MANAGING MAYHEM*

K. S. White, ORNL, Oak Ridge, TN, 37831, U.S.A

Abstract

Research institutes, typically full of excellent scientists and engineers, tend to be very focused on the technical aspects of their work, but reluctant to put much energy into the management functions that enable a healthy, productive organization. This is not really surprising when one considers that scientists and engineers are well trained to measure and evaluate quantitative entities while the management arena is dominated by qualitative concepts. Management is generally considered to include planning, organizing, leading and controlling. This paper discusses the essential management functions and techniques that can be employed to maximize success in a research and development (R&D) organization.

MOTIVATION

Roughly half of all scientific R&D is underwritten by public funding. With ever increasing pressure on governments to reduce spending, it is more important than ever to effectively manage these projects and demonstrate the long term value to the public. For R&D undertaken by private companies, there is even more pressure to demonstrate the investment will lead to profitable products sometimes with very short timelines.

In contrast to most for-profit companies, where goods or services are produced and success is measured almost exclusively by revenue, R&D organizations deal in innovation and measure success in terms knowledge gained. Of course dollars are easy to count but advances in understanding elude quantification.

By its very nature, R&D requires trial and error, creativity, and even failures that lead to rework, to move towards discovery. These critical ingredients are in fact the same variable factors that traditional management techniques strive to eliminate from processes for the sake of consistency and efficiency. The challenge for managers of R&D is how to enable the mayhem needed to fuel innovation while simultaneous assuring the needed progress to keep sponsors satisfied and therefore support future funding.

BACKGROUND

Modern management methods can be traced Frederick Taylor, a mechanical engineer who first published his theories in "The Principles of Scientific Management" in 1911 [1]. It was Taylor's work that first introduced the concept of management as a distinct profession. His work was primarily aimed at the manufacturing industry, which drove the economy during the Industrial Age. Taylor sought to maximize productivity and advocated careful (scientific) study and measurement of each step of the work process to determine the most efficient method. Trained workers should execute these steps without deviation and be paid more for achieving higher productivity.

Taylor's methods proved effective and were widely adopted, laying the groundwork for industrial engineering and quality control. This autocratic approach, with a strong emphasis on the planning, organizing and controlling functions of management, did have a positive impact on productivity and Taylor's influence is still very present in management training and practices today.

Conversely, Taylor's techniques essentially viewed the workers as interchangeable parts of a machine, with pay as their only reward. They had no input into the prescribed processes and were likely to be assigned to perform the same limited function for long periods of time with no consideration of job satisfaction or avenues for skills development. This naturally led to boredom and job dissatisfaction and worker potential remained largely untapped in this system.

Subsequent management studies and theories such as Abraham Maslow's "Hierarchy of Needs", Elton Mayo's "Hawthorne Studies", Frederick Herzberg's "Hygiene and Motivational Factors" and McGregor's "Theory X and Theory Y" introduced elements of human behavior and employee motivation as significant contributors to overall productivity [2].

For R&D managers, one of the most relevant contributors to modern management theory was Peter Drucker who first introduced the term "knowledge worker" in 1957 in his book "The Landmarks of Tomorrow" [3], signaling the future shift from the Industrial Age to the Information Age. In many subsequent publications, Drucker elaborated on how to improve productivity in knowledge work, advocating a high degree of self-management for knowledge workers and viewing knowledge workers as assets rather than costs [4].

WHY IS MANAGEMENT DIFFERENT FOR R&D ORGANIZATIONS?

The primary difference between managing commercial activities and research lies in the inherent uncertainty of the work. By its very nature, research is unpredictable, making it difficult to define desired outcomes, much less forecast each needed step along with associated timelines and costs. Research is nurtured by experimentation and missteps, which are largely excluded by popular management methods, but are vital to discovery.

