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See the Future—Choose Your Future

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ABSTRACT:

This is the sixth in a series of articles addressing how R&D organizations in the US are implementing key elements of the "high performance business model." The HPB model integrates Strategy (S), Processes (P), Resources (R), and Organization (O) to deliver high performance business results.

Our previous article discussed how technology resources available from third parties could be used to achieve near-term breakthrough business performance. But what about markets that are further out in time? Can those markets only be satisfied with "quantum leaps" in innovation? Is it possible to exploit future market and technical "discontinuities" to your advantage? Or will discontinuities continue to represent threats to your existing market position? This article shows how *you can see the future* objectively and how that vision can *expand your business choices* and ultimately *direct you to pacing and emerging technologies* that someone (perhaps you) will be using to establish market leadership.

FIRST, SOME OLD PHILOSOPHY AND SOME NEW VOCABULARY

"My interest is in the future, because I am going to spend the rest of my life there"... a quote from Charles Kettering, founder of Delco, VP of GM Research Company, and inventor on 140 patents.

"The trouble with our times is that the future is not what it used to be"... a quote from Robert Frost, American poet.

"It isn't that they can't see the solution. It's that they can't see the problem"... a quote from G.K. Chesterton, London-born 20th century writer.

Taken together, these quotations philosophically express the drivers, risks and opportunities inherent in managing technology for future competitive business advantage. Technology managers must embrace the future—they'll be living in it soon enough. And they're certain that, no matter what the future holds, it will be different from the past and probably different from any linear projection of the present. And, as the backlog of technical innovations (the *solutions*) grows, so does the gap in understanding which of them holds the most promise for commercial success (what *problems* these solutions can sustainably and profitably address)!

If technology managers could see clearly into the future, what exactly should they be looking for? For a start, we would want to see enough to allow us to project which technologies could contribute to competitive positioning and business impact and how they might do so.

One key determinant of technology's future: the *evolution over time of the performance desired or required by a given end-use market*. Thinking clearly about whether, how, and why a given performance requirement will change over time is fundamental to understanding which technologies could be commercial winners in the future.

Next, thinking objectively about the *performance limits* of existing technical solutions *in the context* of evolving end-use performance requirements leads to predictions of maximum tension in the technology supply/demand balance. A graphical representation of this *technology supply/demand balance* is presented in Figure 1. Figure 1 illustrates that Technology "A" shifts to Technology "B" at the point where A reaches the limits of its ability to deliver against functional market requirements and B exists to (literally) fill the gap.

AN EXAMPLE: WHY THE "PERFORMANCE" AXIS COUNTS MOST

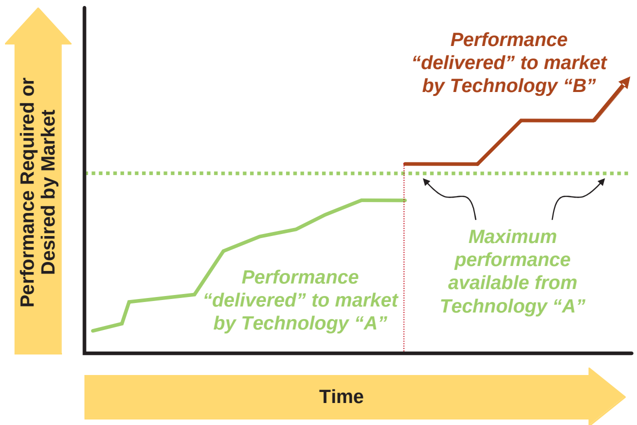
To help make the concept of 20/20 Foresight more real, let's consider an example: passenger car tires made for and sold to US automotive original equipment manufacturers (OEMs) by US tire manufacturers. In this example, we will define technology "A" as "bias" and technology "B" as "radial." Bias tire technology and radial tire technology each can be unbundled into a number of associated component technologies, e.g., material, design, process, and equipment technologies.[1] Each component technology has its own "20/20 Foresight" diagram. For the purpose of this

1. For a good collection of relevant articles, see Rubber Products Manufacturing Technology, Marcel Dekker, 1994; Anil K. Bhowmick, Malcolm M. Hall, and Henry A. Benarey, editors.

