Research-Technology Management

ISSN: 0895-6308 (Print) 1930-0166 (Online) Journal homepage: http://www.tandfonline.com/loi/urtm20

The Future of R&D Leadership

J. Stewart Witzeman, Pamela Henderson, Aaron G. Welling & Raymond Cosner

To cite this article: J. Stewart Witzeman, Pamela Henderson, Aaron G. Welling & Raymond Cosner (2018) The Future of R&D Leadership, Research-Technology Management, 61:4, 35-44, DOI: 10.1080/08956308.2018.1471275

To link to this article: https://doi.org/10.1080/08956308.2018.1471275

Published online: 05 Jul 2018.

The Future of R&D Leadership

Wider changes in the culture and the market will drive changes in the practice of R&D leadership.

J. Stewart Witzeman, Pamela Henderson, Aaron G. Welling, and Raymond Cosner

OVERVIEW: The environment in which industrial R&D operates is continuing to evolve, at a pace that seems to be ever increasing. Within the enduring elements of R&D leadership—management of staff and content creation and dissemination, among others—significant changes in practice are emerging or can be expected to emerge over the next few years. These changes, their impact on R&D leadership, and a vision of what R&D leadership will need to be in the future are the focus of this article.

KEYWORDS: R&D leadership, Talent management, Future of innovation, IRI Research

R&D leaders are facing constant change that is affecting every aspect of their work and leadership. The pace of change in technological innovation is unprecedented, and it is accelerating (Jones, Cope, and Kintz 2016). But the job of R&D leaders is not just to keep up with technological change. They must also manage staff at a time when the workforce is changing, with a loss of talent due to retirements, changing values and motivations for younger employees, and a rise in the outsourcing of labor (Aiman-Smith et al. 2006); oversee how research is conducted as new research methods and new laboratory structures emerge (Farrington and Alizadeh 2017); and ensure that R&D fulfills its dynamic function in assimilating and disseminating knowledge across the organization, as the advent of new digital channels and other technologies reshape how knowledge is acquired and shared (Jones, Cope, and Kintz 2016). With all of these changes within R&D, leadership is also facing pressure from outside, to better integrate R&D and innovation into the rest of the organization (Euchner 2016).

The support structures R&D leaders have traditionally relied on are also changing. The nature of the personal and professional networks R&D leaders have always depended on, for organizational learning and for their own personal growth in leadership, is shifting. The professional societies that blossomed during the 20th century and provided a venue for leaders to meet and share knowledge are being replaced with virtual connections, forged outside the official umbrella of societies and formal meetings (Farrington and Alizadeh 2017).

Despite these changes in the R&D environment, the topic of R&D leadership and how it must respond to these changes has received limited attention. Studies have focused on the evolution of technical skills (Cordero, Farris, and DiThomaso 2004), the effectiveness of various models and theories for managing R&D functions (Elkins and Keller 2003), and the leadership skills and styles important for R&D leaders in comparison to other parts of the business (Gritzo, Fusfeld,

J. Stewart Witzeman worked for Eastman Chemical Company managing a variety of R&D organizations for more than 30 years. His final position was as Director, Eastman Innovation Center, on the Centennial Campus of North Carolina State University. In this role, he managed partnerships with NCSU, the University of North Carolina at Chapel Hill, and the University of Tennessee. He received a PhD in organic chemistry from the University of California at Santa Barbara and a BS in chemistry and environmental science from Northern Arizona University. jswitzeman12@gmail.com

Pamela Henderson is CEO of NewEdge, Inc., a growth, strategy, and innovation firm that advises companies across industries, including more than 75 Fortune 500 and 50 startups and nonprofits. She was formerly on the faculty at Carnegie Mellon University and later worked with the national laboratory system and Washington State University to commercialize early-stage technologies. She has published widely on market insight, business and innovation strategy, and design; she is the author of *You Can Kill An Idea, But You Can't Kill An Opportunity! How to Discover News Sources of Growth for Your Organization* (Wiley, 2013). pam.henderson@new-edge.com

Aaron G. Welling is a former senior director at NewEdge, Inc., where he was employed for the last 11 years. He applied the Opportunity Thinking Vision Process to assist a number of companies in building a long-term growth vision and strategy, including John Deere, Armstrong Ceilings, PepsiCo, Parker Hannifin, Procter & Gamble, DSM, Harley-Davidson, and others. He received a BA in Spanish from Brigham Young University and an MBA from Thunderbird, The American Graduate School of International Management. welling.aaron@gmail.com

Raymond Cosner retired from Boeing in 2015 as a Senior Technical Fellow after 40 years at the company. For the last 12 years, he coordinated R&D planning in the defense/space business unit in collaboration with the office of the CTO. For his first 28 years, he was an R&D contributor and then group leader developing and applying new capabilities in aerodynamics, propulsion integration, and computational fluid dynamics. He holds a BS and MS in aeronautical/aerospace engineering from Purdue University and a PhD from CalTech. ray.cosner@outlook.com

DOI: 10.1080/08956308.2018.1471275

IRI Research Profile

The Future of R&D Leadership

Exploring the changes in R&D leadership and the skills and traits future R&D leaders will need.

Goal: To explore how macroenvironmental trends are changing the roles of R&D leaders and, consequently, the skills future leaders will need.

