

- Is it an MVP (Minimum Viable Product) development? - focusing only on the features required for Early Adopters?)

- Is the Affordability (Frugal Design and Engineering) an important criteria?

8. To quickly and inexpensively **Build a** bare-bones **prototype for early feedback.**

To seek out and obtain user feedback without delay (wasting no time) to incorporate valuable and constructive feedback for improving the next version of the product and to repeat the process until the customer is satisfied with the solution.

- Focus should be on building and shipping products with 'good enough' quality

  and

  not striving for perfection as most products do not require so.

9. To Test if 'Y''s product satisfies customers' needs and to know

- How well the product performs,
- Whether it is priced rightly,
- How do customers use it?
- Whether the marketing message is succeeding

(revenues, sales leads, sales)

- And, then to Evaluate test data and results, incorporate improvements.

and

test some more and to continue testing

10. To improve based on test result data

(By analyzing the data, to make only necessary improvements - Products get Improved through multiple iterations

(To warrant mitigation of risks, improvement in value sensitive benefits and re-checking the

desirability (User/consumer/ buyer/ market),

feasibility (technical and organizational and

viability (economical and sustainable) factors

- Innovation is targeted at the intersection of the above three

11. To critically audit the development process and to apply the lessons learnt.

(by applying the lessons learned during the development process on the next set of incremental steps forward for next rounds of improvements in an iterative manner.

- Several factors need to be considered before embarking upon a new business venture.

Innovation in Startups

- Developing a technological startup is not at all easy – it is a risk-prone and time consuming endeavour.
- Some of these resources, however, may be secured later, if all are not available at the beginning.
- Entrepreneurship pathway is to be embraced only when one believes that the commercial opportunity is attractive and rewarding enough to garner the necessary resources.
- Innovators and Entrepreneurs bring in valuable ideas and are willing to undergo the painstaking process of convincing self first, and then others about the value of those ideas.

Innovation in Startups (….contd.)

- An Innovator-entrepreneur should be prepared to spend time and energy through the periods; of incubation and the early stage development regime.

- Thus, it is a must to start building a sound foundation for the innovation and commercialisation.
- Success is uncertain and many are not suited for this vocation.

- However, It is not unusual to find a lot of new business ventures desire to start big.

- They invariably start with high expectations, while having inadequate experience and crucial knowledge gaps, and miss to recognise what it requires to reach to something meaningful from zero.

Some salient Challenges associated with ‘Innovation’

- It is a learning process as new problems are encountered many times over; investigations and solution search becomes necessary.

- An idea, initially preferred for its simplicity, may become much complex with further thoughts evoking new questions or issues.

- Efficacy of bottom-up innovation, as usually in a startup, depends on the type of individual:
    a) Who is willing to put in personal time and effort to realise a goal
    b) Who has the drive to pursue a goal, despite a compromise with the career, if necessary.
    c) Who does not take ‘no’ for an answer

Some salient Challenges associated with 'Innovation' (..Contd.)

- Innovators are not always the people who have generated the idea.

- Innovation primarily is:
  a) Assimilating the knowledge, experience, information and data from many different sources.
  b) The ability to interblend knowledge of the technological and marketing issues, alongside the acumen of scanning the innovation from a strategic business view point.

Roles of the Innovation Team in a Startup:

Opportunity Admonitor, Information Facilitator,

Execution Expeditor

Opportunity Enabler, Resource Developer

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