Radical Innovation of User Experience:
How High Tech Companies Create New Categories of Products

By
Mikhail Turilin
Master of Science in Applied Mathematics
Lomonosov Moscow State University, 2000
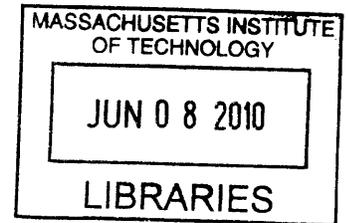
SUBMITTED TO MIT SLOAN SCHOOL OF MANAGEMENT
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

**MASTER OF SCIENCE OF MANAGEMENT STUDIES
AT THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY**

ARCHIVES

June 2010
© 2010. Mikhail Turilin. All right reserved.

The author hereby grants to MIT permission to reproduce and to distribute publicly
paper and electronic copies of this thesis document in whole or in part in any medium
now known or hereafter created.

Signature of Author__

Mikhail Turilin
MIT Sloan School of Management
May 7, 2010

Certified by_____

Alan MacCormack
Visiting Associate Professor of
Technological Innovation, Entrepreneurship,
and Strategic Management
MIT Sloan School of Management
Thesis Advisor

Accepted by_____

Michael Cusumano
SMR Distinguished Professor of Management
MIT Sloan School of Management

Radical Innovation of User Experience:
How High Tech Companies Create New Categories of Products?

By

Mikhail Turilin

Submitted to the MIT Sloan School of Management on May 7, 2010

In partial fulfillment for the degree

Master of Science of Management Studies

Abstract

In the last 15 years, several high tech companies successfully developed revolutionary products that were not based on completely new base technology. Instead, the companies used existing technologies to create products with attractive user experiences. The products appealed to customers and made their manufacturers leaders in their corresponding market segments. The approach to innovation taken by these companies could be called the "radical innovation of user experience."

In this work, I will look for common patterns in customer research, product development, and the organizational management of successful user-experience innovation companies. As a result, I will create an asset of recommendations that could be used by product managers and general managers of technology companies to assess their innovation strategy.

Thesis advisor: Alan MacCormack

Visiting Associate Professor of Technological Innovation, Entrepreneurship, and Strategic Management, MIT Sloan School of Management

Table of Contents

6

List of Figures

1   Definitions

This section contains definitions of the terms used in this document.

1.1   Innovation

According to Luecke and Katz, innovation is:

> *Innovation . . . is generally understood as the successful introduction*
>
> *of a new thing or method . . . Innovation is the embodiment,*
>
> *combination, or synthesis of knowledge in original, relevant, and*
>
> *valued new products, processes, or services.*

1.2   Breakthrough vs. incremental innovation

Breakthrough innovation is the introduction of a completely new idea, approach, or product. Breakthrough innovation usually happens because:

1) New technology is invented through base research

2) Existing technology is used in a completely new application

3) A new kind of product is introduced to address a need that was unaddressed before or address a need in a completely new way

On the other hand, incremental innovation is an evolutionary change of an existing idea, product, or service. Incremental innovation is usually done because of:

1) Slight changes in the market and environment where the product or service is used

2) Better understanding of customer needs or technical conditions where the product is used

3) Repositioning an existing product to the new market segment within the same industry with slight design, performance and functional changes

4) Changes of implementation technology of an existing product that doesn't enable completely new applications or penetration into new markets

1.3 User experience vs. Technology innovation

Innovation of user experiences means a combination of two types of novelties:

1) A new set of features that deliver a different user-visible experience. For instance, when Apple added a radio feature to the iPod Nano it was a user experience innovation.

2) A new meaning of the product for user. For example, when Nokia stated that they don't produce phones, but they produce pocketable personal computers it was an innovation of meaning.

Technology innovation usually means:

10

1) The implementation of a new technology in some product. For example, when Sony used e-Ink display technology in their Sony Reader it was a technological innovation (however, the device also had an innovation of user experience).

2) Improvement of product robustness by improving existing technology, or using new technology. For example, when notebook producers switched from NiMH to Li-Ion batteries it was a technological innovation.

1.4 Radical innovation of user experience

Radical innovation of user experience requires the creation of a new set of features and performance characteristics that makes the user:

3) Address needs that weren't addressed before

4) Do the job much faster or much simpler than before

Usually products that introduce a radical innovation to user experience don't solely rely on new base technology, but also find new ways of using existing technology.

2   Research method

The current research is based on two types of data:

1) Secondary data from press articles and books

2) Primary data collected through the series of interviews

This research sample contains a number of companies that have created a product with an innovative user experience:

Company	Products with innovative user experiences
Apple	iMac, iPod, iPhone, iPad
Bose	QuietComfort, SoundDock
Peek	Pronto, TwitterPeek
Microsoft	UMPC (Origami), Surface
Research in Motion	Blackberry
iRobot	Roomba

The sample was limited to companies that were willing to share information. For example, Apple has a very strict confidentiality policy that forbids employees from sharing any information about their product development process. Luckily, a person who quit Apple 5 years ago was ready to share some of this information. On the other hand, the author's attempts to contact members of Google Maps and GMail teams were not successful.

During interviews the content respondents were asked the following questions:

1) What were the most innovative products made by the company?

2) How were ideas generated?

3) How was an idea developed into an official project?

4) What was the decision-making framework?

5) How was marketing research used in different stages of the project?

6) What were the roles of the project leaders?

7) How did team communication happen?

8) How were the team's incentives aligned with the project goal?

3   Research Findings

We found that breakthrough user-driven innovation depends on three conditions:

1) **Intuition** – the ability to create a vision of a new product based on the team's personal experiences

2) **Leadership** – the availability of a project leader capable of generating ideas, resolving trade-offs, and protecting the team

3) **Multi-disciplinary approach** – the organizational capability of creating dedicated multi-disciplinary teams fully focused on a project

3.1   Decision making in innovation projects is driven by intuitive vision and personal taste rather than market data

> *"If I'd have asked my customers what they wanted, they would have told me 'A faster horse.'"*
>
> Henry Ford

Breakthrough products' development teams face many uncertainties in choosing product features, performance, and price. Traditional market research techniques are widely used for incremental product development, when the user is familiar with the previous generation of products and likely can express an opinion of what features, price and performance are the most desirable. However, these research tools don't get the right result

for radically innovative projects. Breakthrough products explore new market segments where users don't know anything about the new product and don't have an opinion yet about what features they would prefer. In other words, users don't know the meaning of the new product and can't help to define it.

In the absence of accurate data, product teams use product vision as a guideline for development. Product vision is a consistent story about what the new product is and how it should be used. The story has to be attractive because the vision has to be promoted inside the company to find a team of supporters and get the project funded.

When team members discuss the project vision, they usually evaluate it on the basis of their personal experience and personal needs instead of market research data. When the story is told, each person could ask himself: "Does it make sense for me? Would I like to use this product?"

Breakthrough innovation is possible when there's a gap between what current products offer and what users actually need. Because the social, technical, and economical landscape of our civilization constantly changes over time, there's always room for radical innovation.

Therefore, vision creation process has two steps:

1) Find what needs are not covered by existing products and services.

2) Create a product that is able to get enough market traction to payback the development, create profit and cross the chasm.

Sometimes a company needs to wait for the right moment to implement innovation: when technology is ready and the economy is in a favorable condition.

According to [Cagan,Vogel], breakthrough products use market opportunities created by three kinds of industrial changes: social changes (S), technological advances (T) and economic forces (E). Radical innovation of user experience starts with user needs, and only after analyzes if the appropriate technology is available on the market and the general economy climate is right.
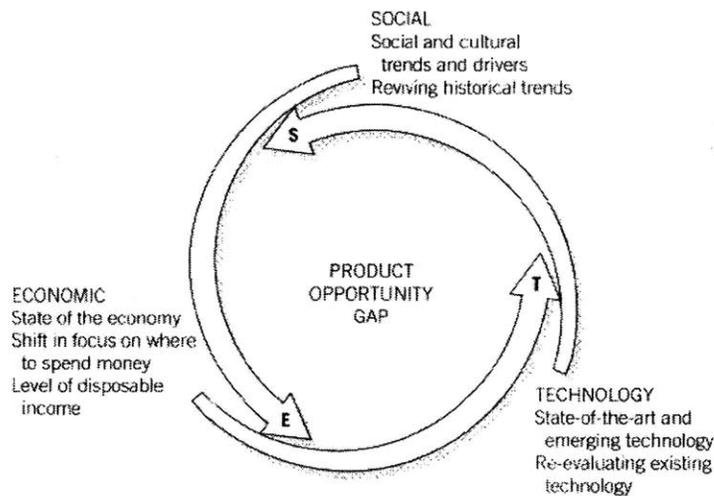
Figure 1: J. Cagan and C.M. Vogel - SET factors of product-opportunity gap

Vision plays an important role in decision-making. Project teams refer to vision each time they face an important product decision. For example,

16

vision is required to resolve trade-offs, when it's impossible to fulfill all planned requirements and the team has to choose between many mutually contradictory features, like price, size, battery life and performance.

Putting vision first in radical user-driven innovation doesn't mean that data is useless. Indeed, data is widely used to test general assumptions and to understand user behavior. Good data can help to find where vision is wrong and test numeric assumptions.

3.1.1 Apple

According to BusinessWeek, Apple is the most innovative company in the world[1]. The company introduces breakthrough products, like iPod, iPhone, Apple TV, every few years. Apple doesn't use market research to define the features of their products.