Co-Chairs: Raymond Cosner (Boeing, retired), Stewart Witzeman (Eastman, retired)

Subject Matter Expert: Pamela Henderson (New Edge)

For more information, contact Stewart Witzeman (jswitzeman12@gmail.com).

and Carpenter 2017). No work, to our knowledge, has addressed the changes to the R&D environment, both internal and external, that are pushing R&D leaders to rethink what R&D leadership will mean for the future.

To explore how R&D leadership is being reshaped by these changes, and by changes still emerging, an IRI Research working group undertook a study of the nature of R&D leadership and the impact of the shifting environment on leadership itself. The group sought to define the enduring functions of R&D leadership, identify the macroenvironmental changes most relevant to those functions, and build a vision for how R&D leaders will need to work in the future to adapt to those changes.

The Opportunity Thinking Vision Process

To explore how R&D leadership is being affected by the rapidly changing competitive and technical environment, the group turned to the Opportunity Thinking Vision Process developed by NewEdge. This method has been used by numerous organizations to build a long-term growth vision (Henderson 2014). The Oppportunity Thinking Vision Process begins with considering how we think about opportunity. The Opportunity Thinking approach defines opportunity as arising from the intersection of market needs with the value that organizations can create through new technology, business models, services, or products and the conditions that bring the two together. These conditions include both current conditions inside and outside the organization and trends—the ways in which those conditions are changing. Organizations and leaders may see needs they can meet and ways to create new value in meeting those needs, but they are ultimately subject to the headwinds or tailwinds created by prevailing conditions and trends as they work to bring that opportunity to fruition.

The Opportunity Thinking Vision Process maps how conditions are changing onto an organization's means of creating value as a way to define a vision for how the organization can create value in the future. The challenge is that prevailing conditions, and the changes that may be occurring, can be so vast and so diverse that it is difficult to know where to focus. In the vision process, focus is narrowed by anchoring explorations of environmental change to the key ways the organization creates value—what are defined by the process as its *essences*. Then, prevailing trends can be mapped onto these essences to provide a view of the future. In this way, it is possible to form a vision for the future by working from the value the organization or function provides today and the way the world is changing relative to that value-creation mode.

The process proceeds in three steps:

1. **Essence Development.** The essence of an organization is how it creates value; within a given organization, there are typically four to six key elements defining the overarching ways that the organization creates and delivers value.
2. **View of the Future.** The essences direct attention to the trends most likely to impact the organization. Once the key trends are identified, they are grouped into themes, which inform statements that challenge the current approaches to delivering value. Taken together, these statements provide the view of the future.
3. **Vision.** The view of the future, contrasted with the current way the organization is operating, raises the question of how the organization must change in response. If the ways an organization creates value today are being challenged by changing conditions, then that organization must adjust how it will create value in the future. The perspective on how practice must change becomes the organization's vision for its future.

John Deere used this method to define its innovation vision in the face of overwhelming market change (Henderson 2014). The key for the company was to determine how to tether the various sources of change to business value. To accomplish this, the group first defined the essences of the business, the enduring elements that define the company across its various markets and product lines. Ultimately, the group settled on three:

- Connected to the Land
- Focused on Getting the Job Done
- Intent on Making Customers' Businesses Profitable

Determining the business's essences provides a framework to distill the ongoing wave of change into a highly relevant and focused view. At John Deere, reframing those essences as questions—How is the land changing? How is the work, the job to be done, changing? How is customer profitability changing?—drove attention to the most relevant trends, producing a crisp view of the company's future environment. This allowed John Deere to focus on the most salient changes in its environment and consider its position—and the likely opportunities—in relation to these changes.

The company used this awareness to transform its business, moving from its historical focus on producing machinery to a new focus on the worksite, which led to a drive to

leverage data to help do work. This view led to new efforts in software development, data management and analytics, and technologies like sensors and the Internet of Things. In designing products, the company now considers not just the work but the worksite, creating a new context that can drive new products—and open up new sources of revenue.

The IRI Research group sought to apply this process to the larger context of R&D leadership, to identify the enduring elements of leadership that will persist even as the environment changes, and to explore how leaders' skills and behaviors will have to change within those elements in order to continue to deliver value.

The Study

The study was conducted in four steps—the three steps of the Opportunity Thinking Vision Process, plus a case study to better articulate and illustrate the view of the future and vision identified in the study. At each of the three steps of the Opportunity Thinking Process, the working group met with groups of mostly director-level R&D leaders at mid- to large-size US-based corporations in working sessions held at IRI Annual Meetings and Winter ROR Meetings in 2012, 2013, and 2014. Each session attracted 25 to 35 leaders and lasted about three hours, with participants divided into small, facilitated groups of four to seven people. In addition, the study team met monthly between IRI meetings to refine the outputs from each session and set goals for the next set of group sessions.

Step 1: Determining the Essences of R&D Leadership

The work began by defining the essences of R&D leadership. In the first working session, approximately 35 people met to discuss the overarching methodology of the study, describe the key functions and value propositions of R&D leadership, and begin to cluster the functions, activities, and value propositions into essences. The study team captured these essences as they emerged, summarized the activities within each, and presented them back to a larger group in the next session for feedback to refine and finalize them.

