Lean Innovation

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Lean Innovation Introduction

What do you think innovation is? Where does innovation exist?

Innovation is...

- New and alternative technology solutions?
- New approaches in services to enhance stakeholder interaction?
- Radically improved data management?
- Transformative business models?
- Internal processes to foster new modes of team interaction?

Actually, it is all of the above. Innovation is not one-dimensional. It is not just about new technologies or products. It cuts across the entire organization and it needs to be a holistic endeavor, from the culture of the company/business to its business process.

The Risk of Innovation

Eastman Kodak Co (OTCMKTS:EKDKQ)

Some of the most innovative companies fail to commercialize their innovations effectively over time and adjust disruptions in technology and culture change. Kodak invented digital photography and by 2006, sold more digital cameras than anyone else. However, they were still tied to their physical film printing business. While they tried, they could not survive rapid changes in how we take and share images. From Facebook, to smartphones, to Instagram and Snapchat, they could not react fast enough. Eventually, they went bankrupt in 2012.
Sony has had a very difficult time over the last 10 years. Despite the success of the Playstation, the company has faltered. Imagine the company that owned personal, easily transported music for decades (from transistor radios to Walkmans), could not develop and commercialize a successful MP3 music player. Sony failed to take advantage of the internet and the changing listening patterns in the home, which lead to new companies like Sonos. Within several years Sony may exit consumer electronics.

TiVo was a great technology, but the company struggled with the best way to strategically approach the market. Should they focus on their own set-up boxes? Or license the technology? Why did they not move quickly into cloud-based storage and streaming?

**Risk and Rewards - Apple**
Arguably the most recognizable and famous brand is Apple. By 2004 Apple was a very different company than the apple of 1993. They were able to experiment and learn, using lower cost and lower risk strategies. Despite the iTunes port to the Motorola Rockr was a failure, the company learned a lot about music and phones, lessons that they integrated into the iPhone, which was in development at the time. Apple has done the same thing over the last few years with the Apple TV. The new Apple TV with its new interface, App Store, and gaming ability stands the chance to be a breakout product over time.

Apple - Leading through innovation

- Technological innovation - iOS, hardware components
- Design innovation - GUI
- Product line innovation - multi-generational with good, better, best
- Business model innovation - iTunes, media and apps, SCM
- Channel innovation - Apple stores
- End-User Services innovation - Apple store/Genius Bar
- Branding innovation - from .Edu to Generation X, Y

And the reward...

Here's the reward. Explosive growth and profitability.
Below are some specific examples of companies that felt the weight of the risk and often caved as well as the reward and have flourished. Many of these examples you have seen in daily life. Others, you may not be so familiar with.

**The Risk**

This is a list of once great companies, that were innovative, then fell victim to technology changes, a poor innovation process, etc. Digital was once the most valuable technology company in the world, sold off in the mid-1990’s. Commodore was highly innovative, but had a poor approach to product strategy. Even though they produced the most advance personal computer in the late 1980’s and early 1990’s (the Amiga), they went bankrupt in 1993.

**The Reward**

Here’s a snapshot of some leading companies. What do they have in common? They have a winning approach to innovation resulting in high brand recognition, higher prices and profit margin versus competitors, and they take risks. From Ford experimenting with ride sharing to IBM and Watson. Honda just released a new business jet (a brand new market for them).
Some companies, however, recognize their issues. Ford nearly went bankrupt in 2006. Their new CEO was dismayed over the product development process and lack of focus on making truly great cars and trucks. Radical changes were made to their approach. Ten years later Ford is highly profitable, with vehicles that are segment leaders (from the F-150 to the Fusion).

**Boeing 707**

Here’s an example of a winning product, the Boeing 707. It transformed air travel. Boeing took its experience of making large jet aircraft for the military (B-29, B-52) and leveraged that into the commercial space.

