CREATING A WINNING R&D CULTURE—II

How a new five-step approach to increasing R&D group effectiveness was implemented more broadly in The Dow Chemical Company.

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OVERVIEW: *This is the second of two articles describing how a new approach to selecting, training and coaching people helped to improve the effectiveness of new business development at the Dow Chemical Company. Part I explained how key aspects of the approach, called Speed, delivered over $23 billion in cumulative value between 1991 and 2008 from the company's formerly commoditized Polyolefins and Elastomers (PO&E) business. Part II describes the implementation of Speed more broadly in Dow between 2005 and 2007. Dow Automotive R&D, for example, strengthened its culture of creativity significantly in less than one year. In 2007, Dow Performance Plastics and Chemicals business identified and coached six Rainmaker personality types in Business Opportunity Analysis techniques who then identified five breakthrough commercial opportunities with over $3 billion new revenue potential and $2.5 billion net present value. Speed can enable other businesses to also achieve the "Holy Grail" of strategy by enabling a firm to be both low-cost (with those parts of the business led by genetically-inclined Finishers), and innovative (with those parts of the business led by genetically- inclined Starters.)*

KEY CONCEPTS: corporate culture, genetic creativity, new business development, radical innovation, Rainmaker Index.

In a prior article in *Research-Technology Management* (Jan.-Feb., 2009, pp. 35-50), we described how the creativity of the R&D leadership culture at Dow Chemical's Polyolefins and Elastomers (PO&E) business was raised by implementing a new business development (NBD) philosophy called Speed. By using Speed, the commercial success rate of NBD activities was raised to 84-95% (vs. the norm of 11%) after completion of the early stages of NBD (*1-3*). In other words, the approach delivers profits per person-year eight times faster than standard stage-gate NBD processes, and consequently twice as much profit can be attained with an NBD group that is one-fourth the usual size. This is always beneficial, but especially in harsh financial times.

In 2005, Dow was realigned so that much of the rest of the company adopted this philosophy (*4*). Implementation was most rigorous within the Dow Performance Plastics and Chemicals Division, which includes Dow Automotive. This involved identifying and coaching six *Rainmakers*, each of whom completed a Business Opportunity Analysis.

In prior years, according to top management, Dow Automotive had greatly over-promised but under-delivered new business growth. Since that time, in 2006, new management established new growth goals that called for more than doubling the revenue and profits from this business by 2011. (This was prior to the severe 2008 automotive recession.)

The first thing top R&D management did was to rapidly raise the creativity of R&D management by bringing in more inherently creative leaders. This was achieved in less than one year (vs. 4 to 8 years for the business described in the first of these two papers), proving how fast this sort of cultural transformation can be achieved. However, even after these changes, Dow's new top Automotive R&D

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management was convinced that there was still insufficient creativity within the division's R&D leadership to generate the new products required.

To assess what actions were really needed, we started by taking the first step of the proven five-step model described in Part I of this series and shown in Figure 1 (*5,6*).

1. Raise Leadership Group's Creativity

The first step involved measuring the creativity of the Dow Automotive R&D leadership, again using Form G of the MBTI® psychological profiling instrument. As before, this was done on an entirely voluntary basis with participation exceeding 98% from both the top scientists and managers in leadership positions (designated within Dow as leadership level *LI* and above). The findings were a surprise to Dow Automotive top management. The 2005 Automotive R&D leadership group was slightly more creative than the PO&E R&D leadership group of 2001 on all metrics measured (Figure 2). This was even *after* PO&E R&D leadership had been transformed into a far more creative organizational culture than in 1991. This was a simple metric to measure, and it changed the expected course of action completely. Additional creative leadership did *not* need to be brought into Dow Automotive R&D.

2. Match Leadership Personalities to Job Roles

As noted earlier, the personality types of the Dow R&D leaders were determined by the MBTI instrument to be primarily *Starters* or *Finishers.* The next step involved ensuring that the *Starters* and *Finishers* among the R&D leadership were in the correct job roles (*5, 6*). For each leader, the directors assigned job roles as either *Starting* (involving *initiating* or *developing*) or *Finishing* (involving *growing* or *enhancing*). This was done prior to their learning the results from the personality profiling and independently of the personalities of the leaders currently in those roles.

