Speed Matters:

Innovation in the NASCAR Motorsports Industry[1]

by

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by Carlos Martinez-Vela, Ph.D.

1. Introduction

I am delighted, and I am honored, to be among you today to share some of the findings of my research on innovation in NASCAR motorsports, which I started when I was a doctoral student at MIT. Working on this research has been the most fascinating journey during my years at MIT. A high moment during my Ph.D. experience happened last year, when I spent race weekend at the New Hampshire International Speedway in Loudon immersed in the garages and pit area observing and learning from the practice sessions of Friday afternoon to the post-race inspection on Sunday. When I was there I understood with great clarity something that Andy told me when I first met him: That racing just "sucks you in." It is an experience that captures all senses.

This journey began in February of 2003. At that time I was part of a research team working on the Local Innovation Systems Project, an international research partnership based at the MIT Industrial Performance Center. That project, which brought together a group of researchers from the United States, United Kingdom, Finland, Japan and Norway, addressed an important question facing regional economies around the world: How can regional economies survive and prosper in the global economy? More specifically, we studied the role that universities and other higher education and research institutions play in enhancing the creation and transformation of industry clusters.

I came to Charlotte looking for an additional case study for the Local Innovation Systems Project. When I first came here, though, I was not looking for motorsports. In fact I didn't even know there was such an industry or that it was located here. I knew nothing at all about NASCAR or about racing. I came here because I had found some data that suggested a concentration of machinery and metalworking companies. Since I had been doing a study of innovation in that industry in Tampere, Finland I wanted to explore whether a meaningful comparison could be made with the Charlotte region.

Because of my interest in the role of the university in industrial innovation, the first stop was UNC Charlotte. There, the office of former Chancellor Jim Woodward kindly arranged a series of interviews with university professors and administrators, as well as with some prominent civic leaders in the city. My second conversation was with former Chancellor Woodward himself. On minute 43 of the interview he said: "Now that you are talking about mechanical engineering, well, the center of motorsports in the country is the Charlotte region." That captured my attention and intrigued me. I kept inquiring about it in subsequent interviews during those two days and then once back in Boston I followed up with some research to get an idea of what was going on. I started to discover that most NASCAR teams were located here and also that there appeared to be a whole industry around them. In that way the NASCAR motorsports industry in the Charlotte region became not only part of my own doctoral research, but also one of 23 case studies of as many regional economies in which we studied industries such biotechnology, machinery, optoelectronics, and oil and gas in five countries.

Here in the Charlotte region we studied motorsports. In the context of the Local Innovation Systems Project this case study was one of "industrial upgrading." The motorsports industry grew out of a hobby; of the backyard garages of car aficionados that were tinkering with their cars and racing them informally during the first half of the 20th century. How did this hobby become a multi-billion dollar, innovation-intensive industry? I started from the premise that one key driver of this transformation had been technological innovation, which becomes evident if we look, for example, at the performance improvements of the engines over the last few decades. A key question for our study was whether local universities and other higher education and research institutions in the region had played a role in the technological transformation of the industry.

While the NASCAR motorsports industry has been transformed at multiple levels – organizational, technological, business models and so on – my research took a primary interest in *technological innovation*. Within that domain, the study proceeded by focusing

primarily on NASCAR teams, the primary anchors of the industry cluster in the Charlotte region, and on the technological evolution of stock-cars. The story would probably be different if, for instance, the focus had been on innovation in the supplier base, or consulting, or services. When it comes to the role of universities, the study centered on UNC Charlotte and its relationships with the industry as a whole and NASCAR teams in particular. I recognize that community colleges, for example, are important players in the higher education–industry relationship for motorsports. However, they were not the main focus of this study.

Before I continue, I must say that this research builds primarily upon the experiences and insights that many of you and others in the industry shared with me during more than 60 interviews. These interviews included, in addition to industry practitioners, professors and administrators in UNC Charlotte and the community colleges in the region, as well as local government and economic development organizations. For your time and for your openness throughout this process an industry that has little time for anything, I am deeply grateful. I also recognize the work and contributions of my colleague Kimmo Viljamaa from the University of Tampere in Finland, with whom I did the first part of this research and developed some of the early insights and writing on this case study. Finally, this is an interpretation that is open to be questioned, challenged, and improved. Your feedback to improve it is more than welcome. I am an observer. You are the true experts in what you do.