According to an [Apple Interview], instead of market research, the company conducts regular vision discussions to brainstorm through all aspects of potential products. There are two parts of this process: informal and formal.

Informal discussion starts with an idea, proposed by somebody from the company. People discuss ideas during lunch and unofficial meetings. The company lunchroom is a large open space where people have lunch meetings to discuss the latest ideas. Lunch discussions are a great tool to

---

[1] http://bwnt.businessweek.com/interactive_reports/innovative_50_2009/

build personal networks, start assembling project teams, and to just get influence by building the image of a creative person. Each project team is often started during idea discussion sessions.

Vision creation is an important part of the product development process at Apple. According to [Turner],

> *"Apple spends 15 to 20 percent of its industrial-design time on concept (far more than most other computer companies) and the rest on implementation."*

According to [Breillatt], people at Apple don't use a lot of market research to create visions. The company employs many people who know what is "cool" without the need for extra research and the company trusts their taste. Steve Jobs explains:

> *"It's not about pop culture, and it's not about fooling people, and it's not about convincing people that they want something they don't. We figure out what we want. And I think we're pretty good at having the right discipline to think through whether a lot of other people are going to want it, too. That's what we get paid to do. So you can't go out and ask people, you know, what's the next big [thing.]"*

[Breillatt] explains, that instead of using traditional quantitative marketing research, Apple product designers immerse themselves into the environment to understand user needs with their own senses. They listen to music, perform photo editing, and use computers on-the-go to

understand the user goals and limitations of existing solutions to come up with visions of "cool" new products.

Not all of the concepts become official projects. [Apple Interview] reveals that it's very difficult to get your idea funded. To do so, a team needs to have one of the Apple VPs on board and then the VPs discuss the idea between themselves. Only after the idea is approved by executives could it get the required financing. The idea approval process is also very personal: a project is started if the team and executives think that they would personally use the proposed product. This process works very well for Apple – 90% of approved ideas are launched to the market.

Apple widely uses concepts and prototyping. Because the emotional component of decision-making is very important, the company asks designers to make prototypes "pixel perfect", that means simulated computer screens designed so precisely that it's impossible to discern the prototype from a real application. [Breillatt]

To reinforce vision in the early phase of a project, Apple hosts regular "pony meetings," where executives share their product thoughts with the project team. [Breillatt] explains:

> *"In other words, I want a pony. Who doesn't want a pony? A pony is gorgeous! Anyone who has been through this experience can tell you that these people are describing what they think they want."*

Apple'sfinal products are typically very close to what the initial vision proposed was. In most high tech companies, the design team either "beautifies" the solution built by engineers or allows engineers to seriously modify their initial concept. Apple designers have the power to preserve their initial design and to push engineers to find technical solutions to make the product as it was specified by the vision documents.

The design process at Apple emphasizes the user-experience as their first priority. Product commercial feasibility is usually priority #2. It's easier to cancel an initial idea than a product with a great user experience. Apple's approach allows the team to prove a product's value in terms of user-experience before a feasibility study is made. Knowing how great the product is reinforces team spirit and justifies the development of new technology in order to bring the product to market. On the other hand, putting a feasibility study first (as usually Microsoft does) could cancel the development of potentially groundbreaking products on the basis of "unavailable technology" or "high investment costs."

Apple follows a design-centric approach for product development. They use their team's intuition and personal culture to create visions of "cool" products with a great user experience. At the same time, the company is very structured in their design effort: they have built a creative environment to keep ideas flowing and provided a process for implementing the best ideas.

3.1.2   Bose

Bose does two kinds of innovation: radical and incremental. As described by [Bose Interview 2], a radical innovation usually starts in the engineering department. Bose engineers are experts in sound: they know what audio quality is possible with existing products and what sound technologies are currently available. Their vision is a combination of what kinds of sound they would like to create and what technologies could be used or needs to be developed. For example, Bose was a pioneer in personal-use, noise-canceling headphone technology. The idea originated from similarly acting military headphones made by Lawrence J. Fogel[2] in the 1950's, However, consumer implementation was difficult because the semi-conductor industry couldn't yet produce the small, low-cost circuitry necessary for implementing noise-cancelation technology within a relatively small device. Bose started the process of developing personal noise-canceling headphones in 1978, but it required a decade of research before they were able to make an actual working model. This research was driven by a consumer-oriented vision – the need for noise reduction during long flights where people were subjected to the often deafening whir of large aircraft engines.

[Bose Interview 2] At Bose, the engineers are considered the most important source of new ideas. As audio enthusiasts, they must ask themselves, "What would I want that I can't yet get?" in order to come up

---

[2] http://en.wikipedia.org/wiki/Noise-cancelling_headphones

with ideas for breakthrough innovations. The company provides a well-equipped workplace to think about the possibilities for future consumer audio devices. For example, the main lunch area has a beautiful view of the Massachusetts's landscape that inspires their tough process. Modern prototyping tools with computer simulation allow them to quickly mock up solutions and foster the idea discussions. For example, the SoundDock product was created from the desire of one engineer to have a speaker for his iPod that produced high quality audio. While other companies were selling low quality cheap speakers or "good enough" speakers, Bose pioneered the market for premium iPod docking stations and speakers.

[Bose Interview 2] shows that the company doesn't conduct focus groups to ask customers about exact product features. People don't know what they really need before Bose introduces them to a new customer experience. Bose looks for latent needs, opportunities that look like they don't make sense at first. Bose looks for breakthroughs by finding unmet needs or needs that can't be met by current technology.

However, according to [Bose Interview 4], this vision-driven approach is not implemented uniformly across the company: many products are developed using pre-set requirements, formed from information collected using traditional focus groups and surveys.

[Bose Interview 1] For incremental innovation, when the market needs are changing or there are product adoption barriers, Bose uses more traditional market research methods. For example, when the company's market

research sector surveyed consumers about why they might not buy a 5.1-speaker system, they found that, on average, people don't have enough space in their living rooms for the speakers. Using this information the company created the Acoustimass series, which featured smaller-sized speakers, while retaining the high sound quality users had come to expect from Bose. Another example: Bose researchers found that some people wouldn't buy the 5.1-speaker system because they think the high number of cables would make installation of the system too difficult. In response, Bose introduced the 3.1-speaker system, which smartly utilized the walls of a room to reflect back sound. This is system ended up being very successful on the market.

[Bose Interview 2] Bose has a structured approach for vision-driven product development. If the vision is not clear enough for company managers, who act as gatekeepers, the project won't get funded. However, once a vision is finalized, the company tries to keep it relatively unchanged in order to introduce the product to market as soon as possible.

As [Bose Interview 4] suggested:

> *The key is that Bose holds hundreds of ideas open for further investigation. As an idea matures, they add more funding. When it finally gets the go ahead, most of the risk has been compressed out. Less inspiration and lots more perspiration. And the effort is deep and time-consuming and patient.*

While Bose is not an entirely vision-driven company, it has at least two elements of intuitive taste-oriented product development:

1) The company's big vision of "creating natural sound through research" that is driven not by marketing but by Dr. Bose's personal taste.

2) Mini-visions created by engineers on the basis of their own intuition that enables the company to fulfill a big vision by creating breakthrough user-oriented products.

3.1.3 Peek

The idea of Peek Pronto, a single-function, instant email, pocketable device was created by the company's founder, Amol Sarva, by looking at his wife's difficulties using a smartphone[3]. Amol was inspired by Flip, a single-purpose compact camera able to shoot high quality videos. Eventually, he created the Peek Pronto, a very simple device that can only send and receive emails, but does it simply and quickly with an affordable mobile subscription plan[4].

According to [Peek Interview], besides the initial vision, product development at Peek is driven by market research. Their product design team uses a multistage design process, starting with sketches, mockups and detailed 3D design, to build prototypes and test it with users. For example, during user testing a Peek Pronto team found that customers

---

[3] http://www.getpeek.com/aboutpeek.html

[4] http://www.youtube.com/watch?v=EUrfo49CGF8

24

were satisfied with a very basic user interface. As a result, the team canceled development of a more detailed UI in order to improve time to market.

Peek uses "after launch" market research to fine-tune product marketing. For example, initially the company planned to market the Peek Pronto for housewives, low-income service workers, and professional female workers. However, initial sales proved that the device is demanded for SMB that don't want to pay higher fees for a Blackberry Enterprise Server. The company quickly adjusted, implemented Microsoft Exchange integration, and achieved success in the small business market.

Nevertheless, according to [Amol Sarva], data is only the part of development process. The company trusts the intuition of key team members better than the research data.

What makes Peek a real design-driven company is the TwitterPeek product. TwitterPeek is a single-purpose mobile device providing access to the Twitter social network. The company made another risky bet of creating a vision-driven product without solid market research data. The team analyzed new trends in social networking and proposed a specialized device for users for keeping in touch with their Twitter updates. On one hand, the device was named the worst gadget of the decade by several reporters[56]. Sales weren't particularly great either. On the other hand, as

---

[5] http://www.youtube.com/watch?v=DJDdw0FiLjc

stated in [Peek Interview], the device created media buzz around the company that was worth more than all the money the company put into development. Also, Peek is now seen as aproducer of futuristic devices.

3.1.4   Microsoft Surface

In this research, Microsoft is represented by two projects intended to create a new product category: a Surface interactive table and an Origami small tablet computer.

Surface table-like computer project was started in 2001 by Steven Bathiche of Microsoft Hardware and Andy Wilson of Microsoft Research[7]. The pProduct went through different phases from concept to prototype to industrial product. Today, Surface is an independent division inside Microsoft with a separate P&L. The product is sold to B2B partners such as travel agencies, museums, parks, and entertainment halls.

