

Innovation Challenges for Engineering Managers

Nik Tehrani¹, Jahan Ghofraniha²

¹PhD, International Technological University

²PhD, San Jose State University

Abstract— *The crucial challenge for managing engineers with technical expertise is to connect them to the commercial aspects and end-users of their products. This ensures that engineers fully comprehend the purpose of business: salability and profitability. Corporate team managers need to implement a channel for ideation and collaboration connected to the engineering processes. First, is picking the right people: diverse, analytical, and creative. Management should try to harness diversity so that there is good conflict or 'constructive conflict' that optimizes debate and problem-solving using group process skills, procedures, rules, interaction styles, and group dynamics. Start by knowing the actual work the team will be doing and then optimizing the staff around key activities. Access to strong well-connected networks provides support from a broad range of knowledge. One team leader should be appointed, as innovation teams with more than one leader are not set up for success due to inefficient decision-making and low morale. Other team members should have the ability to step in and lead when their relevant expertise is required. To realize the full potential of an innovation, management should seek outside ideas from a disrupter or an external provocateur to gain fresh perspective that extends beyond the teams boundaries or thinking. Knowing they may be rewarded with the potential of more financial compensation, innovation teams might be spurred toward more risky entrepreneurial motivation.*

I. INTRODUCTION

Innovation in the corporate world is anything new that creates value for users, and has the potential to be commercially successful, such as new algorithms, data models, patents, abstract technical concepts or functional prototypes ^[1]. Technical engineers can drive innovation because they can see opportunities and possible underlying constraints. Engineers can lead real innovation given the right culture, direction, programs and tools provided by management ^{[1][2]}.

Managerial Challenges

Software engineers tend to work inside their own microcosm, working on lower level design and implementation or on higher level components and systems architecture. The crucial challenge for managing engineers with technical expertise, and who perceive themselves as creators, builders and innovators, is to connect them to the commercial aspects and end-users of their products. This ensures that engineers fully comprehend the purpose of business: salability and profitability. Managers need to make engineers feel that they have autonomy to pursue their ideas, not as innovators of an isolated feature, component or process, but rather that they share in driving financial value ^[1].

Technological Support from Managers

Technology in the form of intelligent ideation platforms can capture and categorize ideas, and prioritize the innovation

stream to product backlogs ^[1]. Team managers need to implement a channel for ideation and collaboration connected to the engineering processes. In contrast to the production mode that requires set processes, coding principles and protocols, managers can encourage 'rapid prototyping' that allows engineers to take shortcuts, make assumptions or use artificial data to build functional instances of an idea. Rapid prototyping requires managers to invest in technological readiness, such as maintaining reusable components, APIs, and standardized data sets to allow for rapid assembly of functional prototypes with little waste of functionality not relevant to the core idea. This framework captures a reliable history of ideation, prototyping efforts, or patent filings, fundamental in defining baselines and reference points ^[1]. Quick prototype creation can be shown to selected users to capture feedback for the next stage in development ^[1].

Health Care App Requirements: HIPAA Compliance

In Health care for example, the Health Insurance Portability and Accountability Act (HIPAA) regulates healthcare electronic transactions for cost reduction and to outline practitioner, hospital, and health plan requirements which protect data confidentiality ^[3]. Managers must oversee teams to ensure that health care mobile apps adhere to rigorous HIPAA Compliance standards ^[3].

Management of Innovative Teams

Corporate innovation teams is a key to finding breakthroughs in large corporations, and it takes proper management of engineering talent to help such high-performance teams deliver a new revenue-generating business idea and take it from concept to launch. The first step toward success is picking the right people: diverse, analytical, and creative. The ideal way to start is by knowing the actual work the team will be doing and then optimizing the staff around key activities ^[4].

The new management attitude is not to simply have a team that 'thinks outside the box,' but rather 'builds a bigger box' ^[4]. Innovation teams go through several phases: 1.) creative to generate new ideas, 2.) analytical to grasp business potential, and 3.) development to improve promising ideas and do market testing. Thinking 'outside the box' applies to just the generation of ideas phase. Thus, the personnel goal is to create a team that provides the 'biggest box' ^[4] that represents the sum of their collective diverse experiences, academic knowledge, and professional networks. Access to strong well-connected networks provides support from a broad range of knowledge.

Management should appoint one team leader, as innovation teams with more than one leader are not set up for

success due to inefficient decision-making and low morale ^[4]. The one leader model allows for owning the vision and making final decisions to keep a project moving rapidly ^[4]. However, other team members should have the ability to step in and lead when their relevant expertise is required ^[4]. Also, a team leader must be granted total autonomy for team selection, to recruit, make substitutions, or terminate team members ^[4].

A good business idea fills a gap in the market that addresses an unmet need for which there is no other solution currently available, but the new idea needs customers willing to buy it. Consumers' needs have to be the basis behind the direction of the innovation process ^[4]. Just knowing the size of the market isn't enough, so management should include an ethnographer on an innovation team to observe consumer behaviors and generate ideas about their unmet needs, daily activities, and motivations ^[4].

Managing Innovation Team Conflict

With desired diversity on a team, conflict is inevitable. Team members should learn to work together, but too much compatibility will limit challenging other's ideas, assumptions or hypotheses for better answers. Management should try to harness diversity so that there is good conflict or 'constructive conflict' that optimizes debate and problem-solving using group process skills, procedures, rules, interaction styles, and group dynamics. If constructive conflict is repetitive, it may lead to bad or interpersonal conflict, and must be stopped immediately ^[4].

Conflict Resolution Strategies: ^[5]

- 1: Avoiding: Ignoring or withdrawing from the conflict.
- 2: Competing: Team members are assertive and uncooperative.
- 3: Accommodating: One party gives in to the demands of others.
- 4: Collaborating: Team members are assertive and cooperative.
- 5: Compromising: Each member gives in, resulting in no one getting it all

External Provocateur

To realize the full potential of an innovation, management should seek outside ideas from a disrupter or an external provocateur to gain fresh perspective that extends beyond the teams boundaries or thinking ^[6]. An external expert, or 'irritant' might inspire a team to consider bold strategies and game changing insights ^[4].

Set Clear Goals and Rewards

Innovation teams must set goals at the start of a project, regardless of the wide range of potential outcomes. Teams without the discipline to set goals upfront may be doomed to failure ^[6]. First, they should establish a vision of the end goal

that the team buys into to mitigate interpersonal conflicts ^[6]. These goals should be revisited periodically to reinforce commitment to the effort. Innovation requires many applied experiments aimed at deciding which new idea will work or not in meeting goals. Bad ideas are not necessarily failures, as it shows which ideas are not valued in meeting goals ^[6]. Much innovation today is occurring because of an entrepreneurial commitment among teams with clear goals, mindsets and behaviors. For such teams, knowing they may be rewarded with the potential of more financial compensation might be spurred toward more risky entrepreneurial motivation. This would better lead to full commitment for engineers put their soul into a project to make it successful.

II. CONCLUSION

Entrepreneurial commitment among teams with clear upfront goals, mindsets and behaviors leads to innovation. It is crucial to select the right engineering people: diverse, analytical, and creative, who comprehend the purpose of business: profitability and salability. Managers must allow engineers to have autonomy to pursue their ideas, not as innovators of an isolated feature, component or process, but instead that they share in driving financial significance. Management should introduce a disrupter or an external provocateur to provide new perspectives that go beyond the team's boundaries or thought processes. Proper management that allows freedom and autonomy with clear goals during the innovation process, along with the right people and practices, will bring innovation and successful ideas to fruition.

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