

What does management have to do with innovation?¹

By John Levy, Ph.D.

Abstract

Innovation is not about managing constraints and tracking progress, but is about creating products that appeal to new classes of customers. What is management's role in innovation?

There are three domains of activity for a manager, each of them critical for effective development of innovative products:

- 1. Inwardly-focused activity, related to maintaining well-functioning teams and individuals;*
- 2. Outwardly-focused activity, related to creating teams, communicating and removing roadblocks; and*
- 3. Upwardly-focused activity, related to managing expectations of your bosses and your teams.*

Drawing on many years in hardware and software development, John will suggest when to "get out of the way," when to "get our way" and when to "get in the way" while managing a development organization.

Introduction

Why manage?

There are many reasons people have for not respecting or wanting to be part of management. One of them is that "management" is an exclusive club, distinct from "workers," or people who actually do the work that results in something useful.

In my first job in the computer industry, I had the opportunity to supervise a software team that was located in the UK. The project leader was a very capable man who definitely viewed himself as part of the working class. He tended to make disparaging comments about managers, not without justification. The managers dressed differently and had a "clubbiness" about them that served to make them stand apart from the technical contributors.

In Silicon Valley, we've overcome the stigma of class but we still have many examples of poor management. Look at how popular Scott Adams' Dilbert comic strip is! We wouldn't want to be associated with such bad vibes.

I was called in to help diagnose what was wrong with an engineering department some years ago. I found a perfectly competent development group managed by a person who knew nothing about the technology they were working with. That manager's boss was far too busy to deal with the inadequacies of the first-level manager. The two managers, one incompetent and the other overloaded, protected each other and made sure that no useful communications went up or down that management chain.

¹ This article is adapted from a talk given at IEEE Engineering Management Society, Bay Area chapter, on March 29, 2006; and SofTech, North Bay chapter, February 22, 2006.

Another reason you may resist managing is because you perceive that your value has always been as a brilliant technical contributor. It will take a very strong reason to convince you to move out of identifying with your technology. Maybe I can offer one strong reason: your technical understanding is sorely needed in management situations.

Still another reason may be that you don't aspire to be a general manager, someone who is three or more levels above the engineers or workers. Even though a computer science professor, John Hennessy, is now President of Stanford University, you may not choose that path.

Here are some great reasons for taking on management duties:

- (a) You can do more as a manager to clear the way for major projects to complete – and for exciting innovations to occur;
- (b) You can provide leadership and mentoring for technical contributors, perhaps even better than you received when you were in their place.

Assumptions about the reader

I assume that you have a technical background and you've been doing engineering for a long time; you've had management duties; you haven't experienced a lot of great management; maybe you're not even sure what great management looks like!

My purpose is to give you reasons to be a manager and some ideas about how to do a great job as a manager.

Preview of what's to come

Introduction:

- What innovation is and isn't
- Things a manager does
- What you shouldn't do as a manager

Main points:

- Managing a team to "win"
- Clearing the way
- Keeping the bosses happy

What is innovation?

"Innovation" is a very popular and over-used word today. What does it really mean? Something that is innovative is a new idea, product, application, method. There should be some aspect of novelty, something we haven't seen before. Finally, something innovative is also typically an invention: it has a practical use in the world.

Before you can start innovating, you need all of the following:

1. A goal or problem statement
2. A set of constraints (There are always constraints. You should try to make them as explicit as possible)
3. Resources, including people (a team), tools and a place to work

"Innovation is hard to schedule. -- Dan Fylstra"²

Project management, while it is critically important to product development, is not innovation. Generally, project management consists of the application of known methods to well-stated problems, doling out of resources, measurement of resources & expenditures, and maintaining status in PERT charts & Gantt charts.

As a manager, you make tradeoffs in time, cost and quality. For example, you may be the one who decides when the project is done.

Who decides whether it's innovative? Maybe we shouldn't care. After all, we really want to measure what counts to customers & users.

Other people may also ask, "Is your development team creative?"³ This is another question that may not be worth answering, as long as you are satisfying your customers.

If we equate innovation with great leaps forward, that is, with both inspiration & implementation, then we will not look for innovative ideas that come from incremental progress.

Here's one way to make innovative products without making great breakthroughs. Push the technologies you know, gaining slow, steady progress. As you make things smaller, faster and cheaper, you will eventually cross a boundary into new territory. You know that there are critical points on the curves for cost / speed / size, and you can deliberately aim at moving your product beyond one or more of those points.

As you manage a development project, you may make go/no-go decisions based on expectation of future cost reduction / speed increase / size decrease. This has led to a lot of new products in the computer industry and in the hard disk business.