The outcome was a list of five enduring elements that define how R&D leaders create value and serve the needs of their organizations:

- **The Practice of R&D** centers on the drive for innovation, science, and technology; the changing landscape of portfolio management; and the importance of R&D and innovation setting direction for the company.
- **Management of Staff** deals with building effective teams, developing leadership in staff members, and creating a safe, collaborative, and nurturing culture.
- **Networking—Internally and Externally** focuses on the role of leaders' professional and personal networks, both internal to and beyond the organization, as well as on the organization's network of external partnerships.
- **Working at the Seams** speaks to the need to develop and sustain cross-functional relationships across the organization and engage with project teams within an expanded set of global participants.

These are the essences of R&D leadership; they persist across industries and sectors, organization sizes and types, and value chain positions.

- **Creating and Disseminating Knowledge** addresses R&D's critical role in creating and managing knowledge, as well as sourcing information from outside the organization.

These are the essences of R&D leadership; they persist across industries and sectors, organization sizes and types, and value chain positions.

The next step was to identify the trends impacting each of these essences.

Step 2: Forming a View of the Future of R&D with Trend Mapping

In this phase of work, the trends impacting each of the essences were identified through two facilitated working sessions of about 20 people each; the goal for these sessions was to learn what change these leaders saw and to map those changes to the essences. In the first session, we presented the essences and asked participants to brainstorm the changes impacting each essence. After that session, the study group conducted further secondary research and informal interviews with colleagues and R&D leaders to further enrich the list of trends impacting the essences. During the next working session, participants were asked to prioritize and cluster the trends around the essences using wall charts. We also asked them to identify any trends they felt were missing from the list. The study team then clustered the trends impacting each essence around similar themes; from those themes, we created a series of summary statements about how conditions are changing for that essence.

In the next step, these summary statements would drive the creation of a vision for the future of R&D leadership.

Step 3: Developing a Vision of the Future for R&D Leadership

Once the nature of the changes in the R&D environment had been captured in the summary statements, we asked another group, this one also including about 20 R&D leaders, what they would need to do to respond to those changes. From notes taken during these sessions, the study team then created summary statements of how R&D leaders might respond to change, thereby creating a vision for the future of R&D leadership. The summary statements addressed the elements of change and provided contrasting views of how leaders were leading today and how they would need to lead in the future. These statements were

examined and refined over eight monthly meetings of the study team. The final outcome was a vision for the future of R&D leadership, which was presented in a plenary session at the 2014 Annual Meeting.

Step 4: The Case Study

In the course of the visioning process, we encountered several examples of organizations and individuals responding to the changing environment. These examples suggested some best and emerging practices and helped the team to further refine the vision for the future.

Those organizations that have made this transition have taken a number of approaches; most notable are those that have embraced more open and cross-functional approaches to innovation, particularly in engaging with universities. This evolution is exemplified by BASF's UNIQUE program, which involves a global network of key universities to "strengthen BASF's innovation portfolio and enable direct access to scientific expertise, new technologies and talented minds from various disciplines" (BASF Corp. 2011); Mitsubishi Chemical's Center for Advanced Materials at the University of California, Santa Barbara (www.mc-cam.ucsb.edu/); Boeing's efforts, which include the University of Sheffield's Advanced Manufacturing Research Center (http://www.amrc.co.uk/) and participation in the Oregon Manufacturing Innovation Center (Bell 2017); and John Deere's partnership with Iowa State University (John Deere 2017). These companies established strategic partnerships that reflect the evolving nature of the research enterprise and vividly demonstrate the changes in the essences of R&D leadership identified in our study.

In this final phase of the work, we examined more closely how one organization—Eastman Chemical Company—navigated the changing environment and adjusted its approach to R&D leadership. Eastman was selected due to the significant change its new partnership program represented and because the new approach illustrated many of the key principles identified in this study. In this case study, we mapped Eastman's practices against the five essences and the future statements identified in the Opportunity Thinking Vision Process.

Findings: View of the Future and Vision for R&D Leadership

While the essences of R&D leadership will endure, the skills necessary to be successful in these areas will change substantially, reflecting the changing nature of business, the work force, and information exchange in an increasingly global business environment.

The Practice of R&D

Historically, R&D has been centralized, working within or in some cases across business units and focusing heavily on building necessary capability in-house. Thus, the focus has typically been on the context of the company's competencies supporting its existing businesses. However, with open innovation and globalization, the activities of the R&D organization are becoming much more widely distributed, with outside partners in essential roles and with in-licensed technology and corporate labs around the globe contributing to the ultimate solution (Jelinek et al. 2012). In other words, R&D is moving from one big lab focused internally to a federation of smaller labs focused on a big, global picture (Figure 1).

Workshop participants identified a number of trends that are shaping the practice of R&D and R&D leadership in this regard, including an increased scope of concern (different markets, new competitors), a widening network of activities (from primarily in-house research to growing investments in partnerships), faster time-to-market expectations, more diverse teams including nontraditional partners, and R&D's growing role in the leadership of innovation, as R&D increasingly is seen as just one component of a corporate innovation engine. In short, R&D is being stretched to do more work with more partners. Labs are increasingly distributed—globally and across partners. And the work is fundamentally cross-disciplinary in nature.