Microsoft Surface has a unique ability to interact with other electronic devices (like cameras and music players) placed on top of it, enabling intuitive ways to connect and manage content.

---

[6] http://www.businessinsider.com/the-50-worst-gadgets-of-the-decade-2009-12#twitterpeek-50

[7]

http://www.microsoft.com/presspass/presskits/surfacecomputing/docs/SurfaceHistoryBG.doc

Figure 2: Microsoft Surface

According to [Microsoft Surface Interview 2], the idea of Microsoft Surface was created by Steve Bathiche when he was walking around a game shop looking at "Dungeons & Dragons" and "Magic the Gathering" games. He noticed people played "Dungeons & Dragons" sitting around the table with mock landscapes and physical figures. He thought about how great it would be to implement the same type of game on a computer but to make it dynamic: changing the landscape over time, seeing monsters attacking you, and counting up all the scores automatically.

Steve continued developing the idea. During brainstorming sessions, he and Andy had not only concrete ideas of table-like products but also far-looking visions that every surface in the future will be highly interactive. It was definitely a new class of computer devices inspired also by Hollywood science fiction films, like Minority Report. The idea got a popular response and the team started to make some preliminary technical modeling in Microsoft Research.

The research group very soon realized that the table needs computer vision to see what objects are located on it. The table would interact with other objects, becoming like a membrane between the physical and virtual worlds. Computer vision of that quality wasn't available at the time. However, the team was quite successful in developing a new vision of technology, and were able to build the first prototype in just two months.

Vision was an important component of the Surface team's decision-making process. The team followed the vision in situations with a high level of uncertainty. As Steve Bathiche said:

> *Users don't know what they want. Sometimes you have to give them stuff they don't know anything about. Sometimes you have to develop ideas that don't have user data at all because user don't understand it.*

However, the process of product development is very user-centric. As Steve Bathiche noted:

> *The goal is to get a right understanding of what a user needs and what a user "might need" in the future - latent needs.*

The team got feedback from users by conducting experiments. These experiments allowed the team to observe user behavior: How do they interact with the computer? How do they interact with the real word? Then the team, knowing the new information, tries to optimize user experience on the basis of the collected data to deliver another prototype.

Still, research is only a tool to collect data. It by no means is the way to define the product, it's just one of the inputs in a project.

Steve Bathiche summed up the relationship of vision and research:

> *The team follows the vision but uses research to learn how implement*
> *it in the best way. Product development is an art; it's not a hardcore*
> *science. The most important thing in this art is to have a vision.*
> *Vision usually doesn't change. In these kinds of projects, you work on*
> *something that hasn't been created before. You're blazing a trail. To*
> *deal with uncertainty the team refers to the vision.*

To create breakthrough products, the Microsoft Surface team took an intuitive approach to create ideas and used creative brainstorming to create a full-scale vision from the initial idea. Contrary to Apple, the Surface team used a lot of marketing research to get information about a particular aspect of vision, keeping the core idea intact.

3.1.5   Microsoft Origami

Microsoft Origami, officially known as UMPC[8] (Ultra-Mobile PC) was started in 2001 by Otto Berkes from Microsoft Research. Otto was working to predict evolution of PC form-factor under Moore's law of technology advancements. He used to work a lot with Windows as a platform

---

[8]

http://www.microsoft.com/windows/products/winfamily/umpc/default.msp
x

engineer. Getting enough experience, he wanted to make a new kind of device where Windows could be used.

First, Otto Berkes wanted to make Haiku, a small and slick tablet computer with a long battery life. The initial vision was created in 2000, but the hardware was 4 years away from the required specifications. In 2001, Otto shared his vision with Bill Mitchell who also had his own thoughts about tablet PCs.

At that time, Bill Mitchell was in charge of the Tablet PC division. He had a target of selling 1 million Windows Tablet Edition licenses per year. Because of the high cost, Tablet PCs were sold only in the enterprise market, however the target of 1 million units was much higher than anticipated demand from corporate customers. Bill Mitchell looked for a tablet device that was more approachable for consumers. Existing products' utility wasn't high enough to justify a price for private consumers. Bill believed that the magic price point would be $500. Market observation confirmed that the demand for laptop computers increased dramatically after price drop supported Bill's conclusion.

Otto's idea was simple:

> *"A tablet PC is great. Let's incorporate it into a consumer device.*
> *Let's break the relationship between High Mobility and High Cost!"*

Technology factors made this vision possible:

- Transmeta pushed SSD technology and started to produce it in scale

- VIA started systems-on-chip, capable to run full implementation of Windows. System-on-chip is usually less expensive than separate components and requires less energy.

- Display was the most expensive component of Tablet PC at that time. However, the economy of scale made 7" displays become cheaper because they were used in portable DVD players and GPS navigators.

The concept of a Tablet PC made from cheaper components got name "Origami."

During the project, the team used different kinds of input for decision-making:

- Avision that was built on the experiences and intuition of the team members

- Common sense: What makes sense

- Pragmatism: What is possible?

- User research on Tablet PC that provided some general facts about consumers

As Bill Mitchell elaborated, data never played a primary role:

There is always some data, but data alone can't solve anything. Many projects failed because people tried to stick to data too much: you can prove almost anything using the data.

Sometimes market research data is wrong. For example, Tablet PCs used two input methods: touch and stylus. In focus groups users supported the decision to show a big picture of an old style computer mouse on the screen under the stylus point to confirm mouse click. However, everyone on the project hated it and it turned off. Eventually, the team came to the decision that data is biased (most likely users didn't really understand what is real usage patterns of Tablet PC) and removed the feature.

According to Bill Mitchell, for projects like Origami, the quality of vision depends on how accurate they understand not only the customer's needs but also knowledge of the technology landscape. The company needs to start a new category when the new hardware is ready. You don't have to be first; you need to time opportunity right. Good examples of this principle are the smartphone projects in Microsoft and Apple. Microsoft started too early in 1997 when the required hardware was not mature enough. The company had limited success but the Microsoft smartphone never found its way to a mass consumer market because initial hardware limitations led to a very basic user experience. Contrary to that, 10 years later when the hardware was ready, Apple created the iPhone, that became one of the most successful products in consumer electronics in the last decade.

The Origami didn't have huge market success[9]. The first devices were introduced to market with a price of more than 1000$ that put it far out of the initially planned market segment. Microsoft doesn't produce most of the hardware devices to run its software. Instead, it partners with OEMs who have production capabilities and retail channels. The traditional approach is to introduce a device to market at a high price to get high initial returns from technology enthusiasts and only then to decrease the price to reach mass market. To make their vision come true, Origami had to be introduced by the price of $500. However, that would leave too thin margins to Samsung and other OEMs. Interestingly enough, the first "netbook" product ASUS Eee PC was made to Origami specifications.

Origami was a "right-brained" project driven by strong intuitive vision created by understanding market trends, technology advances, and user needs. While the product wasn't very successful, it's an example of potential problems of radical innovation:

1. Wrong time of starting project when technology is not ready

2. Difficulties to change existing relationship with partners and existing business models

3. Disagreements inside the company (project was sabotaged by Microsoft marketing department)

---

[9] http://reviews.cnet.com/2300-33_7-10001201-33.html?s=0&o=10001201&tag=mncolpage

3.1.6 Research in Motion Blackberry

RIM Blackberry was a revolutionary device that changed the concept of mobile email. The first Blackberry 950 was started as a 2-way pager, which later was extended by Blackberry Enterprise Server to support full-scale email integration. The two-way pager business was started from a few contracts with Ericsson to produce 2-way communication devices for Delta Wireless.

As it was explained in [RIM Interview 2], the Blackberry 850/950 was driven from an intuitive vision of the company's founder Mike Lazaridis. The initial idea of the product was envisioned as solution to his own "pain" – he wanted to have email with him everywhere and be able to reply instantly. It was a different paradigm from traditional email when messages were really asynchronous and were replied to after several hours or days. Once the vision was established, the next step was to design the right product to fully implement the vision.

As we can learn from [RIM Interview: Jason Griffin], the reason for quick success of the Blackberry was because:

> *"The company exploited the addictive nature of data communication."*

In the end of 1990's, the mobile communication market was shared between voice and paging. Paging was in a decline and wasn't a primary focus of such players as Motorola that wanted to keep making money in this market until it was no longer feasible. However, Research in Motion

had other plans. The Blackberry 850 was just an interactive pager. Model 950 added a separate "gate" email address that allowed sending and receiving email messages. The user had to support two email addresses – regular email and a pager address, keeping his contacts organizedand remembering which addresses they should use to send messages to. Later, a Blackberry Enterprise Server was added, tying the user's existing email address to their pager and making the system fully transparent.

Their vision defined not only the general messaging paradigm but also how the messaging device should be implemented. One of the base requirements was to make UI simple and accessible to all groups of users (company didn't know at that time in which market niche the device would be popular).

At the time of the Blackberry launch, RIM didn't have a large marketing budget. However, the device appealed to bankers, lawyers, and high-level executives that struggled to get access to emails during long business trips. These high ranking employees pushed IT departments to adopt RIM technology and eventually made it possible for anybody in their companies use a Blackberry. Also, high ranking managers were corporate trendsetters. They convinced other employees to adopt the Blackberry by making the device considered "cool" in the corporate environment.