Figure 1. Technology Contribution to Competitive Positioning and Business Impact

"20/20 Foresight"SM is TIAX's methodology for spotting, in advance, significant shifts in commercially valuable technologies.

- All such shifts are driven by *foreseeable gaps* between what a technology *can deliver* and what the market *wants*.



20/20 Foresight is a service mark of TIAX LLC.

The new vocabulary introduced in Figure 1: **20/20 Foresight**

- **20/20:** 20/20 vision is a term used to express normal visual acuity (the clarity or sharpness of vision) measured at a distance of 20 feet. If you have 20/20 vision, you can see clearly at 20 feet what should normally be seen at that distance. 20/20 vision does not mean perfect vision. It only indicates the sharpness or clarity of vision at a distance (source: http://www.visionww.org/article-what-is-20-20-vision.htm)
- **Foresight:** (noun) seeing ahead; knowing in advance (source: http://www.webster-dictionary.org/definition/foresight)

example, however, we will remain at the higher level of "bias" vs. "radial."

Furthermore, in this example, we will define "performance" (the y-axis) as the sum total of all performance demands made by US OEMs on passenger car tires. Performance demands fall principally into one or more of the following categories:

- Increased tire service life
- Increased safety
- Reduced energy consumption
- Improved ride

Back in the 1950's and 1960's, US tire makers were reveling in the innovations that allowed them to meet the ever increasing demands on tire performance from the automotive makers. Advances in materials (e.g., introduction and availability of synthetic rubbers; of tailored carbon blacks); in design (e.g., migration of bias tires to bias belted tires); and in process equipment and know-how (contributing to greater product uniformity) had advanced the passenger car tire product to the point where warranties were approaching "30,000 miles." Then, those who were in the industry at that time began hearing "whispers" of the "100,000 mile" tire! For those who were caught in the bias tire world, a "100,000" mile tire, under any set of normal driving conditions, seemed impossible. Yet, if it *were* possible, what would that do to the existing industry? Existing materials and designs indeed could *not* deliver such an extended lifetime. After all, a 100,000 mile tire implied 5–10 years of driving without a tread going "bald", without sidewalls failing, without the tread separating from the carcass, without underinflation or over-inflation causing failures related to heat build-up within the plies. What technologies could deliver that performance?

As we know, *radial tire technology* was the *solution* to the "100,000 mile" problem (opportunity!). Radial tire technology revolutionized the tire industry globally—everyone in the value chain was affected. Radial tire constructions delivered break-through performance and, at the same time, required breakthrough performance in their enabling and component technologies (e.g., adhesion of steel reinforcing cords to rubber). Existing investments in bias tire production equipment, from raw material processing to tire building to tire curing, were not applicable to the production of radial tires. Bias tire production lines became "cash cows" in the best cases; bias tire plants became candidates for closure in the worst cases.

Uniroyal was one of the US domestic tire companies to make the decision to transition to the new, revolutionary radial tire technology. That decision was based on a number of factors, but its ability to do so was based on one critical (business) factor: it had a commercial commitment to the US automotive OEMs as a customer base—indeed, Uniroyal enjoyed a favored position as a tire supplier to General Motors. The commercial relationships were multilevel, which meant timely multi-level *access* to ever evolving performance requirements and specifications. Moreover, radial tires were not a "drop in" replacement for bias tires in new cars—US automakers had to re-engineer cars to realize the performance advantage potential inherent in radial tires. So, "coordination" in innovation—innovation in radial tires as well as innovation in car design—was a necessary condition for the commercialization of radial tire technology in the US.[2] Uniroyal's close relationship with General Motors helped facilitate such coordination. In effect, Uniroyal could "see the future" of US OE passenger car tires. Indeed, Uniroyal could see as far as US OE customers, who relied on tire suppliers such as Uniroyal to help them set the pace for performance improvements. The question for Uniroyal became: "Now that we can see the future, what future do we choose for ourselves?" (For the answer, the reader is referred to the paper by Rajan, Volpin, and Zingales referenced in footnote 2.)