At the same time that R&D's scope is widening, its target is narrowing and the work is being distributed across many smaller units. Centralized corporate laboratories are giving way to global networks and smaller labs more closely tied to individual business units and to the ultimate customers. The trend toward research within individual business units is driven by specific business goals, which are often tactical rather than strategic and time limited (Roussel, Saad, and

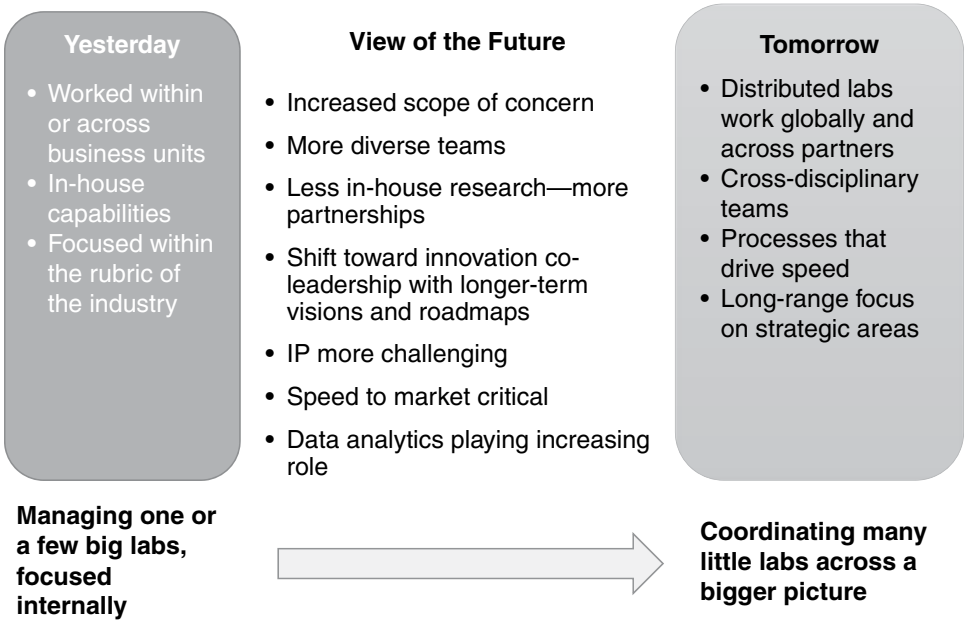

FIGURE 1. Trends: The Practice of R&D

Erickson 1991). Other implications include an increasing reliance on external collaborators for key elements of new capabilities and a vital role for supplier participation in innovation.

Central corporate labs are refocusing on research that is relevant to multiple business units, longer-term research investments, and research that will lead the company into adjacencies. Past studies have shown that a corporate function of this nature is instrumental in driving breakthrough innovation (Cotterman et al. 2009). Yet even these corporate functions are becoming more connected to external and internal partners through open innovation. The lab for the new generation of innovators is not just physical space and assets but also a broad network, both internal and external, of facilities, assets, and partners (Jelinek et al. 2012).

Rapidly expanding capabilities in data analytics will affect all aspects of R&D management. Communication and insight capabilities are changing quickly, enabling more effective collaboration across multiple sites but also creating greater complexity (Markham, Kowolenko, and Michaelis 2015). While data management tools abound, the practice of R&D will continue to be confronted with the need to manage large amounts of information in ever-shortening time frames.

Management of Staff

In the past, R&D leaders focused on managing other scientists and engineers and on developing a culture driven by technical excellence. Today, R&D is expected to blend technical and business acumen. As R&D teams become more dynamic, less specialty driven, and more widely dispersed, R&D leaders increasingly require a full set of "soft" skills in addition to cross-disciplinary technical and business skills. The acceleration in R&D may drive faster advancement to management and the development of more fluid roles—R&D leaders must be able to transition rapidly between people, project, and business management. People management needs are also

This fluid R&D environment is mirrored by a more fluid workforce.

evolving, as new generations of workers are often as motivated by vision, potential impact, and the opportunity for rich experiences as by traditional professional advancement incentives. At the same time, R&D leaders are increasingly being held accountable for contributing measurably to the company's sustainable growth objectives. In short, R&D leadership is moving from directing for technical excellence and managing for technical outcomes to coordinating, collaborating with, and inspiring staff to achieve business outcomes (Figure 2).

Gone are the days when leadership and management of R&D could focus on technical excellence and technical outcomes. In many cases, technical excellence and knowledge of current technology trends are only the bare minimum required to get the employee into the game. Increasingly, these skills must be supplemented by business skills and softer skills associated with teamwork, collaboration, and external partnering. And today's R&D staff must also have technical breadth, with expertise stretching across multiple technology domains.

The tools needed to support this workforce are changing as well, with managers needing stronger skills in "soft" management areas, such as coaching, communicating across functions, and collaborating to achieve results. In this future, R&D management means inspiring workers and driving business results in a highly fluid environment. In addition, the new generation of workers values the connection between their work and the greater good and looks to leaders to connect their individual assignments with wider company goals and social good. Teams are more likely to cohere around a project with purpose, forming tribes of matrixed employees who care little about hierarchies and direct lines of reporting.