For example, at Quantum, we knew that hard disk development was pushing the 60%/year density curve with incremental improvements in five technology areas -- mechanical, servo, read/write, heads/media, controller/firmware. The density increase itself was enough to drive the market, as long as everything else did not get worse.

I conclude that you can make innovative products by pursuing steady, incremental progress.

"Good ideas and innovations must be driven into existence by courageous patience."
-- Admiral Hyman Rickover

Innovative product development requires not just ideas, but good implementation or realization.

"Under the right conditions, the problems of commitment, alignment, motivation, and change largely melt away." – Jim Collins⁴

² This quote and others without further attribution are from "one-liners! (c) 1990-1999 Adam Rifkin Ink. All rights reserved. No fair taking this line out, as I know many leeches, er, lawyers. -- Adam Rifkin"

³ See article by Patrick Bailey on Creativity, Better Software magazine, March, 2005

⁴ Jim Collins, *Good to Great*, Harper Collins, 2001

The right conditions are achieved by

- (a) assembling the right team,
- (b) obtaining the necessary resources,
- (c) setting clear goals,

and then getting out of the way of the engineers.

This doesn't mean that you're not making decisions! Part of your job is to drive the development teams to make choices in a timely way. One of my favorite managers used to say, "I'm setting a date for this decision. If the team doesn't make the decision by then, I will."⁵

What does management have to do with innovation?

The first domain of management is inwardly-focused activity. The key to innovation here is to **get out of the way** of creative individual and team work.

Here are the inwardly-focused activities:

1. Setting the goal, the charter and the constraints

You must be sure that goals and constraints are known to the team.

2. Coaching individuals

You may coach technologists on when to switch approaches & methods, how to avoid burnout (while still making an effort).

3. Listening

You may provide team members a time and place to reflect on the project, a forum for team issues, and time to articulate problems.

A great deal of what you are doing for your team is to provide encouragement, establish trust, and offer support. The teams are not counting on you for the inspired idea. Instead, support & encouragement are the critical factors. Their trust in you will depend on the answer to their question, "*Will you defend the value of my ideas when you are with upper management?*"

I was the project engineer on a CPU development which was breaking into new ground for that company. My team was mostly made up of new hires, and both my manager and his manager were new to the company. My team made a special effort to estimate the project time honestly. About one year into the project, we were displaced by an "old hands" team that underbid our development time. They had credibility, but in fact the project completed in exactly the month we had scheduled our completion. We hadn't known that in the company culture, engineers' estimates were always expected to be shorter than reality.

4. Coaching teams

Coaching teams includes a variety of team maintenance activities, including maintaining focus by reminding team of goals & priorities and deferring or spinning off peripheral activities; recording & displaying status as part of every day communications; and "clearing" of interpersonal issues within the team.

⁵ David A. Brown, former President and VP-Engineering of Quantum Corporation

I was a member of a strategic planning team once that had a member who we all knew to be very bright, but he had a habit of talking too much. We were quite surprised when, after a week of intensive team interaction in which we made sure that everyone was heard, he stopped the excess talking. The talking was an artifact of his feeling that he wasn't being heard. As soon as he knew that he was being heard, he didn't need to talk so much any more.

Here's a method of resolving interpersonal issues in a team that I call "clearing." At the start of each session, or at least once a day, each team member has the opportunity to address other team members, one at a time. If there is something not working in their relationship as team members, the one who starts says (1) What I observed, (2) How I felt about it, and (3) What I would like to ask of you. The responding person acknowledges what was said by repeating what they heard from the first person. They then have the opportunity to do what was asked – or not.

In addition, it is a good practice for a team to dedicate a time for each team member to offer acknowledgement for something positive from each other member. This should be done separately from the clearing session.

Outwardly-focused activity

Certain aspects of managing a development team or department are essential to setting up the right conditions under which the teams will flourish. This outwardly-focused activity is the domain in which is it important to **get your way**.

1. Making the right hiring decisions

You are responsible for composing the team that will work on the projects in your department. You must have a sense of what characteristics are needed in people who will work as members of teams. In this sense, you are filtering candidates based on team values that are to be shared. People who can't or won't work well with others are known in the trade as prima donnas. While they are often very smart and productive as individual contributors, you cannot put prima donnas into a team and expect productive results.

I worked for several years in a company with a high percentage of prima donnas. When a new boss came in from a company I had worked for before, I used to attach a maxim-of-the-month to my monthly report, just for his amusement and mine. I titled them "The World as Seen by a Prima Donna." Example: "The purpose for existence of other people in the world is to appreciate my work."