**Boeing 7207**

However, sometimes innovation efforts are a bridge too far. This is the Boeing 2707, a supersonic transport designed to carry 277 people at 70,000 feet at Mach 2.7. However, concerns over the sonic boom, damage to the ozone layer, and rising fuel costs caused the US government to withdraw funding. Boeing had 121 orders, and two prototypes were over 25% complete. This project almost bankrupted the company.
Original Ford Taurus

Ford was almost bankrupt by the early 1980’s, losing billions of dollars in the recession at the time. In a bold move, the company decided to try to develop the world’s best mid-size car. They set-up shop in a warehouse with 300 engineers and developed the Taurus. This may look mundane today, but it was revolutionary. By 1990 it was the best-selling car in the US, and helped transform the company. From the same chassis it spawned successful minivans and luxury cars. It was such a successful project, that an engineering manager at Boeing used many of the lessons of Team Taurus and applied them to the Boeing 777 airliner. The Boeing 777 is arguably one of the most successful case studies of developing a complex product.

1990s Ford Taurus

Only 10 years later, Ford had forgotten what made the development of original Taurus so successful. The 1996 Taurus was poorly designed and poorly received by consumers. By the early 2000’s, what was once the best-selling car in the US was mainly relegated to rental fleets. Remember that Boeing engineering manager that so admired the original Team Taurus and how they approached development. Well, he (Alan Mullaly) become CEO of Ford in 2006 and was disheartened by what he saw and how Ford approached new product development.
Palm Pilot

I mentioned the Apple Newton and PalmPilot. Here is the Pilot. During development, the Palm Computing founder Jeff Hawkins carried a small block of wood in his pocket for many months, taking it out at meetings and seeing what features and how it could be used. Talk about low-cost prototyping and real world investigation. Simple and effective. The focused and relatively simple Pilot was a massive success.

Timing is also important for innovation. Friendster was first, and while they had limited success, the market was not yet fully developed.
What made Facebook successful? Remember, when first introduced it was exclusive (first only the Ivy League, then only users with an .edu account). Also, the target audience was perfect. College students, who grew up online, and have active social lives. The market of Friendster had come of age. It didn’t hurt that like the PalmPilot, the features and design were simple and straightforward.

**Disruptive Business Models**

**Uber**

A disruptive business model or a disruptive innovation is a one that creates a new market of a good or service that disrupts one that is currently in place. Uber is a perfect example of that.

One of the keys to innovation are leveraging existing platforms allowing the development of new business models. Just look at the rise of Uber. From leveraging the freelance economy to really addressing customer pain points in elegant ways. Uber is transforming a sector of the economy.

**New Applications of Mobile**

We live in a mobile-centric world. The most innovative firms are leveraging this to develop new services and ways to interact, inform, and deliver value to customers.
Example: New Service Programs

Here's an example, the development of the Keep the Change Program at Bank of America. This was developed from observing and understanding how people balanced their checkbook. Through design thinking methods, this highly successful service was developed.

Here's some more information on this project.

So, why look to new ventures?

- New firms are small and do not have the financial or human resources to withstand new product development failure.
- However, new ventures are 13 times more innovation based on I.P. per employee.
- In new ventures, the failure rates of the business and the corresponding initial product are high at 75% in recent students (Nobel and Gnosh, 2011).
- Lack of resources and potential for failure drive a different approach.
- We look to new ventures because those that survive and thrive, we can learn from. Their approach to innovation has many lessons that can be applied to large, established firms.

Let's look at some successful examples across industries...

We can look to more than just app start-ups. Successful start-ups span industries, from bio technology to consumer products.
Lean Innovation

Our research has shown that regardless of industry, successful new ventures approach innovation is one of lean innovation. And this is the combination of three main elements.

1. Lean Innovation is a combination of three main methodologies. Each one of them is powerful by themselves, but it is their combination that can be transformative. The first is the ability identify new opportunities and gain a deep understanding of the user through the use of design thinking. Design thinking, popularized by design firms such as IDEO, enables individuals and groups to obtain considerate, empathetic knowledge of the user and their context, and through observation, uncover unique and non-obvious insights that can translate into opportunity. Within this methodology are ways to perform structured brainstorming, near zero cost prototyping, and approach user research, not from a traditional perspective of quantitative data, but to understand problems in their natural environment. I recently had the opportunity to be involved in a design thinking workshop at Kaiser Permanente innovation labs in Oakland, CA, with leading practitioners and academics. The work being done surrounding healthcare innovation using design thinking was truly inspiring, from rethinking hospital room layout to changing the interaction between doctor and patient. At Northeastern University, the School of Law has used design thinking to develop a law innovation lab, the first of its kind. The potential to leverage design thinking methods to uncover new opportunities has potential in all industry and governmental sectors.