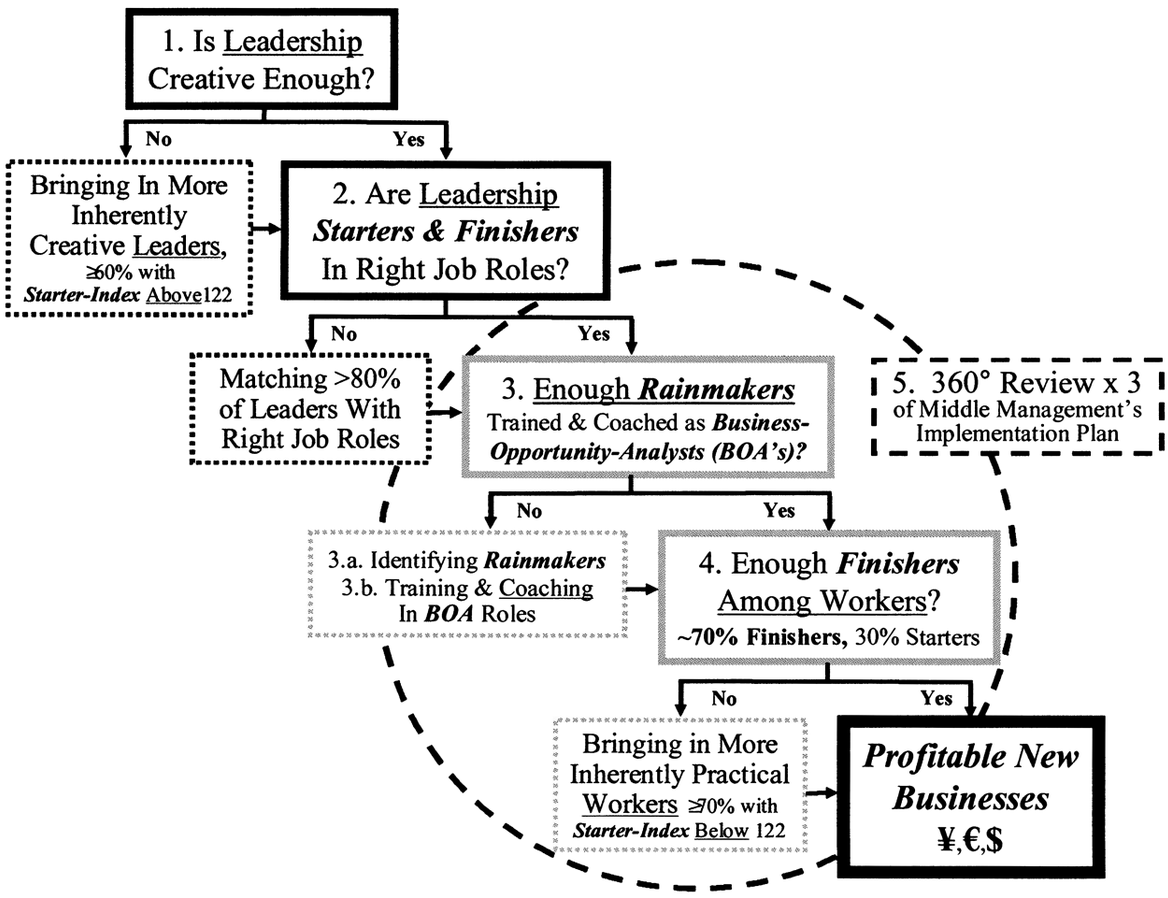

Figure 1.—Each step in this five-step model for increasing R&D group effectiveness contains new forward-looking performance metrics that are highly indicative of future NBD profitability, as demonstrated by a 15-year longitudinal study of actual profits delivered.