This fluid R&D environment, with distributed labs and external networks, is mirrored by a more fluid workforce, with increased worker turnover, global talent pools, increasing use of consultants and other external personnel for focused technical needs, and a growing reliance on generalists to support fewer subject matter experts. Teams may come together for short-duration projects and then disperse, with a new team custom-built to take on the next

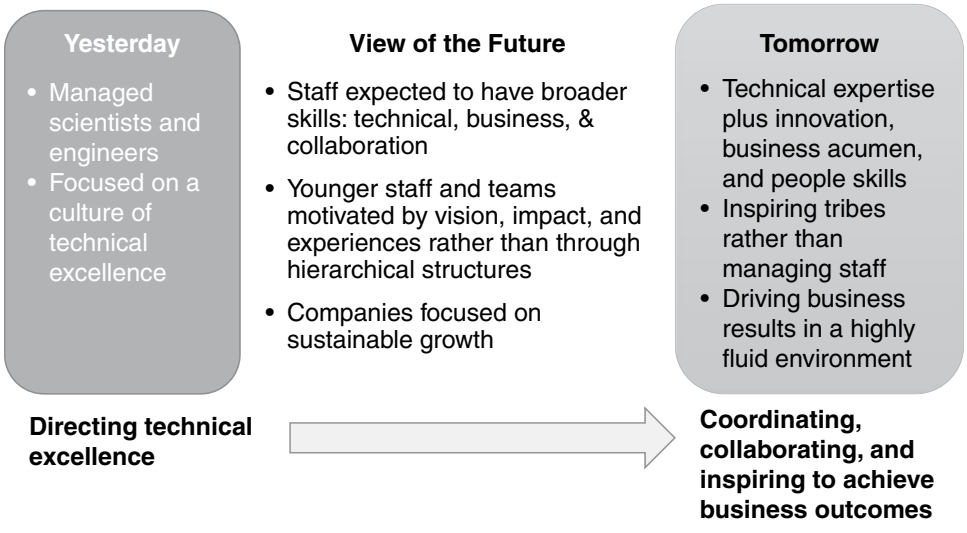

FIGURE 2. Trends: Management of Staff

stage of a development process. This fluidity means that team managers may not be entirely familiar with the strengths and working styles of every team member.

Networking—Internally and Externally

Networking has always been a core part of R&D leadership, but the nature of that networking is changing. Historically, networking has been driven by personal contact, with small but qualified networks built through formal and informal meetings, professional associations, and personal conversations. Networking for R&D relied on business card collections, technical conferences, and trade shows, and these contacts often resulted in long-standing relationships. Now we see multiple platforms bringing people together virtually, across companies, industries, and geographies. In the future, networking will be about virtual, anytime connectivity to anyone, intelligently supplemented by in-person networking. Thus networking is evolving from traditional, face-to-face networks to ad-hoc, opportunity-driven networks (Figure 3).