Another important difference between for-profit companies and scientific entities lies in the typical characteristics of the workforce. Professionals employed by R&D organizations tend to have a higher potential and level of education than the average worker. The best R&D

* SNS is managed by UT-Battelle, LLC, under contract DE-AC05-00OR22725 for the U.S. Department of Energy

professionals work well independently and have a strong need for autonomy.

Management of R&D organizations is also complicated by the tendency to place people in management roles primarily because they have demonstrated technical excellence as a scientist or engineer. In this system, a high performing technical person is assigned a management role without any preparation or consideration of characteristics desirable in good manager. This even occurs when the incumbent would prefer to spend the bulk of their time pursing their technical work, but accepts the management role because it is viewed as a way to progress on the career ladder. In this case, it is not uncommon for the newly appointed manager to continue pursuing their research and largely ignore their management duties.

MANAGEMENT FUNCTIONS

The traditional management functions - organizing, planning, controlling and leading - can be overly prescriptive when applied to unpredictable R&D work and demotivating to knowledge workers. Without adjustments for the nature of the work, managers can spend a lot of time on functions that do not help productivity or help the organization meet its goals.

Organizing

The organizing function involves developing a structure and allocating resources to achieve objectives. This implies understanding the required skills mix and recruiting, training, developing and retaining people with the appropriate skills. The organization of a group should take into account how people will be deployed. For example, a group may be organized around projects and this works in the simplest case where people work on only one project at a time. In reality, people are often assigned to more than one project at a time. This leads to the need for more complex structures where people are grouped by skills or functions, and then divide their time between various projects. Given the dynamic nature of R&D, managers should consider organizing in ways that can easily adapt to changing project needs and ensure people can work across organizational boundaries as needed to enable success. The organization structure ultimately influences how people interact and share information.

Planning and Controlling

There are many types of planning, but two important types are strategic planning and work planning. Theoretically, strategic planning begins at the highest level and sets the overall vision and goals of an organization. From strategic plans, sub-organizations set their goals which eventually are divided into group goals and then projects. Work planning typically involves breaking a project down into a series of scheduled tasks along with cost estimates. A typical project plan includes a long list of tasks organized in a timeline along with the resources needed, both labor and materials, to accomplish each task. These plans form a baseline used periodically to assess progress and determine success.

When guided only by traditional management theories and techniques, R&D managers struggle with planning due to limited precedents for their work, the unpredictability of the R&D process and the inability to form clear definitions of successful outcomes. This makes it challenging to generate accurate plans and cost estimates.

Customary management dictates that managers control work by periodically checking project progress versus established goals and objectives detailed in work plans. When progress does not meet expectations, managers are expected to take corrective action to get things back on track.

Too much emphasis on planning and controlling R&D work can lead to great frustration and imply a lack of success when in fact good progress is being made. R&D projects could be better served by reducing the level of detail in plans to reflect the uncertainty of the project. Rather than scheduling strict milestones, managers could define logical points when decisions should be taken about the future path of the research. Plans should build in flexibility and be viewed as a living documents rather than a strict baselines.

Without highly predictable detailed plans, the idea of controlling a project is really futile. For R&D, it is necessary to evaluate progress, but this should be primarily for the purpose of adjusting the plan according to lessons learned. Rather than controlling, an R&D manager should focus on guiding or steering the process in collaboration with key contributors.

Leading

Leadership is perhaps the most important function for R&D managers. First and foremost, leaders establish and communicate their vision for the organization. Articulating an inclusive vision serves to inspire employees and energize them towards accomplishing organizational goals. Leadership also includes establishing an environment that enables success. R&D efforts thrive where people are free to try new methods and openly disseminate the results, even when unsuccessful. Such an environment is key to realizing real innovations, as opposed to the small incremental improvements that otherwise occur.

There are many different leadership styles, often defined by the approach a leader takes to decision making. Because R&D professionals are generally intelligent, educated and value autonomy, effective R&D managers can benefit from engaging key contributors in the decision making process. This is known as the “participative leadership style” and enables better decisions by tapping into the collective intelligence of the organization [5].