Personality Metrics Averages for Leadership Based on Form G of MBTI® Instrument	**2001** PO&E R&D Leadership	**2005** Automotive R&D Leadership
Creativity-Index (ENTP)	287	299
Rainmaker-Index (NT)	34.5	42.4
Starter-Index (NTP)	134	143
% Starters (% With Starter-Index ≥122)	57%	63%

Figure 2.—2005 Automotive R&D leadership was slightly more creative on all measures than PO&E R&D in 2001.

Next, the percent fit was determined, as shown in Figure 3. The overall fit of 75.5% was far better than PO&E R&D leadership in 1991 and about the same as the optimized group in 2001 (*5*, *6*). Although it could be boosted to 80–90%, the overall fit of the personalities of R&D leaders to their job roles was *not* found to be a major bottleneck to increasing NBD productivity in Dow Automotive.

The metrics involving *fit* between personalities of leaders and job roles can be easily measured in a matter of weeks. Appropriate action by management is clear. Changes in leadership can be achieved in a matter of months usually just by shuffling leaders within a group. This clearly benefits the company through increased productivity and pays for itself in a matter of months.

Equally important, the individual leaders and workers benefit psychologically (as well as career-wise) because they are allowed to do what they are best at doing, and therefore enjoy doing the most.

3. Train and Coach *Rainmakers* as BOAs

In the recent past, there was far too much internal project "selling" (regardless of the merits of the NBD concept) as opposed to figuring out what customers really needed and valued, and learning how to provide that. This was (and largely remains) the major bottleneck limiting the commercial success of Dow Automotive R&D, as well as most other R&D groups within Dow. Specific practices needing improvement (described more fully in Part I) include the following:

- Selecting inherently creative individuals for the role of Business Opportunity Analyst (BOA) is critical. The top third on the genetic *Rainmaker Index*SM *(RI)* identified projects which went on to out-earn the bottom third on the *RI* by a factor of 9,500%, when provided with the same training and coaching in stage-gate methodology. Those scoring above 40 on the *Rainmaker Index* routinely *morph* starting point ideas into winners (*3*).

- Better understanding of top management's *Gut Level Screen* was needed to gain top management's support.

- Better understanding of the customers' real functional requirements and needs (many of which are unspoken or even the opposite of what is initially articulated by customers). In short, Dow Automotive and much of the rest of Dow needed to gain a deeper understanding than the typical Voice of the Customer (VOC) provides, at least compared to how VOC is typically implemented.

Leadership Groups Only	**MBTI® Personalities**		**% Starters**	**# Mismatches**		**% Mismatch**
	# Starters	*# Finishers*		***Starters* in *Finisher* Roles**	***Finishers* in *Starter* Roles**	
Automotive R&D	31	18	63.3%	6	6	24.5%
					Swap?	
Plastics Subgroup	11	7	61.1%	2	3	27.8%
BES/DP Subgroup	4	1	80.0%	0	0	0.0%
MatEngCtr Subgroup	6	2	75.0%	1	1	25.0%
Emissions Subgroup	3	1	75.0%	1	1	50.0%
Adhesives Subgroup	4	6	40.0%	2	1	30.0%
			Probably Too Low		Probably Too High	

Figure 3.—2005 Automotive R&D leadership personalities (i.e., Starters and Finishers) were 75.5% matched with job roles and 24.5% mismatched vs. a goal of 80-90% matching.

• Earlier use of comparative system cost-performance models was needed from the customers' perspectives to determine whether the new business concepts will beat the best-performing competitors.

• Paying greater attention to developing a sustainable competitive advantage was needed, for example by establishing exclusive intellectual property rights, or through commercial agreements.

Paralysis by no analysis

One recent bad example of *not* learning the customer's key functional requirements, and of *not* determining competitive cost-performance models early, involved a new high-temperature crystalline engineering thermoplastic, targeted in large part at automotive applications (Questra® syndiotactic polystyrene). While there was a lot of wishful thinking about what customers might need, the physical properties of the polymer did not meet *the real functional requirements* of customers, and the cost to produce the new polymer was uncompetitive with commercial alternatives. As a result, only a few million pounds per year of this polymer were ever sold from a production plant with 79 million pounds capacity. Finally the entire plant was shut down, after receiving a painful lesson from the marketplace (*7*). This is not a case of Monday morning quarter-backing—it was avoidable. BOAs had shown it should never have been allowed to go forward.