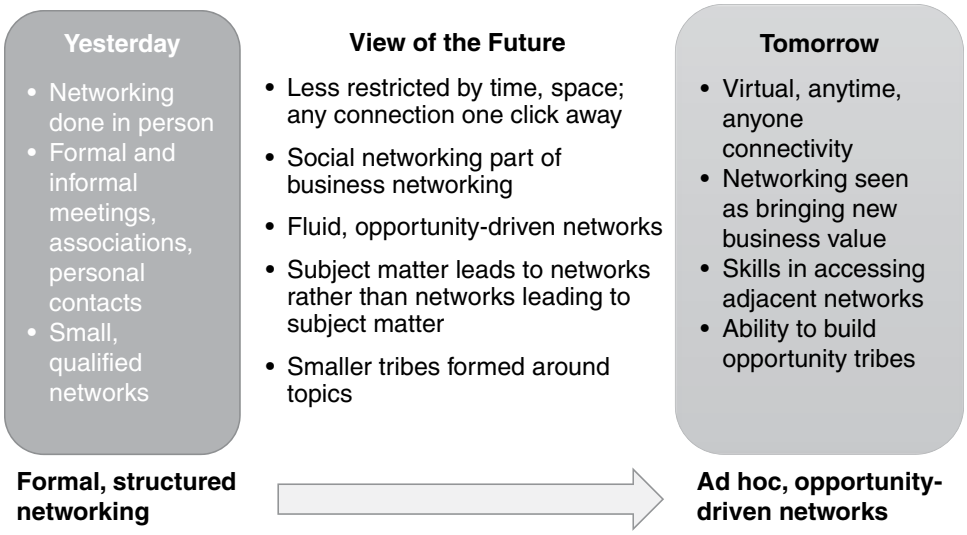

FIGURE 3. Trends: Networking—Internally and Externally

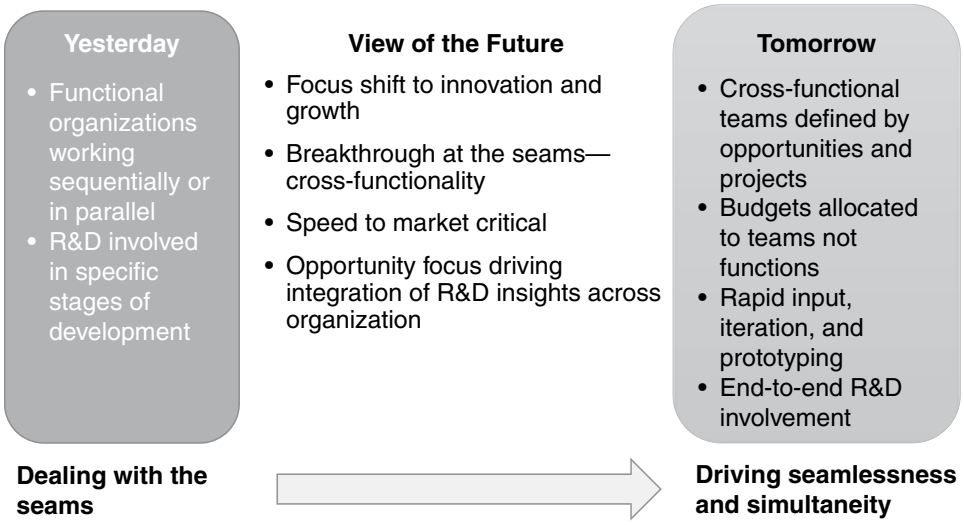

FIGURE 4. Trends: Working at the Seams

One key driver of this evolution has been the meeting of the virtual and physical worlds. As manufacturers of physical goods reach out to digital companies to understand how to improve their own products and operations, they create connections not only with the digital firms but also with manufacturers of sensors and other enabling devices. R&D circles are expanding quickly; companies and individuals are creating their own ad hoc networks based on current needs. Individuals increasingly participate in goal-oriented networks, rather than industry-centered networks.

These new structures present unique challenges with regard to intellectual property management and the ability to harvest value from network-generated insights. This changing nature of networking means that particular networks may have their own restrictions regarding dissemination of information about their progress and goals.

Working at the Seams

Traditionally, R&D has worked independently without much involvement from the rest of the organization. However, as it becomes clear that breakthrough innovation requires collaboration across the organization (Cotterman et al. 2009), working at the seams—at the interfaces between company functions and between the company and the wider ecosystem—is becoming imperative. The focus has shifted from research to innovation, with R&D having an important but not exclusive role in driving innovation. In addition, external partners, such as universities, startups, and government labs, also play significant roles. In short, the traditional boundaries between functions are collapsing; rather than managing the seams within and outside the organization, R&D is driving seamlessness (Figure 4).

Within organizations, once-entrenched barriers between individual functions are collapsing. R&D, marketing, and supplier management, once considered independent, are blending into innovation functions that are often combined into innovation teams. These teams are becoming more holistic and integrated across both physical and virtual

environments. The seam between R&D and manufacturing also is being erased. New, sophisticated technologies, such as additive manufacturing, simulation and virtual experimentation in product and manufacturing design, electromechanical manufacturing processes, robotics, and the Internet of Things, are changing manufacturing. Understanding how to exploit these technologies requires new skills in sophisticated analysis and collaboration, skills R&D can provide. Business models and supplier management also may need to adapt to support this trend. As these technologies evolve, more of R&D's focus will shift inward to internal process innovations. This trend may be heightened by the ongoing focus on cost cutting, as organizations hard-hit by unstable financial projections focus on innovation for efficiency.

Creating and Disseminating Content and Knowledge

One of the key aspects of any technical field is creating new knowledge and using it to create value. Historically, the products of knowledge creation have been closely guarded. Written reports or in-person meetings were the primary means of disseminating information. Those rules are being rewritten, however, by advances in technology that facilitate information sharing, by increasing openness within and across organizations, by the increasing pace of R&D, and by the more distributed nature of the research effort. R&D is moving from internally focused content creation and dissemination to multimethod integration, application, creation, and dissemination of knowledge (Figure 5).

Several trends are driving this shift. As a generation of R&D workers retire, they take with them significant stores of tacit knowledge, making knowledge management efforts even more critical. At the same time, companies are dealing with shortened timeframes for information generation—create, capture, push, share, digest—driven by accelerating cycles of technology development. Knowledge creation tools are also changing dramatically—as, for instance, big data tools enable meta-analyses across a wide range of sources (Markham, Kowolenko, and Michaelis 2015).

Historically, information was power, and companies were hierarchical. Now information is accessible to all. R&D content is less often shared through detailed reports than through briefing charts, e-mail, and online collaboration and sharing tools. Data and knowledge are being captured in diverse electronic systems, leading to new challenges around cataloging that knowledge and making it accessible. One adaptation is the extensive use of cloud storage inside the company firewall, coupled with a robust search engine, as a repository for most R&D data.

R&D organizations are increasingly under pressure to communicate their findings quickly to the rest of the organization and to outside partners, customers, and consumers. In short, as scientific advancement increasingly occurs at a nano-scale and competition increases on a global scale, the capture and communication of knowledge is both more difficult and more urgent.

With this increasing reliance on external parties and with instant capabilities to share information in the hands of everyone, protecting intellectual property is becoming more difficult. To some degree, this risk can be offset by speed to market, but more work needs to be done to guide intellectual property protection in the future.

Case Study: Eastman Chemical Company

In this phase of the work, we sought to highlight a specific example to better illustrate the changes captured in the Opportunity Thinking Vision Process. Eastman Chemical Company's partnership management system illustrates many of the principles we uncovered in developing a vision for the future of R&D leadership.