From the beginning, the team took a proactive approach: don't avoid problems; otherwise, it would lead to bad deliverables. One of the major trade-offs was keeping the device small but making the keyboard

convenient and easy to use. Vision said that the device had to be wearable. The team challenged itself to not to make a device any larger than normal pagers - they didn't want the size to be another adoption issue. At the same time, they thought that the keyboard should make typing long messages easier. To keep the device's size small but make keys big enough to type comfortably they had to include a fewer number of keys than usual. This constraint was the reason to create shortcuts like pressing space twice to type a period. Finally, the team made a small keyboard that was more comfortable than if it were bigger – a real breakthrough innovation that contributed a lot to the success of the whole Blackberry project.

As Jason Griffin explained:

> *Innovation can be found when there are things that don't naturally go together. Paradoxes like this is where innovation magic can be found. Usually companies fear these challenges. The ability to find a balance between mutually-exclusive features is key for innovation.*

Technology also could pose challenges for vision implementation. Sometimes the team needs develop new technology if it required achieving a desired user experience. For example, the Blackberry team had to develop a new data transfer protocol because of lack of good data connectivity in most cellular networks. Another problem was traveling: Blackberry users travel a lot and that created a challenge of routing data to a device to send data. The team had to develop a special device location service to handle this problem.

The company needs an evolutionary development of its products to make money: users are already familiar with products and ready to pay for new versions. Also, the company has an advantage over competitors, who need some time to learn how to copy products. Therefore, having strong expertise in not only creating new categories but also developing existing product lines is an important expertise for an innovation company.

Incremental adjustments helped the Blackberry to suit a larger consumer group than it was possible with the first versions of the product. First versions of the device were made to fit the needs of one particular person – Mike Lazaridis. However, many people needed to view HTML messages and follow web links. User feedback was collected by RIM marketing department and evaluated by engineers to see if it's possible to implement this feature. Contrary to a vision-driven innovative process, when the team sometimes had to develop new technology in order to implement the required features, in an evolutionary process engineers usually have more negotiation power to reject features if they prove to be too difficult and costly to develop.

The evolutionary development process is more straightforward: get user feedback, add a new generation of base technologies, and implement new, faster and slicker version of an existing product. It's easy to control and optimize evolutionary development. However, over-optimization can kill breakthrough innovation. People tend to make rules too strict and procedures too formal. While it helps to improve time to market for

products, for breakthrough innovation the team needs to cut corners and invent its own process.

Jason Griffin suggests:

> *You need to balance evolution/revolution. In a small company you are more naturally in this balanced position. However, in a big company you tend to over optimize and you need to work more to preserve balance.*

The Blackberry Storm was a reaction to Apple iPhone's touch screen interface that was getting popular. RIM used an existing Blackberry platform to implement its own version of touch screen interface. However, for truly innovative products it's hard to copy its vision-driven consistent design. As a result, Strom lost the best feature of the Blackberry, a small and easy to type keyboard, and didn't get all the touch screen convenience of the iPhone. Jason Griffin clarified, the combination of touch screen and trackball UI was confusing for users and the product didn't get significant market traction.

Therefore, to create innovative products, Research in Motion uses an intuitive vision-driven development process. Vision drives creation of both new user experience and new technologies. To monetize the competion of its breakthrough products RIM incrementally adjusts them to suit slowly changing consumer trends. The major challenge in this way is to balance incremental and breakthrough innovation cultures to sustain long term (breakthrough) and medium term (evolution) business success.

3.1.7 iRobot

iRobot is world known because of its vacuum-cleaning robot Roomba. The initial idea was created by Colin Angle, the company's CEO. At that moment, iRobot was an already established company working for government military orders. During the flight, Colin told his neighbor about his company and the women asked if the robotic technology is advanced enough to create a vacuum cleaning robot. Colin got inspired by this idea and started the project Roomba that turned out to be a great market success.

In the early days of iRobot, ideas (like Roomba) were generated by company executives. Projects were vision-oriented and led by a top executive. The project team held meetings with the project leader to make some important decisions, but enjoyed freedom in making detailed design. Market research wasn't used too much because the executive's intuitive understanding was enough to answer most of the questions.

Later, the company started to generate visions through an idea pitching process. Each company employee has some "free time" to work on his own ideas and resources to develop prototypes. People pitched ideas to a committee inside their departments. The best ideas got support from management and would be funded to create official projects.

After Roomba's success, iRobot was gradually transforming into a consumer device company. New projects were becoming more data driven. Teams used the following market research techniques:

1. Ethnography: coming to people homes and observe their behavior.

2. Qualitative research: deep interviews and focus groups.

3. Quantitative research with surveys

For later projects, decisions were very market oriented. Corporate processes required certain market size, margin, and sales estimate. Projects out of allowed range usually got cancelled by the project committee.

According to [iRobot Interview], the new project management approach didn't contribute to the company's innovation capability: market and profitability standards discouraged risk-taking and data driven research replaced intuitive visions as the main decision making tool. As a result, later projects introduced either incremental improvement, were canceled, or failed in the market.

3.2 Innovation process is driven by motivated creative individuals who control decision-making and maintain integrity of product vision

Leaders bridge the gap

Creating innovative products is more than just an execution sequence of task according to a predefined process. In order to deal with uncertainty and build bridges across gaps in knowledge team have to take risk and use its intuition. The problem is that intuition is an individual rather than

group ability. Thus, development of breakthrough products is dominated by individuals who have influence with the rest of the team and take responsibility to create vision and make key decisions of how to implement it.

Leaders keep vision integrity

The vision of a new product usually has to go through many challenges and decisions along the way to full product development. Many decisions and facts, like envisioned user preferences and technological capabilities may propose alterations to initial concept. For example, some technology couldn't be implemented with the initially projected cost or the team faces conflicts like cost vs. size or weight vs. battery life. In such situations, the product team has a great temptation to change their vision in order to resolve problems. However, changing the vision is risky because some changes are safe and don't change the core concept while others could distort the initial idea and ruin the final product. At moments like this, project leaders have to step up and preserve the core vision concepts. Sometimes this could mean canceling the project because it's impossible to implement at the current level of technology (see Apple delay of a tablet computer). Sometimes the leader needs to challenge the team to create a novel technological solution (see Blackberry keyboard example). Sometimes vision integrity requires ignoring customer input and trusting team intuition rather than focus group results (see Microsoft Tablet PC touch screen mouse indicator example).

Leaders start the culture

In the first part, we discussed the importance of an intuitive approach to decision making. Culture usually is not randomly created, but starts with company leaders who set the values and decision-making principles. For example, when the company leader and chief product architect prefer vision-oriented logical discussions to data driven decision-making then the whole company start to replicate this approach (see Microsoft's Bill Gates decision making approach example in first part).

Leaders create the ideas

Being able to come up with a strong vision is a unique ability. Research shows that creators of initial ideas and major contributor to the product vision often play leading roles in other aspects of product development.

Leaders sell ideas to others

It's not enough to create an idea. Ideas need to take off inside the company and become contagious. Also, when breakthrough products hit the market people could be confused with an unfamiliar experience. It's hard but necessary to "sell" ideas to the public, to convince people that new functions and new user experiences create enough value to adopt a new product.

Leaders "cut corners" in process when it blocks innovation

Nobody has been able to formalize breakthrough innovation so far. While there are certain dependencies and principles, innovation is rather more of

an art then a process. Art is the antithesis to efficiency. Efficiency requires predictability and upfront agreement on the sequence of steps. That's why a company's attempts to improve efficiency could inhibit its innovation capabilities. Innovative ideas that don't conform to company profitability and market size could be canceled. The project team could lack key resources or the support of a key functional department (see lack of resources and marketing support in Microsoft Origami project in part 3).

All the described roles of a leader in the innovation process are illustrated by example from real companies.

We will use the following scorecard to summarize each of the leaders:

Leadership Quality	Compliance
Create ideas	[ ]
Makes decisions in uncertainty	[ ]
Protects vision from criticism	[ ]
Promote project	[ ]
Create culture	[ ]
Protect the team from bureaucracy	[ ]

In the scorecard:

[ ] – Leader didn't show this quality

[+] – Leader showed this quality

[?] – Not enough data

3.2.1 Apple

Steve Jobs is an important component of Apple's success. Ex-Apple product manager in [Apple Interview 1] explains that Steve has a unique role in a company. Apple can innovate without Steve only if somebody else as talented as him would take his place. In other words: Apple has yet to find how to innovate without Steve Jobs.

In the start of his second Apple term (started in 1996), Steve Jobs was involved in product design and made many decisions either himself or collaborating with Jonathan Ives. Today, the product design team is much more developed and Steve makes less product design decisions. However, according to [Apple Interview 1], 2% of the product decisions he's making today are very important for their products' success.

[Apple Interview 1] describes Steve Jobs as *"right-brained maverick"*:

> *Today he looks at the products in a holistic way. He doesn't make a lot of design decisions - only the customer facing ones. His question is: Why is it cool? Why is it awesome? He makes the user experience 'amazing' instead of just 'great'. He's interested in the emotional impact of the products rather than how the products are made.*

Don Norman, who was the vice president of advanced technology at Apple from 1993 to 1998, according to [Turner] confirmed:

> *Jobs is a dictator, but with good taste. He is good and driven to create the perfect experience. He doesn't want good design; he wants great*

design. The difference between BJ and AJ, Before and After Jobs, is not

the process; it is the person. Never before did Apple have such focus

and dedication. Apple used to wobble, moving this way and that. No

more.