2. Why motorsports?

As the research started it became clear that NASCAR motorsports –and I would later learn, all forms of professional motorsports– are quite special in several respects.

First of all, the industry is incredibly diverse. As John Connaughton from UNC Charlotte observed in his widely-cited economic impact study, the motorsports industry brings together businesses in more then 40 industrial classification codes. Given this diversity it is hardly a surprise that accounts of industry clusters solely based on using economic or census data to count businesses and employment in a few industry codes

concentrated in regions around the country had never accounted for the more than 450 businesses and thousands of jobs related the motorsports industry cluster here in the Charlotte region –and North Carolina as a whole.

Beyond the diverse nature of the industry, let me cite the opinion of British scholars Steve Pinch and Nick Henry, who have studied the UK's motorsports industry, where the vast majority of the Formula One industry is concentrated within a 50mi radius of Oxfordshire. About the motorsports industry, they say:

> "In many respects [motorsports] is the ultimate post-Fordist industry involving, on the one hand, technological innovation and, on the other hand, a global spectacle based around image and multiple, complex signifiers. Few industries produce such small batches of highly specialized products that require so much continuous modification, and few industries gain such vast amounts of investment in the form of sponsorship from global corporations. In addition, few industries have provided such vast fortunes for some of their key entrepreneurs. However, rather than the acquisition of wealth per se, what binds many people together in this industry is the desire –some might say obsession– with winning races. Thus, inspired by their leading personnel… few industries can command such dedication from their employees in terms of hours worked and commitment to the main objectives of the firm."[3]

Except for the global scope of Formula One (compared to the mostly national scope of NASCAR), all of these features that Pinch and Henry associate with Formula One (I do not know about the fortunes) are also present in NASCAR motorsports. Together, they make the industry a fascinating arena for research on industry and innovation from which there is much to be learned.

But Steve Pinch and Nick Henry rightly clarify that, rather than motorsports being unique, the industry's distinctiveness is a matter of degree. All industries are subject to

[3] Steven Pinch and Nick Henry, "Paul Krugman's Geographical Economics, Industrial Clustering and the British Motor Sport Industry," *Regional Studies* 33 (1999) 815-827.

competitive pressure, the need to innovate continuously, regulation to a higher or lesser degree, and so on. In these and other respects however, motorsports is an extreme case and as such it brings into high relief the effects of these pressures on the life of an industry. Three features, in particular, capture the extreme nature of the motorsports industry. The first one is the intensity of competition. In the motorsports industry innovation is driven by competition. The industry is hypercompetitive because everyone is working with virtually the same technology and competing from week to week. Second, NASCAR is a highly regulated industry. NASCAR is the regulator that sets the rules of the game and dictates what can and cannot be done with the cars to make them go faster. The industry as a whole is constantly given new problems to solve in the form of ever-changing rules, forcing a continuous flow of innovation. The third extreme feature of the industry is speed. Not only is the goal of the business to go fast. Innovation needs to happen as fast as possible in order to keep a competitive edge. Using the terminology of Charlie Fine, a professor at MIT's Sloan School of Management, the motorsports industry operates at an extremely high clock-speed.[4]

Together, these extreme conditions make innovation in motorsports come alive vividly, and make of the motorsports industry, I believe, a privileged arena for research on industry and innovation. I see in motorsports what Elting Morison, a revered historian of technology who spent his scholarly life at MIT, saw in navy ships. In Chapter 2 of his book *Men, Machines and Modern Times*, –the chapter's title is "Gunfire at Sea: A Case Study of Innovation"– Morison explains why he chose the introduction of continuous-aim firing in the United States Navy in the first years of the 20th century as a case study of innovation. He tells us:

> "I have chosen to study this episode for two reasons. First, a navy ship is not unlike a society that has been placed under laboratory conditions. Its dimensions are severely limited; it is beautifully ordered and articulated; it is relatively isolated from random influences. For these reasons the impact of change can be clearly discerned, the

[4] See Charles H. Fine. *Clockspeed: winning industry control in the age of temporary advantage* (Reading, MA: Perseus Books, 1998).

resulting dislocations in the structure easily discovered and marked out. In the second place, the development of continuous aim firing rests upon mechanical devices. It therefore presents for study a concrete, durable situation."[5]

The extreme conditions of competition, regulation, and speed in the motorsports industry suggest an analogy to Morison's navy ship. In motorsports, innovation is under laboratory conditions. Within an apparent chaos is revealed an industry "beautifully ordered and articulated" around a durable artifact –the race car– and an activity –racing– in which the impact of change and the social process of innovation can be clearly discerned after careful observation and analysis. To me, studying innovation in NASCAR motorsports has been like observing innovation under a magnifying lens. What comes to light when we see through the lens?

3. The innovation process

The first prominent feature of innovation in NASCAR motorsports is that it is driven by and targeted to a *single and immutable goal*: to win races. That single goal gives a great deal of focus to innovation and to the work of everyone in the industry. NASCAR teams are single-minded in the pursuit of this goal, having very little room to think about or do anything that does not clearly contribute towards the goal. In their case, the focus intensifies as each race approaches from week to week.

The goal of winning races gives NASCAR teams a well-defined problem to solve: how to make the cars go faster. This highlights the second prominent feature of the innovation process in the industry: for the most part, innovation in NASCAR motorsports is a *problem-solving activity*. The overarching problem is how to make the cars go faster, but within this umbrella there is a myriad of existing or emerging smaller problems whose solution, added together, contributes to the ultimate goal. These problems include, for example, the car set-up, the ongoing modification of the internal surfaces of the engines to squeeze an extra fraction of horse power, subtle modifications of the surfaces to improve aerodynamic performance, and so on. The means to solve these problems are,

[5] Elting E. Morison, *Men, Machines, and Modern Times* (Cambridge, MA: MIT Press, 1966) pp. 19-20.

for the most part, well known and the task is to apply the right tools to solve a given problem. For instance, to solve the problem of extracting more power from the engine, engineers use –among other techniques– computational fluid dynamics coupled with advanced manufacturing technologies to cast new engine components.

This problem solving process is *highly constrained*. On the one hand, innovation happens within a pre-defined and tightly controlled product architecture that has had few radical changes in decades. The existence of an existing artifact –the racecar– to improve presents those working with the car with a set of problems determined by the product architecture and the laws of physics that govern the behavior of the car and its components. On the other hand, innovation is constrained by the rules. The rule book dictates with precision what can and cannot be done with the car. But as limiting as it may be to work with an existing product governed by a set of rules, innovation is intensive and ongoing. The rules force teams to look for new avenues for innovation, to look for unexplored territory within the car, or to further improve paths already taken. In addition, the fact that the rules are changing from season to season and sometimes more often than that, gives teams –and the industry as a whole– a continuous stream of new problems to solve.

Within the constraints, NASCAR teams innovate through an intensive and continuous process of *experimentation*. Teams approximate the solution to problems successively through trial and error. There is an ongoing oscillation between identifying a problem, coming up with a new idea or identifying the means to solve the problem, testing the solution, and implementing it. In this process, *testing* is fundamental. It is one mechanism through which new information is generated and fed into the problem-solving process and it is also the way in which tentative solutions are discarded or kept. While a great deal of this process happens in the preparations for each race – and for each season from one year to the next – it extends all the way to race weekend. I observed how during practice sessions, for example, the driver goes out with the car to do a few laps, communicates performance to the crew in the garage via radio, then comes back to the garage where small adjustments are made before he goes back with the car out to the

track to do a few additional laps. The cycle then repeats itself several times. Each time, the performance of the car is further optimized until reaching some desired level.