Eastman Chemical Company is a mid-sized specialty chemical company; in 2017, its revenues were $9.5 billion. The company has undergone a significant transformation over the last 10 years as it has sought to position itself as a differentiated provider of specialty chemicals and materials through a series of acquisitions and divestitures and an increasing emphasis on innovation. As part of this emphasis on innovation, Eastman's senior leadership decided an improvement in the company's open innovation efforts was needed. In particular, the management team sought improvements in processes to feed the front end of the innovation engine, provide access to unique capabilities, and bring in new and diverse thinking. In pursuit of these goals, leaders at Eastman rethought how they approached work with universities,

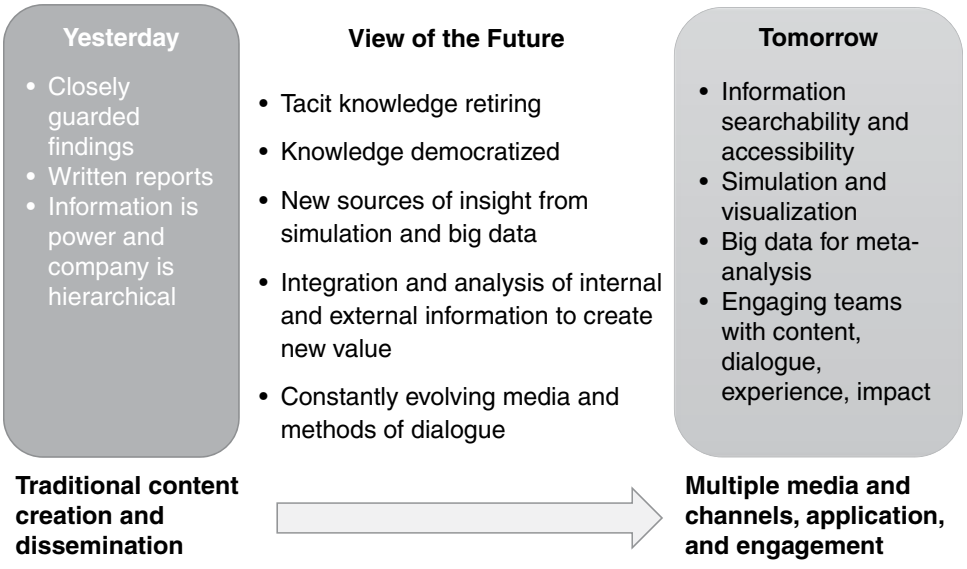

FIGURE 5. Trends: Creating and Disseminating Content and Knowledge

with a focus on much deeper relationships with fewer universities than they had pursued in the past.

Eastman Chemical Company's new model for university partnerships was introduced in fall 2012, when Eastman announced a unique partnership with North Carolina State University (NCSU). The partnership agreement with NCSU included several key elements (Hunt 2017):

- A substantial multiyear commitment—six years and $10 million for sponsored research.
- Engagement of a senior-level manager and staff to be located at the Eastman Innovation Center on the NCSU Centennial Campus.
- A Master Research Agreement (MRA) to expedite interaction between Eastman and university personnel by providing defined provisions for nondisclosure, intellectual property rights, publication review, and other key issues across all projects.

The partnership operates on a Request for Proposal (RFP) approach. Eastman technical personnel create RFPs that identify and define problems of interest; interested faculty submit proposals in response. The MRA ensures that proposals selected for sponsorship can be initiated quickly once a project plan and budget are approved.

In addition to the formal RFP process, Eastman staff at the innovation center interact with faculty members on a nearly daily basis to review project status and explore potential new project areas. The staff are active members of the university community, interacting with students, faculty, administrators, and the broader Research Triangle community. The NCSU agreement represents a highly networked, high-touch model driven by regular engagement between industrial researchers and their academic counterparts. The arrangement has produced significant results, including:

- More than 60 RFPs generating more than 180 proposals and resulting in funding of more than 75 projects aligned with Eastman business needs.
- More than 15 patent applications.
- Multiple publications and seminars resulting from sponsored work.

The agreement exemplifies aspects of changes in all five of the essences of R&D leadership:

- *The Practice of R&D*—The agreement moves Eastman from a big, corporate lab working on little ideas to a lot of little labs, distributed across the NCSU community, working on big ideas. This aspect is further emphasized by the signing of smaller agreements with two other universities—the University of North Carolina at Chapel Hill in February 2013 and the University of Tennessee in June 2015. In all three cases, a local company presence engages with domain experts at multiple locations.
- *Management of Staff*—The Eastman Innovation Center team is comprised of a multigenerational group of staff, spanning baby boomers to Gen X. These employees interface with a similar diversity in the academic community with which they partner.
- *Networking—Internally and Externally*—The Eastman team is a small group that maintains links to a much broader community within Eastman and at the partner universities.
- *Working at the Seams*—Eastman Innovation Center staff work across organizational seams at all stages. Identifying suitable projects involves connecting internal Eastman technical and business personnel with the appropriate faculty members. Project management requires coordinating reviews and input between Eastman and university representatives. These projects focus on outcomes and deliverables rather than strict adherence to organizational structure.
- *Creating and Disseminating Content and Knowledge*—Information exchange and transfer in this geographically distributed partnership is managed by new processes and tools, including extranet sites, a defined process for reviewing proposed publications and presentations, and formalized mechanisms for knowledge transfer.