[Breillatt] elaborated on a lesson Steve Jobs taught the industry:

"The CEO needs to be someone who looks out to the horizon and

consistently sets a vision of innovation for the organization that he or

she is willing to support completely with people, funds, and time.

Furthermore, that leader needs to be fluent in the language of your

customer and the markets in which you compete. If the CEO cannot be

this person, then he or she needs to be willing to trust that role to a

senior executive and give that person the authority and latitude to

effectively oversee the new product development process."

According to [Apple Interview 1], Steve Jobs is the company's "chief
salesmen." He sells ideas to his employees inside the company and to the
public through his world-famous keynotes. Jobs' maniacal dedication to
user experience transforms quantity into quality, creating fans rather than
customers:

The fan-creating formula is that the whole system should be optimized

to fulfill the desires of the customers, even when they don't know what

to ask for. Fans will forgive you most of the time and the company will

have the chance to re-do its mistakes, which are unavoidable in the

high level of uncertainty that accompanies breakthrough innovation.

One of Jobs' major contributions to Apple was the transformation of the company's culture. He influenced people by the tasks he assigned them; by letting people learn what kind of arguments work with him, and by the decisions he made himself.

As described in [Forbes Mafia]:

> *When the team working on the Mac asked Jobs in 1983 for a standard they should shoot for, Jobs' answer was simple: the Beatles, and not just the Beatles – the early Beatles. "That's a big leap," says design guru Clement Mok, who worked on the look and the feel of the original Macintosh program interface.*

According to [Apple Interview 1], Steve Jobs was always a symbol of the company's right-brain culture. Bill Atkinson elaborated that Jobs' emotional connection to the product translated into the rest of the company. According to [Breillatt]:

> *Apple doesn't sell functional products; they sell fashionable pieces of functional art. That present you're unwrapping is all about an emotional connection. And Jobs knows his marketplace better than anyone else.*

Jobs' persistent vision helped to build a strong Apple culture. According to [Asay]:

> *"Apple's campus is a fortress. The people within believe that they are doing The Right Thing, and that they will win."*

The design process is very fragile. It could fail because of resistance from other departments to implement the vision. According to Robert Brunner, Apple's ex-director of industrial design, Apple was able to create vision driven design products because Steve Jobs gave more power to the designers than to other departments. Usually the design team experiences a lot of pressure:

> *The design leader has to walk a fine line. He has to be integrated with the company but keep his team members protected from being lobbied by marketing, engineers, and manufacturers. They all have viewpoints on design.*

Sometimes leadership could be delegated. With Jobs's support, Jonathan Ives and his team lead the design process of Apple products. According to [Apple Interview 1], Jonathan Ives has the second most important opinion in the company. This example shows us that when the values of the company are aligned, the capacity for innovation can be scaled up by delegating out the job of concept creation. However, Apple kept their design team small, around 12 people. It's hard to say if it's possible to align a lager team to one design approach. Also, it's unclear if anybody from the design team will be able to replace Jobs if he chooses to retire.

As we can see, Steve Jobs drives Apple's product development by making the most important decisions, maintaining vision integrity, promoting ideas and building the culture. Also, he was able to delegate part of his

47

tasks to Jonathan Ives and the rest of his team to expand the company's product development capacity.

Steve Jobs's scorecard:

Leadership Quality	Compliance
Create ideas	[+]
Makes decisions in uncertainty	[+]
Protects vision from criticism	[+]
Promote project	[+]
Create culture	[+]
Protect the team from bureaucracy	[+]

Jonathan Ives's scorecard:

Leadership Quality	Compliance
Create ideas	[+]
Makes decisions in uncertainty	[+]
Protects vision from criticism	[+]
Promote project	[+]
Create culture	[ ]
Protect the team from bureaucracy	[ ]

3.2.2 Bose

As it was described before, Bose is not a classic breakthrough innovation company, like Apple. It combines both traditional and vision-driven approaches. Bose has two levels of product leadership: Dr. Bose himself and his product managers.

Dr. Amar Bose, since he started the company in 1961, was highly involved in product development. He started many projects himself: for example, noise cancellation headphones were created based on his own personal need and with personally controlled vision. According to [Bose-Wikipedia], the company itself was a fulfillment of his personal dissatisfaction with the music quality of existing high-end stereo systems. Amar formulated the company's mantra – "nature-like sound," that inspired product visions for many years. This mantra, together with the company motto "Better sound through research," is the core of the company's product development culture.

According to [Bose Interview 2], Amar Bose also inspired his employees to create innovative products and not to go with the mainstream:

You need to be different. You will never win the race by following somebody else! If you see a trend of green speakers, don't make a green speaker - you'll just be the same and you'll have a hard time differentiating yourself.

According to [Bose Interview 3], Dr. Bose still approves all new projects to make sure they comply with the company's vision.

According to [Bose Interview 1], a lot of leadership comes from product management. A typical product manager came from the engineering department. As we described in a previous part, many engineers came up with ideas for new products. Often, the idea-creator becomes the product manager by default. This policy brings benefits to all parties: engineers are

motivated to innovate because it's a natural way to get a promotion; at the same time the company is also happy to keep product teams passionate about their products.

Product managers make many of the project decisions. They have two kinds of power:

1) Formal power because of their managerial position

2) Informal intellectual leadership because they are the authors of and most important contributors to the project vision

[Bose Interview 2] confirms our previous findings: the product manager defines, manages, and integrates new ideas into a consistent product vision. However, the product manager is not alone in this process. The lead engineer is responsible for finding technical solutions for implementing the product vision. The product manager and lead engineer usually have many trade-off negotiations. They need to decide how to make the product cheap to manufacture while preserving the product vision. Also, they both need to comply with the program manager's requirements, who is responsible for overseeing the project budget and target product costs. In the case of highly conflicting demands, the decision could be escalated to the executive approval committee (consists of all VPs of the company) or even to Dr. Bose himself.

Having engineers act as product managers is a risky policy because of their professional biases. For example, traditionally engineers don't experience

any difficulties dealing with complex user interfaces of equipment, like traditional remote controls with several dozens of buttons. Because of that, many user controls of Bose equipment are not as user friendly as the controls on products from other design-driven companies like Apple or Bang&Olufsen.

Bose has a leader-driven product development process. It has two types of product leaders: The CEO (Dr. Bose) and the product managers. Leaders own and manage the product's vision, the set of concepts that give the product a personality and make sure it's demanded by end users. The development process is usually full of technical and business obstacles and having a vision backed by talented and influential people enables the company to produce truly innovative products.

Amar Bose's scorecard:

Leadership Quality	Compliance
Create ideas	[+]
Makes decisions in uncertainty	[+]
Protects vision from criticism	[+]
Promote project	[+]
Create culture	[+]
Protect the team from bureaucracy	[+]

Bose typical product manager's scorecard:

Leadership Quality	Compliance
Create ideas	[+]
Makes decisions in uncertainty	[+]

Protects vision from criticism	[+]
Promote project	[+]
Create culture	[ ]
Protect the team from bureaucracy	[ ]

3.2.3   Peek

Peek is a young company started Amol Sarva, the creator of the Peek Pronto, an inexpensive mobile messaging device.

Amol's leadership style stresses the importance of individual decision-making. According to him:

> *Project leaders are extremely important in the quality of the outcome.*
> *User and [team] consensus yield unclear answers. The project leader*
> *must intervene many times through the process. We start with user*
> *research, focus it using team consensus, and key leaders' intuition*
> *gives way for the final outcomes."*

Dealing with unknowns also requires intuitive opinions. According to Mr. Sarva:

> *"Individual judgment of the product management leadership breaks*
> *the unknowns."*

[Peek Interview 1] confirms this approach:

> *"Team work by consensus-based model. However, there's a program*
> *manager that had the final decision."*

Today, Peek experiences organizational transformation when the CEO becomes less involved in product development. As stated in [Peek Interview 1]:

"In the early days of Peek, the CEO made 40% of all product decisions. Now he's involved in less than 10% of them."

What is interesting is that the only product Peek has introduced lately, a TwitterPeek wasn't too successful. Does it mean that without CEO involvement Peek could lose its innovation capability? Probably we could see this really soon.

Amol Sarva's scorecard:

Leadership Quality	Compliance
Create ideas	[+]
Makes decisions in uncertainty	[+]
Protects vision from criticism	[+]
Promote project	[+]
Create culture	[ ]
Protect the team from bureaucracy	[+]

3.2.4 Microsoft Origami

Otto Berkes

The Microsoft Origami project sets an example of how a project could benefit from strong individual leadership.

Otto Berkes started the project by coming up with an idea for a small Tablet PC. He was searching for breakthrough ideas for some time, moving from the Windows business unit into Microsoft Research. There he studied technology and market trends to get a general understanding of what direction the Windows computer should be developed.

To develop the idea of a small Tablet PC he formed a small informal team. The team conducted many brainstorming and sketching sessions to finally produce a prototype of the Haiku – a small high-performance tablet PC. The idea became popular around Microsoft and he introduced it to Bill Mitchell, who became an executive sponsor for Origami, a stripped down version of Haiku made from generic components.

As project manager, Otto was responsible for all the design, development, and business decisions. He managed the creation of prototypes, software development, and dealing with partners. Many of the design decisions in the project were made by him according of his vision of the product.

Bill Mitchell

Bill Mitchell was the project executive sponsor. Bill officially started the project setting up the budget inside his department of Tablet computing. He played the role of a "leader of leaders" providing support and resources for Otto Berkes. Bill helped Otto to build a design team, including some of the people from his own Tablet PC department.