This iterative, highly constrained problem-solving process characteristic of innovation in NASCAR motorsports needs to happen as fast as possible. *High speed* is not only the goal of teams as a whole. Beyond working to make the cars go faster, solving problems and innovating as fast as possible is vital to NASCAR teams. As an industry executive said: "in this industry, everything is about speed." That includes, for example, identifying problems and manufacturing –or purchasing– new components. The time pressures pervasive in the industry, and evident in NASCAR teams, makes teams inherently short-term oriented.

Taken together, the main features of the innovation process in NASCAR teams create an environment in which there is *little ambiguity*. The goal (to win races), the problem to solve (to make the cars go faster), the means to make the car go faster, and the rules of the game are clear. Furthermore, if we imagine that the racetrack is the marketplace of the industry, in which NASCAR teams compete with each other to see who has the best product –the best racecar– from week to week, there is no ambiguity regarding what the market is or what the product is supposed to do within that market. Ambiguity, in fact, is an enemy of NASCAR teams because fast problem solving thrives on clarity and precision. One strategy to reduce ambiguity is to generate and procure as much information as possible and have it readily available. Another strategy is standardization and codification of procedures and knowledge, which eliminates the need to figure things out on the spot, enables fast responses and reduces uncertainty.

4. Transforming innovation

The way innovation happens in the industry has been transformed by several technological and organizational changes during the last two decades. Despite these changes, however, the innovation process continues to be at its heart about problem solving and experimentation as I just described it. What technological and organizational changes have done is to improve the quality and speed of the process.

On the technological front, the most important change is the infusion of engineering science. Engineers have brought new knowledge into the industry, expanding in that way the range of ideas and tools available for the innovation process. Engineering has been instrumental, for example, in the use of aerodynamic testing and modeling techniques, failure analysis, and optimization and simulation techniques. Another important change in the industry closely linked with the infusion of engineering science is the adoption of data acquisition, analysis, modeling, and simulation tools. With testing being so important for the innovation process, one effect of these technologies is to enable teams to carry out virtual tests outside of the racetrack and to carry out more tests in the same amount of time. Joining these computer-based tools, advanced manufacturing technologies such as rapid prototyping and CNC machining, now enable teams to rapidly transform new designs into prototypes and actual parts. Taken together, information technology and advanced manufacturing technology have further increased the clock-speed of the industry.

The impact of engineering goes beyond the expansion in the knowledge base available for problem solving. Equally important is what an industry executive called "the engineering mindset." Engineers have enhanced innovation by bringing a systematic approach to problem solving that contributes to a more efficient and targeted search for solutions. The systematic approach is seen in the industry as contributing to overall competitiveness by reducing ambiguity and increasing speed across a wide range of areas. As important as engineering has become, however, my conversations in the industry suggest that expert craftsmanship and learning by experience and practice will continue to be fundamental for the industry, at least the way it works today. Why? Because there are many things in the industry that can only be known –and done– through direct manipulation. And also, because in the face of ambiguous situations, experience is fundamental to quickly respond to problems.

On the organizational front, two major changes are specialization and the emergence of multi-car teams. NASCAR teams today divide their organizations into functions that

mirror the car architecture and its components. The division of labor is more refined, with groups of tasks that were carried out by a single individual in the past being subdivided today among specialists. Specialization deepens, targets and makes more efficient the search for improvement by narrowing down the problems that need to be solved to specific components and performance areas of the racecars.

Since the 1990s the multi-car teams have predominated in the competition, and today the largest and most successful teams are multi-car teams. In the face of specialization, multi-car teams enhance coordination among specialized functional units, and enable the sharing of engineering, testing and other problem-solving resources. But I suggest that the most important advantage provided by multi-car teams is to speed up the problem solving and experimentation process that drives innovation. This acceleration comes by making more information available when solving a problem and making communication more transparent due to lack of competition and the familiarity with team members. Multi-car teams are shelters from competition, enabling usually secretive individuals to openly share with each other problem-solving resources and information.

5. NASCAR teams do not innovate in isolation

Having described the key features of the innovation process in NASCAR teams and going back to the original motivation of this case study, the next question is whether local institutions have enhanced the problem-solving or experimentation capacity of NASCAR teams. A more specific question would be whether the ability of NASCAR teams and the industry as a whole to take up engineering science and new technology can be traced, at least in part, to local universities or research institutions.