Positive findings from Business Opportunity Analysis

In contrast, two positive examples follow: one was being commercialized at the time of this writing and the other pending commercialization following a complete Business Opportunity Analysis. The first involves energy-absorbing materials for automotive applications. The real customer functional requirements were ultimately learned, including what the customer could live without, provided the price was that much more competitive. In this case, the business achieved its understanding by entering the business with earlier, more costly versions of the product. Although it worked, and ultimately led to the creation of an opportunity highly likely to grow to over $100 million in automotive sales, management deemed the process to be far too slow.

Business Opportunity Analysis was used within Dow Automotive as well as in other parts of Dow Chemical to speed up the NBD process. Overall, six Business Opportunity Analysts were trained and coached in 2007, not only for Dow Automotive, but also for other Dow Chemical businesses. The six BOAs were selected for their inherent creativity, with *Rainmaker Indices* averaging well over 40. All were good, solid contributing employees, but none were in the group deemed by management to have the highest career potential. They were rigorously trained and coached one-on-one over an extended

Selecting inherently creative individuals as Business Opportunity Analysts is critical.

period of time in Business Opportunity Analyst roles, as described earlier. True to form, all six BOAs found that the initial new product concept they were given to explore needed to be laid to rest and, instead, morphed into commercially viable opportunities. The new concepts that the BOAs created were then evaluated (by them) as rigorously as their initial concepts were.

In the second example, one of the initial concepts in Dow Automotive started out very broadly, exploring opportunities for adhesives and materials in non-automotive transportation markets. It's hard to get much broader than that. By examining the secondary literature and with an understanding of top management's Gut Level Screen, the project zeroed in on adhesives for a particular class of heavy-duty truck trailer cabs. The initial concept proved too small to be of great commercial interest and was shelved. However, after thoroughly investigating the customer's needs, and building system cost-performance models for competing processes, the highly creative BOA morphed the starting point concept. This resulted in three new opportunities for adhesives and materials of construction, not only for heavy-duty truck cabs but also for trailers. The three new opportunities identified by this one BOA were estimated to generate $500 million in profits per year at maturity. The understanding developed was so deep that it was also determined that another ongoing initiative within Dow also involving heavy trucks should be shelved. This provided the opportunity for immediate and substantial savings, more than paying for the entire program.

From good to great employee performance

This example from Dow Automotive was typical of the six BOA projects conducted in parallel within Dow. As predicted, of the six individual BOAs coached, five identified winning opportunities, all with projects that the creative BOAs substantially morphed from their starting points. The potential dollars of new revenue were conservatively estimated (in 2007) at over $3 billion per year at maturity, with a net present value of $2.5 billion. This is highly significant even in a company

with $53 billion per year in sales, and shows the potential power of this approach from even a very small tribe of six *Starters* when fully trained and coached in NBD discipline. In short, these employees went from *good* to *great* in their job performance, by learning and implementing this new non-linear approach to NBD. They did not need to be superstars for this approach to work.

Another way to say this is that it's time to "raise the bar." After every one-to-two person-years of effort from the front end of NBD, a company should routinely provide new business opportunities to later commercialize that have *at least* $25 to $50 million dollars/year in profitable future sales potential. This has been proven to be possible in two longitudinal studies lasting more than ten years, both using this new approach (*3,5,6*). If that is not happening, then the proven five-step approach, with new forward-looking metrics for each step (as described in our two papers) should be helpful. If a steady stream of breakthrough products can be created even from a formerly commoditized business like Dow's Polyolefins and Elastomers, then large and profitable innovations can be created anywhere.

Figure 4 illustrates the first three steps of the approach as a new three-part model for creativity: 1) The light-bulb represents the creative individual who comes up with the ideas. Clearly, if the bulb is not lit, there will be no innovation regardless of the organizational culture; 2) The openings between the shade in the window represents a visionary management; 3) The slatted shade itself represents the process of managing and morphing starting-point ideas. The ideal situation exists when the light-bulb is lit and the window is open but partially shaded. In this case, the light of innovation is filtered, and managed so that it can make it to the marketplace. Conversely, it does not matter how much innovation is going on within the organization if the "management window" is closed to innovation.