However,the department budget, which provided resources for the team, proved to be too small. To overcome budget limitations, Bill suggested taking a startup-like approach for Origami instead of a more traditional corporate high-budget strategy. They had to start with low resources, getting more investments when the project reached major milestones and colleced more supporters. As Bill Mitchell said:

> *"In Microsoft, you have to already be successful to get funding. It's very different from the Apple approach where if the project is funded it get's all the resources in the world[10]."*

While the lean approach made the development of the Origami possible, the budget wasn't enough to successfully launch the new product category. For example, Microsoft left all channel strategizing to the OEMs, providing very basic marketing support which limited the project's market penetration.

Bill Gates

Microsoft's intuitive decision-making culture started with Bill Gates. As Bill Mitchell explained:

> *Bill Gates considered both data and arguments. He could refuse somebody's arguments, but later use the same arguments himself because someone convinced him of their veracity. Decision making for him was a combination of data, intuition and experience.*

---

[10] This confirms the information from Apple that once project is launched it has very high success rate.

Traditionally, Bill Gates was a product intuition leader, often being a creator of ideas. Not data, but persuasiveness of arguments, and Bill Gates' intuition decided whether or not the project would be funded or not. Bill Gates tended to have several competing projects on the same technology to hedge the risk of making wrong decisions. Bill Gates seriously influenced Microsoft's culture until 2005 when he ended his involvement in its everyday management.

For the Origami project, Bill Gates provided some level of support but wasn't involved in everyday operations. His major project contribution was in product marketing. He and Steve Ballmer commanded a stealth-marketing effort for the product launch. The Origami web site had only one page from the beginning asking the question: "What is Origami?", getting a lot of attention from internet media. Later, the site was updated with a product description and videos showing the Origami experience. However, Bill Mitchell was skeptical about the scale of this effort:

> *"It would be good for a startup with 1 or 2 people but it wasn't enough for Microsoft's platform product."*

This opinion also coincided with the reaction of Microsoft's partners: OEM producers expected more advertising support from Microsoft. When they didn't get it, OEMs pushed back and many of them canceled their involvement with the Origami program.

Microsoft Origami shows that leadership roles can be split among several team members if they have a good level of concord and understanding.

Otto Berkes' scorecard:

Leadership Quality	Compliance
Create ideas	[+]
Makes decisions in uncertainty	[+]
Protects vision from criticism	[+]
Promote project	[+]
Create culture	[ ]
Protect the team from bureaucracy	[ ]

Bill Mitchell's scorecard:

Leadership Quality	Compliance
Create ideas	[+]
Makes decisions in uncertainty	[+]
Protects vision from criticism	[ ]
Promote project	[+]
Create culture	[+]
Protect the team from bureaucracy	[+]

3.2.5   Microsoft Surface

Steven Bathiche

Steve Bathiche had the original idea for an interactive table when he designed this game table on the back of a napkin. Then he and Andy Wilson developed the idea of an interactive table in Microsoft Research. Steve and Andy Wilson build the first prototype of a computer vision system in two months and started to think about how to bring the product to the market. The project needed an executive sponsor to get funded.

Steve Bathiche presented Surface to general manager David Kurlander who liked the idea of a computer table, and eventually got his support.

According to [Microsoft Surface Interview 1], Steve Bathiche was the undisputed project thought leader, while the business planning of the project was discussed and managed by many other people. Steve is much more humble about himself:

> *"I wasn't 'in charge' of the vision, I was just a contributor. Other*
> *people also contributed."*

Today Steve continues developing the vision. He's in charge of the research group who makes new generations of Surface. Recently, the group came up with ideas about new hardware and types of interactions.

David Kurlander

David Kurlander was a project sponsor who backed the project with finance and political expertise.

According to Steve, in the Microsoft Surface project the consensus-based decision-making prevailed over individual, however the final word was by project executive sponsor, David Kurlander:

> *Microsoft has a balanced governmental system. Keeping the balance is*
> *not single-sided perspective. Ideally, the general manager makes the*
> *decision. But beforehand, all other perspectives need to be balanced. No*
> *group dominates decision-making.*

According to [Microsoft Surface Interview 1], to start a new product category in Microsoft, the team needs to prove that they have at least a $10 billion market potential in the foreseeable future. Surface technology was very innovative. While Steve and David saw some immediate applications for it in places like museums, amusement parks, and hotels, this market was still far from the required size. David and Steve presented Surface to Bill Gates and he was very excited about the idea. Bill provided the project with resources, and used his personal charisma to promote the product in the media[11].

The Microsoft Surface example shows that even in consensus- and process-based environments, individual leadership plays a major role in product development.

Steve Bathiche's scorecard:

Leadership Quality	Compliance
Create ideas	[+]
Makes decisions in uncertainty	[+]
Protects vision from criticism	[+]
Promote project	[+]
Create culture	[ ]
Protect the team from bureaucracy	[ ]

David Kurlander's scorecard:

Leadership Quality	Compliance
Create ideas	[ ]

---

[11] http://www.youtube.com/watch?v=7WIkrQu0-v0

Makes decisions in uncertainty	[+]
Protects vision from criticism	[ ]
Promote project	[+]
Create culture	[ ]
Protect the team from bureaucracy	[+]

3.2.6   Research in Motion

Mike Lazaridis was the Blackberry 950 project leader from the very beginning. When the company created 2-way pagers he asked: "Why can't I receive and send my emails on this messaging device?" That was the start of the vision for Blackberry. According to [Blackberry Interview 1], Mike acted as the Blackberry's reference customer himself. He asked the team to make a device specially tailored for his own needs. Each device was used by Mike for 6 months at a time, from early prototypes to the almost finished product before it was introduced to market: it was like Mike guaranteed a great user experience.

According to [Blackberry Interview 2], Mike insisted on not making the device any larger than standard with the added requirement of making the keyboard convenient for fast typing. He wasn't afraid to push the team into making something that seemed impossible. The engineering department told him that they couldn't make a good keyboard of that small a size, however Mike still insisted on it. Finally, the keyboard was made and it was great. As of today, Blackberry has the most convenient mobile keyboard on the market.

According to Jason Griffin:

> *"To make a breakthrough you need a strong leader, you can't do it in a*
>
> *totally community-led process."*

Mike is great at making trade-off decisions because of his multi-disciplinary background: he can balance several perspectives and make the right decision afterwards.

When the team gets into details of the project implementation it's easy to forget about vision and changing it because of technical difficulties and later thought. Mike Lazaridis usually was the person that kept the team focused on vision and pushed people forward to successfully implement it.

Mike is a cultural leader; he focuses the company and its employees on innovation. He understands that a truly innovative product can't be good for everybody. Having a vision means making a choice and focusing on your target customer.

Mike valued vision and innovation higher than business processes. When process created obstacles for the project, Mike tended to break the process in order to keep the project going. By Jason Griffin's evaluation, this approach substantially sped up the process and creation of the Blackberry 950.

Contrary to other companies, project mangers in Research in Motion don't play a notable role in vision creation. They are managers who get things done but don't have vision ownership.

According to [Blackberry Interview 1], today Mike becomes distracted by other things and reduces his involvement in the development of the Blackberry. Isn't this a reason of recent difficulties of Research in Motion? This example poses an interesting question: Is it possible to replace visionaries like Mike Lazaridis? How should the succession look like?

Mike Lazaridis's scorecard:

Leadership Quality	Compliance
Create ideas	[+]
Makes decisions in uncertainty	[+]
Protects vision from criticism	[+]
Promote project	[+]
Create culture	[+]
Protect the team from bureaucracy	[+]

3.2.7   iRobot

According to [iRobot Interview] iRobot's CEO, Colin Angle was the vision leader of Roomba, a very commercially successful product. Colin was the author of the initial idea and closely controlled project implementation over all of the stages of its development.

However, in later projects the creative leader-driven innovation was changed to a more process-based development. The projects management team consisted of a product manager and program manager. The product manager was responsible for market research and product design. The

program manager had the goal of finishing the project on time and in the defined budget.

The vision was formally owned by product manager, but in many cases, it was partially driven by the CEO, and partially by other team members. Go/no go decisions were made by the executive committee by a defined set of criteria (usually defined in minimum market size, cost, margin, and sales estimates). However, committee decisions were often overridden by the CEO.

According to [iRobot Interview], new processes didn't work very well and the company failed to create any new successful products after Roomba.

Therefore, iRobot is another example of a company that had difficulties moving from a one-time successful innovation driven by a creative leader, to a repeatable innovation process.

Colin Angle's scorecard:

Leadership Quality	Compliance
Create ideas	[+]
Makes decisions in uncertainty	[+]
Protects vision from criticism	[+]
Promote project	[+]
Create culture	[ ]
Protect the team from bureaucracy	[ ]

3.3 Successful user-driven breakthrough innovations achieved by well-integrated multi-disciplinary teams

Breakthrough innovation usually doesn't fit to existing business processes of the company designed to deliver incremental adjustments of existing products. New revolutionary products require new design decisions, engineering technologies, manufacturing approaches, and new marketing ideas.

To come up with new ideas, specialists need to combine their knowledge in different disciplines. For example, to write software for a new hardware device, a software engineer needs not only to know formal requirements but also to understand the general vision of the product, critical hardware challenges, and key design decisions. Only being a part of the project team would enable this software engineer to educate the other team members, work together with the team to resolve major trade-offs and come up with a vision-aligned effective solution.