Our Example, Continued: Why Technology Alone Is Not Enough

In 1969, Uniroyal chose to build the world's then-largest radial-only tire plant in Ardmore, Oklahoma, to serve its US automotive OE and aftermarket customers. (Michelin operates it today and it's considered to be the most cost-efficient tire plant in the

2. For a superb "20/20 hindsight" analysis of the US tire industry, the reader is directed to "The Eclipse of the U.S. Tire Industry," by Raghuram Rajan, Paolo Volpin, and Luigi Zingales, March 20, 1997, http://gsbwww.uchicago.edu/fac/raghuram.rajan/research/tire.pdf

world.) Although radial tire technology was revolutionary to the US automakers and its tire suppliers in the 1970's, it was not a new technology. Consider what had been going on in Europe:

- The first radial tire is said to have been invented around 1913 by Gray and Sloper of the Palmer Tyre Company in the UK.
- Michelin developed an avant-garde solution, the radial casing, and filed the patent for the radial tire on June 4, 1946.[3]
- Michelin introduced radials into commercial production in France in 1948.
- By 1955, most of the European automotive industry had adopted radial technology.
- Uniroyal's own European operations had started the production of radial tires in the late 1950's.

Rather, it was the convergence of the market need with the technology solution that paved the way for the complete transformation of the US OE (and aftermarket) tire industry to radials. Radial technology alone was not enough. Consider the issue from the perspective of Gray and Sloper: these two inventors likely had great-grandchildren before their invention had been in commercial production in the US. Consider the issue also from Michelin's perspective: by the time Uniroyal's first US radial tire plant was opened, 98% of tires sold in France were already radials and almost 2/3 were supplied by Michelin. Yet it wasn't until 1985, almost 40 years after Michelin filed the first patent on the radial tire, and 10 years after opening its first US production plant, that Michelin's share of the US market topped 10%. Radial technology alone was not enough.

"Identical (and correct) visions of the future produced a number of different alternative business responses to it."

The Future May "Impel" but It Doesn't "Compel"

When Uniroyal looked at the future of passenger car tires, it saw clearly that changes in its automotive OE customer base would lead inexorably to the rapid adoption of radial tire technology throughout the US. Other US tire producers saw the same future, but they chose a response different from that of Uniroyal. *Identical (and correct) visions of the future produced a number of different alternative business responses to it.*

The alternative responses[4] included:

- Withdrawal from US OE market, choosing instead to serve the always profitable aftermarket (B.F. Goodrich)
- Postponement of the expensive transition to radials by pushing the performance envelope of belted bias tire constructions, with disastrous quality and financial consequences (Firestone)
- Choosing to own both the OE and aftermarket "market space" (Goodyear)
- Managed withdrawal from tires as a line of business (General Tire)

The availability of radial tire technology *enabled* certain business choices, but just as certainly compelled none of these choices.

Using 20/20 Foresight to See Your Future

20/20 Foresight is a useful tool if used in a thorough, rigorous and disciplined way. As the Uniroyal/radial tire technology example was intended to show, it's most important to understand in as much detail as possible the dynamic evolution of performance requirements in the end-use application. The performance requirements should be viewed in the context of the entire system in which technology is used (e.g., innovations in radial tires require/influence innovations in the automobiles in which they're used).

20/20 Foresight is applicable to any and every technology that is being applied or might be applied to a current or future market need. To paraphrase one of the quotes that opened this article: you must see the problem clearly and correctly. Seeing the problem clearly and correctly is the same as seeing your future. How to choose to respond to that future is just that: your *choice*. And it's a choice that depends on much more than just your current or future technology options.

3. Reperes_Milestones_2003_fr_en[1].pdf
4. Raghuram Rajan, *op. cit.*

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