The window in our model also needs to have a filter on it, represented by a shade, illustrating that management needs to filter and morph starting-point ideas, which are

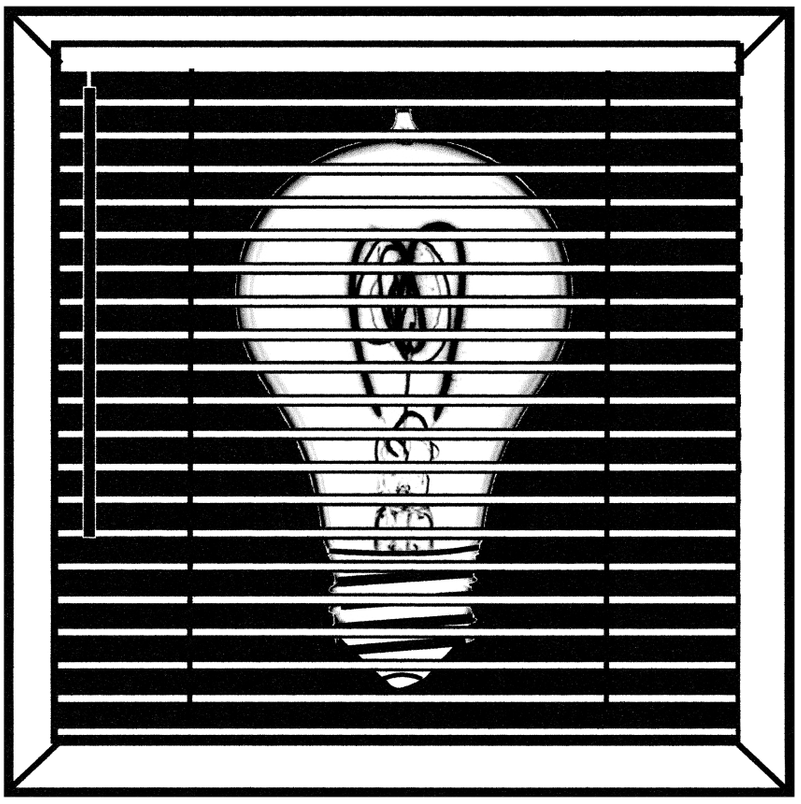

Figure 4.—A lit light-bulb represents the inherent creativity of inventors in this new model of innovation and creativity. The openings between the shades represent visionary management, allowing the creativity to shine through. The partially closed shade represents management's filter, needed to manage and morph *starting point ideas into commercial winners.*

usually doomed to fail, into winners. Management also needs to provide the resources needed for their commercialization. NBD processes that are circular and iterative are essential in accomplishing this, and are a key part of the filter. Further, if the shade is fully open, the light will then be far too harsh: anarchy will reign in the form of "idea-rrhea," as the organization wastes vast sums of money chasing far too many ideas. Recall that 99.7 percent of the early-stage ideas submitted as patent disclosures (or to venture capitalists) are unprofitable (*1*).

A top manager at a major automotive supplier told one of the authors (Stevens) that he firmly believed his own creativity was determined by the environment. He thought so because while at one of the formerly "Big-Three" Detroit-based automotive firms he had very few ideas commercialized. However, after he moved to the automotive supplier he launched many highly successful innovations. This is one reason why many people mistakenly believe that creativity is not genetic but is determined by their environment. However, in the scheme of the new model, he was always a "lit" lightbulb. It is just that when working directly for the automotive firm, the "management window" was not open. At the supplier company, the management window was open to new business concepts, while also filtering them, so his inherent innovativeness could be realized.

It is becoming better recognized that the degree to which key individuals are creative, leading to invention and innovation, is largely genetic (*5*). However, the degree to which management is visionary and open to innovation is also determined by their collective personalities, which are also determined to a large extent by genetics (*5*). Therefore, even the corporate environment, or corporate culture, within which ideas for NBD are conceived, is determined to a surprising extent by genetics. In brief, the corporate *environment* for innovation is largely *genetic*!