Any study of industry clusters as "innovation systems" starts with the premise that there is a set of institutions –other than firms– that affect innovation in the cluster. What stands out in the motorsports cluster in the Charlotte region is the apparent lack of what some have called "institutional thickness." What this means is that the motorsports industry in Charlotte has developed in the apparent absence – until relatively recently, at least – of the institutional support usually assumed to be essential to nurture an

innovation-intensive industry cluster. But NASCAR motorsports is a self-made industry. There were no supportive public policies until very recently, for example; there is no venture capital as such; and at the time of this research there had been no local research organization funneling knowledge into the industry or assisting in problem solving. And as I will discuss latter, the local universities have played a limited role when it comes to research, development and technology transfer.

But the absence of local institutions supporting innovation in the industry is only apparent. The fact is that NASCAR teams do not innovate in isolation. During the innovation process they interact with other local and non-local organizations, some of which may be considered institutions in the context of the industry, that affect the innovation process in important ways:

- Racetracks are fundamental for the flow of information in the industry. In the racetrack, NASCAR teams see what their rivals have been doing and can listen to the performance issues of other teams.

- NASCAR disseminates information when it attempts to counter a competitive advantage of one team by creating a new rule. By creating a new rule, what was a secret becomes known to all teams. In addition, rules catalyze innovation by funneling a constant stream of new problems to teams and through them, to the industry as a whole.

- Auto manufacturers are important sources of knowledge and technology for teams, as well as common arenas for problem solving and in some cases for research and development for more radical or long-term technological changes (such as redesigning the engine).

- Another primary source of new technology for NASCAR teams are suppliers. Teams acquire new technology from them, and in some cases maintain ongoing relationships to develop and implement new tools that support the innovation process (such as

simulation and advanced manufacturing technologies). In addition, when a supplier has relationships with several teams learning could disseminate.

- With testing being so important, the use of wind tunnels and other testing facilities are important catalysts of the innovation process.

6. The importance of being there

One observation about these relationships is that, other than the case of suppliers and more recently a local wind tunnel and other testing facilities, no *local* relationship(s) with a particular organization or group of organizations "anchors" the industry to the Charlotte region. Neither are any of these institutions the sole "source" of the technology or the industry as a whole. An important question that follows is thus: What advantage do NASCAR teams, and the industry as a whole, get by being so close to each other within the Charlotte region?

The classic explanation about the origin and continued existence of industry clusters tells us that an abundance of resources, knowledge, a specialized supplier base, a highly specialized workforce, plus a set of institutions, fuel innovation and competitive advantage within a cluster. Together, these factors are supposed to glue together the businesses of an industry cluster. All of them were indeed often cited by NASCAR teams and specialized suppliers as reasons why they are located in the Charlotte region. But beyond these resources, my conversations in the industry suggest that the cluster advantages have to do with the nature of the interactions that occur during the innovation *process* itself, not just with the availability of inputs.

First, by being so close every business and individual in the industry is swimming amidst an ongoing flow of ideas. These ideas flow through formal interactions with suppliers, informal meetings at lunch times, through the ongoing movement of people from business to business as they change employment, as well as through the personal networks in the industry, which cross business boundaries. This flow fuels the

innovation process. As an industry executive put it: "We would not have a path to all the information if we were isolated; that's why we moved here."

Second, being close facilitates coordination. Stock-cars are always in the making, parts are always changing and need to be put back together. Proximity enables the back-and-forth interactions needed to coordinate change, put the pieces together, and reach optimal solutions. As an engineer from a supplier put it: "The fact that any of the race teams can come directly to us and get not only their questions answered, but any modifications that need to be done [or] adjustments, they can be done right here on the spot."