This model for university partnerships and the development of processes to support it exemplify the changes in R&D leadership all organizations will need to engage with to meet business needs in a rapidly—and perpetually—changing business landscape.

Conclusion

Implementing the Opportunity Thinking Vision Process with a large group of R&D leaders led to a vision of R&D leadership in the future. Collectively, the participants envisioned profound shifts in how R&D leaders will drive value for their organizations in the future—by managing distributed resources across organizational boundaries, coordinating and inspiring staff both within R&D and cross-functionally to deliver business results, maintaining a wide variety of ad hoc, opportunity-driven networks, driving seamless behaviors on cross-functional and cross-organizational teams, and engaging with more data-centric ways of creating knowledge and multimedia channels for disseminating knowledge.

Having a view of the future and a vision for responding to it is critical for successful leadership. While R&D leaders often have a vision of where their organization is going, they have not had a clearly articulated vision of *how* their leadership and activities will need to change to get there. While the importance of specific trends will vary by industry and role and over time, every leader will need to consider how to adjust their skills and practices to the changing leadership

This model for university partnerships exemplifies the changes in R&D leadership all organizations will need to engage with.

landscape. These trends go beyond leadership style to truly reshaping the practice and competitive value of R&D. It is our hope that this vision will confirm activities already under way and offer challenge where a shift in leadership is needed.

We acknowledge several people for their contributions, including Dan Coughlin for his early contributions to the work, Ed Bernstein for his initial inspiration for conducting the work, Bailie Kollmer and Elizabeth Simmilink from NewEdge for their work on gathering insights, and Susan Neylon for her review of the article.

References

Aiman-Smith, L., Bergey, P., Cantwell, A. R., and Doran, M. 2006. The coming knowledge and capability shortage. *Research-Technology Management* 49(4): 15–23.

BASF Corp. 2011. *UNIQUE—The BASF Academic Partnership Program.* https://www.basf.com/en/company/innovation/our-way-to-innovations/collaborations/academia/UNIQUE.html

Bell, J. 2017. Boeing, Daimler and other industry heavy hitters join prominent universities at new R&D hub. *Portland Business Journal*, June 29. https://www.bizjournals.com/portland/news/2017/06/29/boeing-daimler-and-other-industry-heavy-hitters.html

Cordero, R., Farris, G. F., and DiThomaso, N. 2004. Supervisors in R&D laboratories: Using technical, people, and administrative skills effectively. *IEEE Transactions on Engineering Management* 51(1): 19–30.

Cotterman, R., Fusfeld, A., Henderson, P., Leder, J., Loweth, C., and Metoyer, A. 2009. Aligning marketing and technology to drive innovation. *Research-Technology Management* 52(5): 14–20.

Elkins, T., and Keller, R. T. 2003. Leadership in research and development organizations: A literature review and conceptual framework. *Leadership Quarterly* 14:587–606.

Euchner, J. 2016. Ecosystem innovation. *From the Editor. Research-Technology Management* 59(2): 9–10.

Farrington, T., and Alizadeh, A. 2017. On the impact of digitalization on R&D. *Research-Technology Management* 60(5): 24–30.

Gritzo, L., Fusfeld, A., and Carpenter, D. 2017. Success factors in R&D leadership. *Research-Technology Management* 60(4): 43–52.

Henderson, P. 2014. *You Can Kill an Idea…But You Can't Kill an Opportunity! How to Discover New Sources of Growth for Your Organization*. Hoboken, NJ: John Wiley & Sons, Inc.

Hunt, D. 2017. Eastman partnership a win-win. *NC State News*, June 14. https://news.ncsu.edu/2017/06/eastman-partnership-a-win-win/

Jelinek, M., Bean, A. S., Antcliff, R., Whalen-Petersen, E., and Cantwell, A. 2012. 21st-century R&D: New rules and roles for the R&D "lab" of the future. *Research-Technology Management* 55(1): 16–26.

John Deere Corp. 2017. John Deere to open strategic technology office at Iowa State University. Press release, February 21. https://www.deere.com/en/our-company/news-and-announcements/news-releases/2017/corporate/2017feb21-corporaterelease.html

Jones, J. N., Cope, J., and Kintz, A. 2016. Peering into the future of innovation management. *Research-Technology Management* 59(4): 49–58.

Markham, S. K., Kowolenko, M., and Michaelis, T. L. 2015. Unstructured text analytics to support new product development decisions. *Research-Technology Management* 58(2): 30–39.

Roussel, P. A., Saad, K. N., and Erickson, T. J. 1991. *Third Generation R²D: Managing the Link to Corporate Strategy*. Boston, MA: Harvard Business School Press.

IRI RESOURCES

SOLUTIONS TO YOUR R&D MANAGEMENT CHALLENGES

E-BOOK OR PRINT ON DEMAND

Access the best IRI has to offer in your choice of convenient formats. Browse special offerings and reprint collections from *Research-Technology Management* selected to offer perspectives on key challenges in managing technological innovation.

OPPORTUNITY FINDING

R&D FUNDING & VALUATION

SHAPING INNOVATION SUCCESS

IRI2038 FUTURES STUDY

SUCCESSFUL PORTFOLIO MANAGEMENT

GENDER DIVERSITY PLAYBOOK

IRI Industrial™ Research Institute

Creating Innovation Leadership Solutions

www.iriweb.org/reprint-collection