4. Ensure Enough *Finishers* Among Non-Leadership Professionals

As noted earlier, someone has to finish the projects, making sure that they meet all of the customer's requirements in a cost-competitive fashion, and then move them from the lab to the customers in order to make money.

The makeup of *Starters* and *Finishers* among non-leadership professionals within Dow Automotive R&D still needs to be determined, and compared to the extraordinarily effective PO&E non-leadership group. This is an easy metric to measure and monitor, and can be adjusted quickly. The makeup of the Automotive R&D non-leadership professionals (i.e., the working group) may well have too high a percentage of *Starters*. If so, this could have contributed to a relative lack of effectiveness in past years.

The corporate environment for innovation is largely genetic!

5. Review Middle Management's *Implementation* Plan

Once the Business Opportunity Analysis group is established and providing a stream of highly commercial recommendations for the business, it will also be important to conduct multiple reviews of middle management's plans to extract maximum value from the BOA findings, as noted in Part I (*5*). This has not been happening often enough, if at all, in most Dow businesses (outside of PO&E R&D). The result has been a bottleneck in NBD productivity, with much potential value being left on the table. For example, the six Business Opportunity Analysts who were recently coached collectively identified over $3 billion in potential new sales (*8*). If two-thirds of that value was not pursued due to middle management inaction or failures (as is typical), then potentially $2 billion of profitable future sales would be lost.

Recall that the odds of completed BOA projects being profitable if commercialized are between 84% and 95%, assuming the technology risk is low (*3, 5*). This is remarkably high vs. the norm of 11% success after the end of the early stages of NPD (*1*). Morever, $2 billion divided by $566,000 sales per employee at specialty chemical companies, like Rohm and Haas in 2007, equates to 3,500 potential new jobs. Thus, the stakes for companies and entire regions are high. Senior leadership must ensure these periodic planning meetings occur in order to raise implementation rates dramatically, thereby capturing most of the potentially wasted $2 billion in profit, as well as maximizing future employment potential.

In Conclusion

The lessons learned from Speed-Based Development in Dow's PO&E over 15 years made it possible to implement the approach much more quickly in other parts of Dow. Using the same five-step system, Dow Automotive R&D improved its leadership culture of creativity in less than one year vs. ten years for PO&E. Of course, only time will tell whether this continues, since constant reorganizations too often lead to organizations that *forget* rather than *learn*.

Between 2005 and 2007, Dow identified coached and trained six *Rainmaker* personality types in Business Opportunity Analysis techniques. They identified five breakthrough commercial opportunities averaging over $500 million revenues per year each at maturity, with over $3 billion per year total new revenue potential and $2.5 billion net present value. With only one in 125 issued patents typically proving commercially successful (*3*), just as statistically expected, *none* of the starting-point ideas that the BOAs investigated turned out to be commercially viable. All of the commercial opportunities identified required the creative *Rainmaker* BOA*s* to morph the starting-point ideas into winners via a *non-linear* NBD process. The Speed approach provided a clear, actionable environment for creating a winning R&D culture and raised the coached employees' performance from *good* to *great*.

The greater productivity from this approach means that twice as much profit can be attained with an NBD group that is four times smaller than usual. In other words, it's time to raise the bar: After every one-to-two person-years of effort from the front end of NBD, the organization should routinely provide new business opportunities to later commercialize having at least $25 to $50 million dollars/year in profitable future sales potential! If that is not being realized, then the actionable five-step approach with forward-looking metrics for each step (described in our two papers) should be helpful.

The principles of Speed that have worked in PO&E and other parts of Dow should enable other businesses as well to achieve the Holy Grail of strategy by enabling these firms to be both *low cost* (with low-cost parts of the business led by genetically-inclined *Finishers*), *and innovative* (with differentiated parts of the business led by genetically-inclined *Starters*). Such a combination of *low-cost* plus *innovative*, *differentiated* products and services should be unstoppable. We predict this will increasingly become the winning strategy for large organizations in the future. ▲

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