2. The second methodology is the ability to quickly, and with few resources - develop, prototype, learn, validate, and improve solutions that may leverage an opportunity discovered during the design thinking process. The Lean Start-up and associated work by Steve Blank is now required reading for any budding entrepreneur. And rightfully so, its lessons are simple and powerful. However, the concept of fast learning iterations, early validation, and minimal prototypes that illustrate key, but bare-bones functionality are not new. The Wright Brothers, the Apple I computer from 1976, and Microsoft’s early efforts with both MITS and Apple are all examples of a ‘lean start-up’ methodology. Within large firms, these philosophies are starting to take hold. Apple’s iPod was developed by a small, empowered team comprised of individuals both inside and outside the corporate walls. Project Purple, which spawned the iPhone, was run in a similar fashion. Firms like the recently acquired EMC have enacted a systematic innovation process that seeks new ideas, funds winners, and allows these teams to pursue their projects through commercialization. Information technology firms like Constant Contact and Citrix are also exploring how internally funded start-up teams can create new businesses. So far, the results have been promising. Through our research, one thing is clear, setting-up idea hunts and having winning teams is the easy part. The hard part is establishing an engrained innovation ecosystem that funds, mentors, empowers, and rewards individuals and teams for these efforts. Building an innovation space and hoping the new ideas come is a sure fire way for the effort to run a short course, and have it fall into the boneyard of failed corporate initiatives.

3. The third method is the most familiar to existing corporations, but no less important. That method is lean processes, and not just Total Quality Management or Six Sigma. Those efforts are well
established and have a track record of success. Applying lean processes, which are their core are the reduction of waste and continuous improvement, allows innovation teams to tear down some of the bureaucracies and processes that inhibit innovation. All too often promising projects are encumbered by onerous procedures, stage-gates, MS Excel forms, and meetings that detract from value added work. Former Ford CEO Alan Mulally was dismayed at the dysfunction of Ford’s product development process upon taking the reign of Ford in 2006. As a project manager and lead engineer in the automotive industry (at Ford’s former subsidiary Visteon Corporation), at least half of my time was spent preparing documents to be reviewed in stage-gate meetings. And when the time came to present progress, managers were loathed to hear about any issues in the ‘red column.’ Alan Mulally noted the ‘sea of green’ status reports in many of those meetings early in his tenure.

https://hbr.org/2015/09/design-thinking-comes-of-age
http://theleanstartup.com/
https://hbr.org/2013/05/why-the-lean-start-up-changes-everything

For further reading, check out:


New Ventures vs. Established

<table>
<thead>
<tr>
<th>Model S</th>
<th>Panamera</th>
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<tr>
<td>5,800</td>
<td>17,500</td>
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<td>&lt;$500M</td>
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<tr>
<td>~3 years</td>
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<td>2,300</td>
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Tesla is a perfect example. Development of the Model S, a sales leader in its price range, was developed more quickly than its competitors, using fewer resources in less time.
And the Tesla case is such a good example as we learn innovation processes because their innovation efforts go well beyond the traditional product. It includes new business models, new ways to interact with the customer, and additional sources of revenue.

Tesla’s Roadster, of which they sold roughly 2000 examples, was the perfect beta test for them. They were able to sort our technology issues such as their battery management technology, transmission, etc., and learn the wants and needs from early adopters.

In order to develop the roadster, Tesla relied heavily on close partners. Panasonic with battery technology, Lotus supplier the chassis from the Elise sports car, and Daimler-Benz supplied much needed capital. This sped time to market and lowered R&D costs dramatically.
Development Process

An agile approach to development

Successful innovation in new ventures and large firms has common "DNA"

- A deep understanding of the problem and user
- Lean and agile methods to iterate and validate the idea, and pivot where needed
- Use of the latest tools for development and collaboration
- Hyper-functional teams used throughout the process
- Funded pilots to support the project
- A self-sustaining innovation ecosystem

At its core, innovation approaches have common elements, from small start-ups to large firms like Apple. Innovation needs to be systematic within the company, and ultimately can be self-sustaining.
Corporate Innovation Strategies

A sample strategy for corporate innovation

From our research, we have established several commonalities of what companies should do in their approach to innovation.