2. Choosing/removing team members

You not only select team members by hiring or transferring them in, sometimes you must select them out. When someone is not productive or is positively interfering with the progress of a team, you must act swiftly to remove them from the team. Failing to do so demoralizes the other members of the team. And often you can confirm later that the unproductive person is happier somewhere else.

One of my clients asked me to co-manage a firmware development team that was not producing well. On the third day, having canvassed the team and identified two unproductive members, I recommended to the program manager that he remove these two. The program manager, new to the company, asked me to wait a while. The project dragged on for another seven months until I was burned out trying to get results with this team. Eventually, the unproductive people were transferred out, but not until everyone was tired of the failure to get good progress on the project. The lesson to me was to insist

on clearing the team of deadwood – and to place my job (or consulting assignment) on the line. Pay is not enough to compensate people for burnout.

3. Removing roadblocks

As manager, you are responsible for dealing with other departments; arranging for equipment, tools & services; and resolving internal conflicts among projects in your department. When something gets in the way of progress, you should know about it quickly and act immediately to deal with it.

Another area of management work is opening lines of communication with customers & users. The more feedback and involvement you can get from users, the better your products will be. Maybe you shouldn't wait for Marketing to offer to find the users. What would happen if you contacted some of them yourself? Then you could be interpreting some of the user's "world" to your teams. Or better yet, invite a user to be part of the team.

"If consultants had been hired to evaluate the market for printing a decade or two after its invention, they would have concluded that the new technology was vastly overrated. Scribes were already producing the important books efficiently, and the new printers produced mainly the same old texts, such as the Bible, which were readily available to the tiny minority who were literate. -- Ithiel de Sola Pool"

Marketing consultants may not be as effective as direct involvement by users. But maybe, just maybe, management consultants are OK in Engineering when you can't figure out what's keeping your teams from being productive

Upwardly-focused activity

You are the pipeline through which communications flow from your development teams to upper management – unless, of course, you are the upper management. While you want useful information to flow freely up and down the pipeline, there are times when you should **get in the way** of distractions coming from upper management.

*"An important scientific innovation rarely makes its way by **gradually** winning over and converting its opponents; it rarely happens that Saul becomes Paul. What does happen is that its **opponents gradually die out** and that the growing generation is familiarized with the idea from the beginning." -- Max Planck*

While you may have produced a detailed project plan for your product development activities, there are often other expectations coming from your bosses. You must manage your bosses' expectations and provide useful information, but not overwhelming detail, to them.

Often, managing the bosses' expectations means telling them that something that they are asking for is not possible in the time-frame requested (or insisted upon). I'm not talking about a few days or a week differential between what's possible and what's requested. I'm talking about major disconnects in features/requirements vs. resources vs. time. This is the place for you to put your job on the line and to make sure that you do not commit your teams to produce something that is impossible. This is what I call "refusing the insane contract."

Meanwhile, you also must manage your teams' expectations. While you should maintain open communications – keep the teams informed of what's going on outside the department – there are times when you should not expose all of the upper management's concerns and aspirations, particularly when they are not relevant to the projects at hand.

Your goal is to have no surprises for the team. If meeting a particular deadline is crucial to the company, the team should know that. If management is expecting a major time slippage, but you don't, it may be better to keep that expectation under wraps. Aspire to credibility, both with the teams and with upper management.

... false scheduling to match the patron's desired date is much more common in our [software] discipline than elsewhere in engineering. It is very difficult to make a vigorous, plausible, and job-risking defense of an estimate that is derived by no quantitative method, supported by little data, and certified chiefly by the hunches of the managers.

*...
Until estimating is on a sounder basis, individual managers will need to stiffen their backbones and defend their estimates with the assurance that their poor hunches are better than wish-derived estimates. – Fred Brooks⁶ [Note: This was written over 30 years ago!]*

Conclusion

Key activities of a manager who want innovative results include

1. **(Get your way)** Selecting people based on team values.
2. **(Get out of the way)** Coaching people and process, but not determining content.
3. **(Get in the way)** Running interference for the teams in your upward and downward communications, but telling the truth.
4. **Listening**, allowing growth, and allowing yourself to be surprised by what your team can do.
5. **Refusing** insane contracts

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John has held management positions with Quantum Corporation, Apple Computer, Tandem Computers, and Digital Equipment Corporation. He earned a Ph.D. in Computer Science from Stanford University, and holds Bachelors and Masters degrees in engineering from Cornell and Caltech.

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⁶ Frederick P. Brooks, *The Mythical Man-Month*, Addison-Wesley, 1975 and 1995, p.21
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