Normally it doesn't happen. People are often organized in department-silos with poor communication between project members. Moreover, the incentives are usually aligned with department goals and not with the project's vision. Standard processes are usually not fast enough and end up slowing down the project. Political rivalry between department heads adds large bureaucratic overhead to project decision-making.

Top innovation companies usually allocate a dedicated multi-disciplinary team for each of the products to ensure good communication, right incentives, and freedom from bureaucracy.

3.3.1 Apple

According to [Apple Interview 1], while Apple has formal departments, like design, engineering, manufacturing, and software, the actual work is entirely project based.

Project teams are usually multi-disciplinary for two reasons. First, once the project is official, the top management makes sure it has all the required staff and resources. Second, Apple has a special kind of culture. While people have to be very proficient in their main occupation, they also learn a lot from fellow team members. At the end of the project, software engineers know a lot about hardware design and engineers are more skillful in industrial design then typical engineers in other companies.

According to [Grossman]:

> *Apple employees talk incessantly about what they call "deep collaboration" or "cross-pollination" or "concurrent engineering." Essentially, it means that products don't pass from team to team. There aren't discrete, sequential development stages. Instead, it's simultaneous and organic. Products get worked on in parallel by all departments at once — design, hardware, software — in endless rounds of interdisciplinary design reviews. Managers elsewhere boast about*

how little time they waste in meetings; Apple is big on them and proud

of it.

Jonathan Ives confirmed [Grossman]:

The historical way of developing products just doesn't work when

you're as ambitious as we are. When the challenges are that complex,

you have to develop a product in a more collaborative, integrated way.

Tony Fadell, ex-VP of engineering in the iPod division, explains that the multi-disciplinary approach helps Apple build "systems" instead of just "products" [Grossman]:

I think the definition of a product has changed over the decades, the

product now is the iTunes Music Store and iTunes and the iPod and

the software that goes into the iPod. A lot of companies don't really

have control, or they can't really work in a collaborative way to truly

make a system. We're really about a system.

Finally, Steve Jobs explains that innovation of products can't happen fast enough when different part of the product are made by different divisions or even different companies [Grossman]:

One company makes the software. The other makes the hardware...

It's not working. The innovation can't happen fast enough. The

integration isn't seamless enough. No one takes responsibility for the

user interface. It's a mess.

Therefore, the Apple approach to organize well-integrated multi disciplinary teams for new product developments was an important success factor for the company.

3.3.2   Microsoft

In Microsoft, team allocation approaches were changing over time. According to [Bill Mitchell], until the mid 2000s, Microsoft had a project leader role, who was in charge of design and development. They also had a business unit manager (VP) who was in charge of business decisions such as resource allocation and profit targets. Previously it was possible to start projects from the grass roots. The Senior VP could form a small team and start working on a prototype. Then if the prototype got support from the top management (Bill Gates) the team got an official project status. This approach inspired the Microsoft startup culture and many projects, like Windows CE, Tablet PC, and Origami were started in that way.
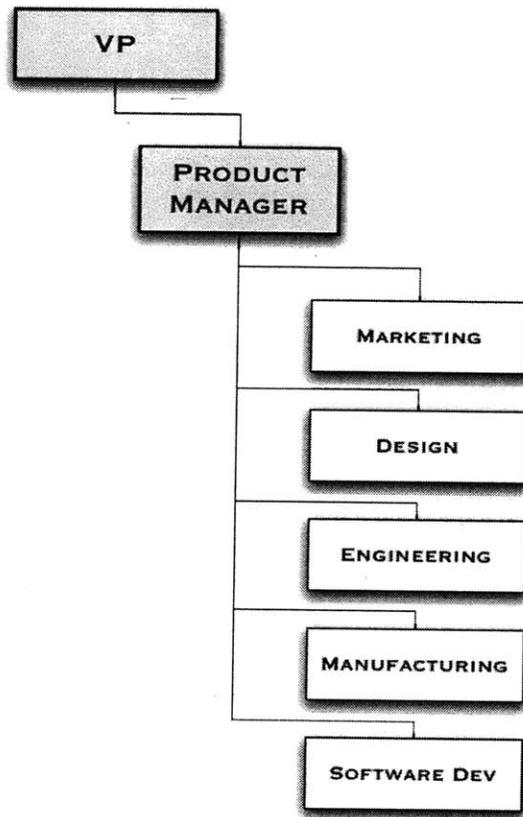
Figure 3: Old Microsoft Project Structure – Integrated Team

Later MS switched to a single-disciplinary model, where different project roles report to different C-level executives instead of to a project manager. This approach made it much more difficult for them to make interdisciplinary decisions. Increased separations between department-silos posed a challenge to Microsoft to start new projects and the number of successful projects has significantly reduced since 2005.
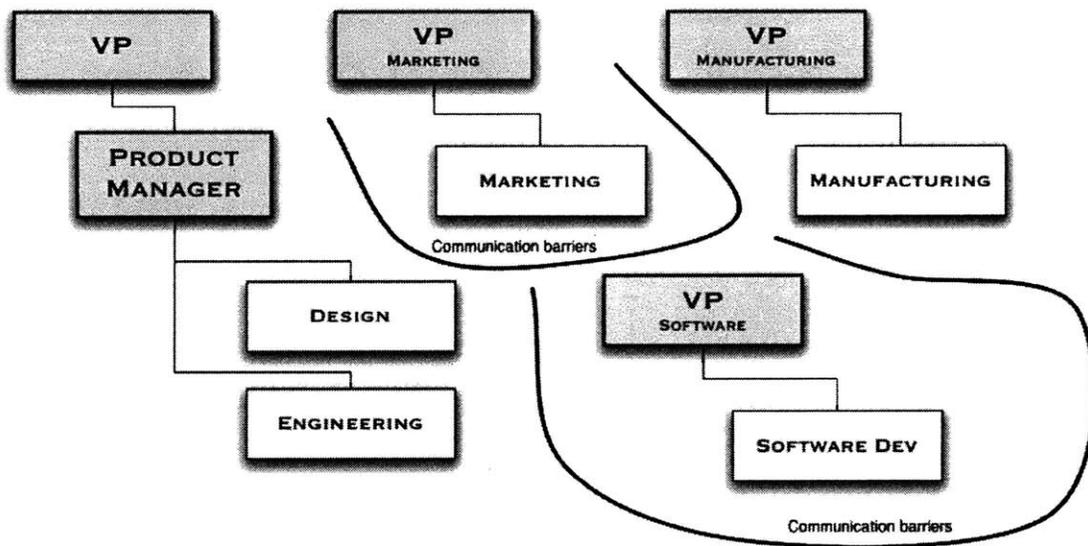
Figure 4: New Microsoft Project Structure – Separated Team

3.3.3 Research In Motion

According to [RIM Interview 2], before the Blackberry, Research in Motion's pager business was small compared to Motorola's. However, soon after the Blackberry launch, Research in Motion became a leader of the new mobile email segment. Motorola stayed in the declining pager market. Why did small RIM succeed while the large and powerful Motorola lose?

These two companies had very different organization structures formed to pursue different goals. Motorola was a very efficient company. They implemented the Six Sigma methodology that required all employees to have a strictly defined set of tasks. This approach allowed them to reduce variability as much as possible. In addition, most activities were very budgeted and it was hard to do anything that had not been budgeted

before. Motorola was split by several technology-based divisions: paging, phones, microprocessors and mobile networks. An employee's incentives were tied to the performance of his divisions. It made it very hard to develop cross-disciplinary products that didn't fit into one particular division.

Blackberry-like projects were canceled in Motorola because the global paging market was in decline. Motorola executives didn't see much value in new device because they didn't think from a cross-disciplinary point of view: instead of envisioning a new class of gadgets with integrated email, phone and pager capabilities, they just saw a new kind of pager. Motorola let the paging division decline with the corresponding market.

An exception from the described rule was the Motorola Razr mobile phone that became one of the most popular phones in the world. The Razr was created by an experimental multi-disciplinary team that wasn't limited by traditional organizational structure and processes. However, later Motorola wasn't able to permanently incorporate the multi-disciplinary approach to their business processes.

Contrary to Motorola, Research In Motion is a very flexible company. The company didn't have departments and was divided by product teams. The goal of such organization was to enable the development of innovative products. Each team was led by a product manager whose goal was to deliver an exceptional user experience. Each team's members were located

in the same room to build team spirit and facilitate communication. According to Jason Griffin:

"To create an innovative product you need to make innovation flow!"

So, Research In Motion was able to set back more cash-rich and technologically advanced Motorola partially because of better team working capabilities and the right incentives.

4 Comparison with existing theories and approaches

Radical innovation is a popular topic in management research. Many authors have published their theories and frameworks. In this section, I will compare the results of this thesis with other relevant works.

4.1 Roberto Verganti's "Design-driven innovation"

"Design-Driven Innovation" by Roberto Verganti influenced this work more than others. This thesis was envisioned as a reality check of Roberto's ideas on concrete examples of high tech companies. However, during the research process I changed the focus of the thesis to include a broader set of companies. In other words, this research could be considered as an extension of Roberto Verganti's method to high-tech industry.