- Establish a fully supported, Lean Innovation Process
- Engage and empower employees to become coaches and champions
- Establish a formal "Innovation Studio" space where employees across all groups can come and enjoy the "Sandbox" (Communities of Support)
- Establish supporting IT and key service providers (Communities of Service)
- Establish a gap funding structure (Communities of Capital)
- Begin the process...

Thought:

How can you best create a viable, salable prototype?

The answer? The Minimally Viable Product (MVP)

Out of the start-up community, one of the most valuable concepts is the Minimally Viable Product, or MVP. Essentially this is a core, functional prototype, where you can test and validate your concept, then iterate and refine it. While the term comes from well-known Silicon Valley Entrepreneur Steve Blank, successful entrepreneurs have been using these methods for over 100 years. The Wright Brothers, Henry Ford, Microsoft and Apple are all examples of firms that started with learning from MVPs.

More on MVP...

In developing your idea, what is the core functionality and essence you need to validate?
The Road to M.V.P.

In developing your MVP, there are several considerations on how to develop it. Often, it requires both internal and external resources. It's the combination of these that can be powerful.

Internal Resources

- Founding Team
- Board Members
- Mentors

External Resources

- Service Providers
- Alliance Partners
- Freelancers
The team is all-important. In our research, we found that small, very fast acting and agile teams are essential. These empowered groups can go outside and inside the company, gathering and developing what they need to develop their innovation. Apple is a prime example of a company that does this. From the original Macintosh to the current car in development, Apple puts together small, fast-acting teams, heavily focused on field research to understand the use - design thinking - then develops and iterates MVPs.

For established companies, empowerment by management is essential. When combined with internal and external resources and a bare bones milestone-based process, the results can be much more innovative solutions.
Together: The Team and Organization

Pure project organization

For large companies, having a pure project team is unrealistic. It is not an efficient use of resources.

The Matrix Organization

Because the pure project organization is largely unrealistic, companies arrange themselves in this fashion. It serves incremental product innovation as well. Rather than being a stand-alone organization, like the pure project, the matrix project is not separated from the parent organization.
Mixed Organization Systems

However, to be truly innovative, firms need to have hyper-agile teams to be separated from the core company, to have the ability to work outside the confines of the corporate process.

Industry Results

Here are some examples of great teams, from Team Taurus to the Boeing 777. Yet, many firms - both new and established - struggle to establish an effective, long-term team culture.
Design Thinking, Industrial Design and Storyboarding

Quote:

In developing the MVP, storyboarding is essential.

Industrial Design Renderings to M.V.P.

Here is an example of industrial design concepts going to computer-aided-design (CAD) renderings. These CAD renderings were used to test the product concept, and develop prototypes of the concept. These helped inform and develop the MVP.
A Digital Design and Culture “Perfect Storm”

The current rise of digital design, a sharing culture and rapid prototyping has impacted the way we innovate dramatically. This has caused a perfect storm, a virtuous cycle enabling increasingly faster development.

Progression of Development Tools

We call this product development 2.0. Communication technology and collaboration have changed the way we approach development and interaction with the team. We are using Web 2.0 technologies to change iterations and how teams approach development. This image is showing that the tools used to design and engineer products has changed over time. Whereas, once you would design a part in CAD, and send it to someone to comment, we now - through the influence of social media and Web 2.0 tools - have a much more collaborative approach to design. What I call PD (product development) 2.0.
Product Development 2.0

Information technology has been the platform enabling this change. From new ways to communicate and collaborate, to opening innovation to the outside community.

New Modes of Innovation

Developing new modes of innovation

There are now multiple modes where companies can innovate and many are exploring these. From GE investing in Quirky, to Local Motors working with UPS.
Example: The Community Mode

Although they recently went bankrupt, Quirky developed a large community of passionate contributors. They arranged their entire company around the concept of open innovation. This is the community mode. While their business model was flawed, the interest of the community cannot be denied.