But I want to suggest that concentration of resources, people who can do the job, flows of information, and improved coordination all boil down to the most important competitive advantage of teams: speed. A supplier put it well: "[Speed is] very important… We are very quick response… it has to be immediate response. If [NASCAR teams] can't get it from you right away they would go somewhere else. In order to keep the business you have to meet their demand" (Supplier). The source of competitive advantage in this industry is to do everything as fast as possible and what being so close to each other ultimately affords the whole industry is a faster clock-speed.

I suggested a few moments ago that in this industry, ambiguity is an enemy because it slows down the innovation process. In the tightly-knit "ol' boys network", everybody knows everybody. You know what others know and how good they are at what they do. Everyone shares the same knowledge and skill base. Information is abundant and flows fast. You share the "racing background." You do not need to reach out far to clarify or solve problems quickly. You can hire someone who you know can do the job. For NASCAR motorsports, the Charlotte region has become a tremendously unambiguous, information-rich space for innovation and competition.

7. The role of the university

What about local universities? Current discussions in public policy and technology-based economic development circles place a great deal of emphasis on the role of universities in the creation and growth of industry clusters. They also emphasize the relevance of close relationships between universities and companies as a way to foster innovation.

When it comes to education, UNC Charlotte –and also several of the local community colleges– play an important educational role for the industry. Together, they are a source of a highly specialized workforce for the industry. The way engineers and technicians are educated –through internships or apprenticeships– is right on target given the relevance of experience to work for the industry, and also to develop important abilities like team work and the integration of theory and practice. The NCMA's workforce development initiative "Introduce, Educate, Intern and Employ" makes sense in an industry for these reasons.

While educational partnerships are increasingly important in the NASCAR motorsports industry, when it comes to research, development and technology transfer the story is very different. In that area, this case study challenges the idea that universities are essential to create and nurture an innovation-intensive industry cluster. The fact is that UNC Charlotte has played a limited R&D and technology transfer in role in relation to NASCAR teams. Moreover, conversations with academics and administrators in the university and with engineers and managers in the industry suggest that building a close relationship for R&D and technology transfer has not –and is not likely to be– easy. Why?

A first explanation has to do with history. At the time of UNCC's creation the NASCAR motorsports industry was very different from what it is today. It was an industry dominated by self-taught craftsmen, not by engineers. For many years, the university and the industry had very little in common. The increased technical

sophistication of the industry is very recent and the idea of research is very new for NASCAR teams and the possibility of a closer engagement now exists. However, UNCC and NASCAR teams do not have a tradition of engagement. For an industry that is an insider's business, being a trusted member of the ol' boys network is a precondition for interaction. It will take time to develop a relationship.

But in addition to the history, there are important differences between the way the university works –all universities, not just UNC Charlotte– and the key features of the innovation process in NASCAR motorsports that I discussed before:

- First, while practitioners in industry devote most of their time to the solution of well-defined problems, the primary activity of academics in universities is research.

- Second, this focus on research means that universities are more exploratory. What academics do is fairly open-ended. In contrast, practitioners in NASCAR teams most of the time have very clear goals. Open-ended exploration is a waste of time.

- Third, universities are inherently open and public spaces. By this I mean that those in academia –researchers and students– are free to talk to each other, to disseminate knowledge within the university and to the rest of the world via publication and conversations. NASCAR teams, on the other hand, are extremely secretive and worried about confidentiality. Universities usually engage multiple interlocutors in the same industry at once, while NASCAR teams prefer exclusive relationships.

- Fourth, and finally, the time horizons of the NASCAR industry and those of universities are very different. NASCAR teams need information and solutions as quickly as possible. They are short-term oriented. Universities, on the other hand, are inherently long-term oriented.

By pointing out these differences I am not arguing that the way NASCAR teams work is any better or worse than the way universities operate. The point is that these are two very

different worlds. It is like trying to bring together two different cultures. In this case, it is the nature of the innovation process that poses important challenges for the development of a closer university-industry relationship.