4.1.1 Design-driven innovation vs. radical innovation of user experience

Roberto's "Design-Driven Innovation" is defined as:

> *Design-driven innovation is radical innovation of meaning. It has not provided people with an improved interpretation of what they already mean by, and expect from, [for example] a lamp: a more beautiful object. Rather, the company has proposed a different and unexpected meaning: a light that makes you feel better. This meaning, unsolicited, was what people were actually waiting for.*

Radical innovation of user experience (RIUE) is a very similar concept; user experience is closely related to the meaning of the product:

1) Most innovation of meaning changes experience

2) To create new meaning you have to change the experience

4.1.2 Product development process

"Design-Driven Innovation" discusses detailed mechanics of the design process that consists of the following aspects:

1) Working with the design discourse

2) Attracting key interpreters

3) Developing the vision

4) Promoting the products

5) Coaching of interpreters by executives

This approach would definitely allow a company to create a radically innovative user experience. However, there are other ways to achieve the same goal. For example, new user experience could be created not by designers but by engineers (like in Bose) who better understand the capabilities of technology and nevertheless are able to come up with great visions.

The process of developing a network of interpreters looks specifically for creative design-driven industries. Roberto explains in detail how to attract key design talent: build implementation capabilities, create radically innovative product, build a brand, and provide creative freedom to designers. Will this approach work for high tech companies? Is it the best way to attract engineers and product managers, who besides their technical proficiency are able to create innovative product visions?

4.1.3 Role of executives

Both this thesis and Roberto's book mark out the role of an executive. Roberto stresses the roles of executives as "art dealers":

1) Choose the direction of the company: what product will we offer to customers? What new meanings are we looking for?

2) Build relations with key interpreters

3) Choose the right vision

The strategy proposed in this thesis makes less distinction between "designer" and "executive." At least in the high tech field these roles are quite interchangeable. For example, Otto Berkes and Steve Bathiche are "leaders" that started as "designers".

We leave more space for grass-root random innovation. Not only executives but also anybody else can come up with an innovative vision. For example, Bose engineers could come up with new visions. In Apple,

almost any employee could come up with an innovative idea for which Jonathan Ives' team will only work on the industrial design aspect of the product, leaving vision to the initial product leader.

4.1.4   Role of vision and personal culture

Both the book and this thesis put the same emphasis on intuition and personal culture in the creation of product visions.

4.2   Eric von Hippel "Lead user innovation"

Eric von Hippel, in his work [von Hippel 1986], was dealing with the problem that marketing research is not very useful in setting requirements for radically innovative products. However, Eric took a different approach. While it's useless to ask all users, he found special kinds of users who had a very good idea of what new products should be. He called them "lead users." Lead users have two qualities:

- *Lead users face needs that will be general in a marketplace-but face them months or years before the bulk of that marketplace encounters them, and*

- *Lead users are positioned to benefit significantly by obtaining a solution to those needs.*

In this thesis, we also discussed the idea of using personal needs to generate product ideas. However, we proposed to use the personal needs of company employees to create visions instead of an external research

approach. Often, idea creators can lead projects themselves and continue to contribute to the initial vision.

These two approaches could be combined. For example, Bose hires engineers who are passionate about audio and, in fact, are themselves "lead users" of high-end audio equipment. Apple employees are advanced computer users with very high aesthetic demands. Peek Pronto was made to fulfill a personal need in simple and cheap mobile email. Therefore, hiring "lead users" and integrating them into the product development process proved to be a viable strategy for generating innovative product ideas.

4.3 IDEO creative process

Tom Kelley in "Art of Innovation" discusses the design process of IDEO, a famous industrial design company. The design process includes:

1) Observation for studying the customers

2) Brainstorming for idea generation

3) Voting-base idea selection

4) Prototyping "Right-Rough-Rapid"

5) Multi-disciplinary teams

The approach of this thesis is substantially different:

1) Observation is not used as a source of product ideas. Instead, idea authors rely on their own intuitive experience in a subject matter

2) Brainstorming is used for challenging existing ideas instead of generating new ones

3) Decisions are made by project leaders and not by voting

4) Most companies use prototyping. However, approaches vary among the companies. For example, Apple use "pixel-perfect" prototyping which is opposite to IDEO's "rough" rule

5) The thesis suggests using multi-disciplinary teams.

However, these differences are easy to understand. IDEO is a consulting company that works on contract basis. IDEO's design consultants should be able to come to any company in almost any industry and come up with a good design solution. This approach is fundamentally different from the approach of a fully integrated high tech company that creates, develops, sells, and updates its products. Moreover, IDEO rarely comes up with its own ideas. Its innovation process specially created to creatively elaborate on the ideas of the customers. This approach could potentially create a radical innovation by spotting a missed feature in product design. In general, IDEO innovation capacity relies on:

1) Team's attentiveness to detailed user needs spotted during observation

2) Team's capability to go over a large body of ideas during brainstorming

3) Vast industrial design experience of team members could allow them to cross-pollinate projects with ideas from other industries.

5 Conclusions

Companies interested in creating products with a radically innovative user experience could look to the approaches of Apple, Microsoft, Peek, Research in Motion, iRobot, and Bose covered in this research. As we saw, innovation is based on intuition, leadership, and a multi-disciplinary approach.

Embrace intuitive thinking

Intuitive thinking is the major capability that makes it possible to create innovative product visions. Companies should make sure that their decision-making is not limited to data based approaches that have a limited innovative product planning capability. The best companies use a structured approach to make their ideas flourish: they hire the best people, provide space to discuss ideas, and allow innovators to turn ideas into real products.

Intuitive thinking is a cultural phenomenon that starts from the top management. If company's executives don't accept intuitive reasoning and require data to support every important decision then they should not expect teams to come up with radical innovation. On the other hand, if they accept the risks and let their subordinates pursue radical projects then they would make breakthrough innovation possible. To reduce the risk they could, like Bill Gates, start several projects in the same field to see which idea survives in the marketplace.

Develop leaders

When it comes to innovation not everybody is equal. Innovation leaders are the key component of successful breakthrough products. Good leaders create ideas, make decisions in uncertainty, promote an innovative culture, and protect teams from bureaucracy.

Each industry has it's own ways of developing leaders. For example, Roberto Verganti showed that in design-related industries like furniture and home utensils lead designers mature by experimenting, adopting knowledge of other industries and communicating with the design community. Therefore, to survive in this industry companies need to search for promising designers and build strong relationships with them. As we have seen in the Bose example, the career path for engineers is different: they usually become proficient in sound engineering before they get enough influence to defend their own ideas and become product visionaries. For Bose it makes sense to hire top engineering talent and create an environment when they can manifest their ideas. Software companies, like Microsoft, could develop their leadership talent by creating research divisions (like Microsoft Research), where top engineers and project managers can start to develop their own ideas and turn the best ideas into projects.

Integrate teams

Multi-disciplinary teams are much more efficient in creating radical innovation that department-based organizational structure. These teams are quicker, more flexible, provide the right incentives, and communicate much more effectively. Some companies successfully co-locate project teams in the same room to improve communication and shorten time-to-market of the product. The biggest risk of optimizing company operations is that defined processes are too rigid to enable innovation that requires flexibility.

On the other hand, implementing a multi-disciplinary team policy poses some challenges for an established company. There are two way of implementation:

4) Make multi-disciplinary innovation teams possible in a current organization structure

5) Create teams separately from current structure

In the first scenario, organization would have to maintain a very unstable balance between efficiency and innovation, putting in place many additional rules and exceptions.

The second scenario is more straightforward. The company has to maintain two organizational units: one for developing existing products, and another one for innovation. Steve Jobs made the same decisions setting up

a product unit in 1983 to develop the Macintosh personal computer. However, there are a number of problems associated with this approach:

6) Innovation unit would be considered as a "cool" place to work, negatively motivating engineers from the existing product division (that's what happened in Apple in 1983)

7) Existing products division is a better place for engineers to learn about technology's limits and applications because they work with a real products, real manufacturing process and real customer needs in situations with very strict deadlines

Nevertheless, innovation team integration is an important problem that should be addressed by any innovative company in a way that better suits its goals and current organizational capabilities.

Future research

This thesis lies down general trends in creating products with breakthrough user experiences. However, many questions in this area remain unanswered:

8) How do you transform a rigid bureaucratic company into an innovation powerhouse?

9) How do you keep a radical innovation capability after the success of the first product, when many companies quickly change focus on the development of existing product lines?

10) When should companies use individual key interpreters and when is the group's own creativity more useful?

11) When do companies need to hire key innovators and when do they need to grow leaders from their own human resources?

12) How do you support the individual innovation of project leaders but not undermine the creativity of other team members?

6 References

[**Luecke and Katz**] Luecke, Richard; Ralph Katz (2003). Managing Creativity and Innovation. Boston, MA: Harvard Business School Press. ISBN 1-59139-112-1.

[**Apple Interview**] Interview with ex Apple product manager.

[**Cagan,Vogel**] J.Cagan, C.M. Vogel. "Creating Breakthrough products", Pearson 2008

[**Turner**] Dan Turner. The Secret Of Apple Design.

[**Breillatt**] Alain Breillatt. You Can't Innovate Like Apple.

[**Bose Interview 1,2,3,4**] Interviews with Bose employees.

[**Otto Berkes**] Interviews Otto Berkes, leader of Microsoft Origami project.

[**Bill Mitchell**] Interview with Bill Mitchell, executive sponsor of Microsoft Origami project.

[**Microsoft Surface Interview 1,2**] Interviews with Microsoft employees involved in Microsoft Surface project.

[**Peek Interview**] Interview with Peek product manager.

[**Amol Sarva**] Email conversation with Amol Sarva, founder and CEO of Peek.

[RIM Interview: Jason Griffin] Interviews with Jason Griffin, a product manager from Research in Motion involved in Blackberry 950 project.

[RIM Interview 2] Interviews with Research in Motion employees involved in Blackberry 950 project.