OTHER CONSIDERATIONS

Communication

The best managers are good communicators. Many people confuse communication with talking. The best leaders listen more than they talk and engage in active listening, and asking well-placed questions. Good listening not only has the benefit of providing the manager with information, it sends a message to employees saying the manager values their work.

On the other hand, when managers have a message to disseminate, it is useful to remember what marketing experts refer to as the "Rule of Seven". This rule says that people need to hear or see a message at least seven times, preferably in multiple formats, before they will act on it. With the large volume of information that bombards employees today, it makes sense to reinforce your message until it becomes part of the collective consciousness.

Motivation

People generally perform best when given the opportunity to do things they are good at and enjoy. Matching projects to an individual's expertise and interests helps to keep people engaged and interested in their work. Particularly in the world of knowledge workers, giving people a high level of autonomy is considered necessary to fully realize their potential.

Higher productivity can often be achieved by letting capable technical professionals "self-manage" their work to a much higher degree than would be prescribed by traditional management methods. Some studies indicate that productivity can be increased by a factor of two if managers adopt an untraditional leadership style that puts the focus on the ideas of others rather than their own. This strategy is known as the "The Multiplier Effect" and challenges the traditional role of managers as decision makers and advocates using the intelligence of everyone to stimulate the flow of ideas and healthy technical debate that lead to real innovation [6].

In this type of approach, the manager must create an environment of open communication and actively encourage other people to bring forward their ideas. Furthermore, the manager has to adopt a role that is more about facilitating and enabling others than controlling everything personally. This might make some managers insecure about their own value to the organization, However, if one considers the possibilities of tapping more deeply into the intelligence and potential of everyone on staff, not just managers, for good ideas it is easy to see that we might be sitting on a great deal of latent value.

Teamwork

While not every activity requires teamwork, little R&D of any importance can be accomplished by the effort of a single individual working in isolation. Unfortunately, many managers lack the skills to build effective teams. Teamwork depends on a foundation of trust, the ability to openly discuss ideas and commit to a course of action and members who hold each other accountable for results. Patrick Lencioni has written extensively on how to create great teams and effectively lead for success [7].

Conflict

If everyone is encouraged to openly discuss ideas, there is bound to be some disagreement. Managers often spend considerable effort suppressing conflict only to create a superficial outward harmony amongst the staff. When conflict is suppressed, it simply moves underground where it becomes more harmful. It is far better to create a safe environment where all inputs are valued and different viewpoints can be openly discussed. From this type of healthy debate, the best ideas will be strengthened and valuable information emerges leading to better technical decisions. The creativity that leads to innovation is difficult to cultivate without the open discussion of ideas. Rather than smoothing over differences, managers are better served spending their effort to teach employees how to discuss ideas without interpreting critiques as personal affronts.

SUMMARY

Successful management for production oriented businesses tends to rely heavily on the planning, organizing and controlling functions. To be successful in an R&D organization, the manager must be willing to relinquish some control and focus more effort on leading and coordinating the abilities of highly intelligent, educated and autonomous individuals. Good managers invest heavily in developing talented people and creating an environment that lets people do their best work

REFERENCES

[1] R. Kanigel, "The One Best Way: Frederick Winslow Taylor and the Enigma of Efficiency", Viking Penguin, 1997.
[2] http://en.wikipedia.org/wiki/Motivation.
[3] P. Drucker, "The Landmarks of Tomorrow", Harper, New York, 1957.
[4] http://www.knowledgeworkerperformance.com /Peter-Drucker-Knowledge-Worker-Productivity.aspx.
[5] R. K. Jain and H. C. Triandis, "Management of Research and Development Organizations", John Wiley & Sons, Inc., New York, 1997.
[6] L. Wiseman and G. McKeown, "Multipliers: How the Best Leader Make Everyone Smarter", HarperCollins, New York, 2010.
[7] P. Lencioni, "The Five Dysfunctions of a Team", Jossey-Bass, San Francisco, 2002.