Prototyping

Rapid Prototyping to Test and Validate

The technology available to rapidly develop concepts, MVPs, and functional prototypes is one of the main results of the ‘Perfect Storm.’ From 3D printing to functional wireframing to layout apps, this allows companies to quickly develop prototypes.
Service Innovation Prototyping- IDEO and the Mayo Clinic

Prototypes don’t have to be physical. Here is a virtual prototype of a hospital.

Local Motors 3D Printer Car, 2015

Here is Local Motors, pushing the boundaries of open innovation and rapid prototyping. Push the boundaries of rapid prototypes and lead customer validation.
Rapid Prototyping Solutions

Prototyping costs have been reduced dramatically. Now, you can buy machines for even less than the cost of this machine at $4,995. Watch the video below.

Rapid Prototyping Solution Examples

Here are some of the different types of 3D-printed, rapid prototypes. These can be painted, nearly production-like.
Rapid Prototyping Solution Examples 2

Here's an example of rapid prototypes for mobile apps - perfect for the MVP of a new app service.

Rapid Prototyping Services

Service providers are the perfect external resource to lower costs. Here's a video of Quickparts:
Developing and Leveraging Innovation Communities

Communities of Support

For companies seeking to improve innovation, draw on inspiration from the start-up world. Develop communities of support within your firm. Develop areas where employees can gather and develop innovations.

Communities of Service

Develop communities of service within your firm to help assist new ideas that arise. Here’s one example.

Communities of Capital

Establish internal venture funding. For outside entrepreneurs, seed funding through crowdfunding has been transformative.
Example: Communities of Support, Service, and Capital

Innovative firms like EMC have combined these three elements. Here's a video discussing the evolution of this program.

New Venture Example

Here's an example of a start-up leveraging these communities. U-Turn raised $230K on Kickstarter, are now in business and making these products in Boston. Check them out at [http://uturnaudio.com/](http://uturnaudio.com/)

The Technology Start-up Continuum...

Now, with these communities and rapid development, the ability for firms to truncate development and apply innovation is moving firms closer to software, where agile development has been in place for many years.
Lean Innovation Framework

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<tr>
<th>Opportunity Assessment</th>
<th>Fast Concept</th>
<th>Resource Allocation</th>
<th>Validation Planning</th>
</tr>
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<tbody>
<tr>
<td>• What is the opportunity?</td>
<td>• Can you rapidly develop a prototype or test case?</td>
<td>• What internal or external resources can you use to develop and test the prototype?</td>
<td>• What B2B partners are needed?</td>
</tr>
<tr>
<td>• Does it tap new markets and customers?</td>
<td>• If so, how?</td>
<td>• Who do you need to hire/partner?</td>
<td>• How will you validate the concept?</td>
</tr>
<tr>
<td>• Does it include new business model and service innovation?</td>
<td>• List steps and what tasks are needed…</td>
<td>• How much ($$ $)?</td>
<td>• How many test cases will be needed?</td>
</tr>
<tr>
<td>• Is it scalable?</td>
<td>• Think about architecture…</td>
<td></td>
<td>• Who can be the lead customer?</td>
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Here is the Lean Innovation Framework, to use to develop your ideas. We need to answer these very important questions when developing a concept and MVP.

Read this article as an overview of the significance of the lean start-up: Why the Lean Start-Up Changes Everything and this paper on Making Lean Innovation Work.
Mini Case Study: Apple iPod

- Apple's iPod development was done by a small virtual development team
- All iPods are Designed in California, Made in China/Taiwan
- Quick development lead-time and new product introduction, proving that the New Product Development process is a platform
- By 2006, accounted for 48% of Apple's revenue
- The same strategy was repeated with the iPhone and iPad

Fast cycles of new variants and models...

This shows how effective Apple became in spinning out new variants.
This is how Apple approached the development of the iPod. They had a small team, led by an outside project manager. They developed the concept quickly, and were empowered to go inside and outside the company. They leverage outside partners and resources to speed development and lower costs. This is an example of Lean Innovation.