But relationships between the motorsports industry with UNC Charlotte and other universities are not impossible to develop. The key point would be to build relationships around issues that are common to the industry as a whole. Think, for example, of developing a strong supplier base. How to upgrade the supplier base that exists in the region in order to meet the increasing demands for quality, performance and reliability that NASCAR teams require? It seems to me that it is in the best interest of the industry as a whole (and of the region) to sustain a strong, advanced supplier base. Or the relationship could focus on advanced technologies for data acquisition, modeling, simulation and experimentation, all crucial for speeding the innovation process across the industry. And beyond the teams, the university and NASCAR itself could collaborate around issues that are relevant to the future of the industry as a whole.

A focus on shared issues would facilitate establishing *terms of engagement* that bridge the differences between the nature of the innovation process in the industry and the way most universities work. By focusing on common issues confidentiality concerns would be avoided, enabling the open sharing of information. Relationships would also have a time horizon longer than winning next week's race or next week's cup. In addition, they would be exploratory, open-ended and oriented towards the future.

These terms of engagement between university and industry, I suggest, are relevant beyond the NASCAR motorsports industry. Due to its extreme nature, this industry amplifies differences between university and industry that other case studies suggest are not uncommon in other settings. The way we normally think about universities –within academia at least– is as organizations that orient industry and the economy as a whole towards the future. We think of them as spaces where knowledge is preserved, created and advanced and where knowledge can be shared freely and where interlocutors from different walks of life can come together to discuss what the future may look like. Our

research in various regional economies suggests that to contribute to regional economic development through industrial innovation, universities are well served by focusing on what they distinctively do best: research, education, and creating "public space." Not by becoming consulting companies or agencies for technology commercialization.

In pursuing closer collaboration between university and industry –in both research and education– it will be important for all sides to set the expectations right. Universities and colleges themselves need to have the right expectations of what they can do –and they can get– by getting closer to the motorsports industry. If there is a flood of students specialized in motorsports, will they all be able to find a job in the industry? Engineers and technicians ought to be educated in a way that matters well beyond the narrow needs of the motorsports industry, which as a few of you have said, does not have that many jobs available.

8. Motorsports as a hotbed of innovation

Why should anyone other than those in the industry be interested in motorsports? Beyond the relevance of the industry for the regional economy, the deeper question is about the place of motorsports in the landscape of American industry.

In the early stages of this research in April of 2003, after coming back from my second round of fieldwork in Charlotte, I was impressed by the creative energy that I sensed during my conversations with practitioners in the motorsports industry. Shortly after my return from the field, I was discussing some preliminary ideas with a close friend and colleague and my stories of innovation in NASCAR teams reminded her of biotechnology firms. We wondered whether motorsports was or could be to innovation in the automotive industry what biotech is to the pharmaceutical industry: a hotbed of innovation and a space for exploration of radically new ideas.

Three and a half years into this research I remain fascinated and impressed by motorsports and the creative energy of its people. But it is now clear that the motorsports industry, whose roots and identity have traditionally been linked to the automotive

industry, has a technological life of its own. While some advances in automotive technology have come from motorsports, such possibilities have diminished as the technological trajectories of cars and racecars diverge.

But motorsports' place as a creative space and hotbed of innovation for the automotive industry could only be assured by bringing the technological profile of both industries closer together. As it is today, NASCAR rules and the rule-setting process promote innovation in areas that are only relevant to making for a safer and more exciting show. To bring motorsports and automotive technologies closer together, NASCAR and other sanctioning bodies would have to assume a role beyond sports sanctioning bodies and marketing machines. They would need to bring technological innovation to the forefront of their agenda, but not just to reduce costs or keep a level playing field. Imagine if motorsports teams were to become the radical innovators of the auto industry, channeling some of their creative energy to technologies that made their way into auto manufacturers, improving the quality of consumer products and the competitiveness of the auto industry. Imagine if NASCAR (or other racing leagues) became a space in which auto manufacturers discuss technological platforms needed to tackle some of the most pressing challenges of our time, such as pollution in many great American cities, or global climate change.

Motorsports is an industry, but it is also a game. Why invest in a game? Because games and game-like activities are inherently playful, open-ended, and exploratory endeavors that unleash the creative potential of human beings. Motorsports, as a game with thousands of people at play, is an industry full of creative potential. Imagine if it were the playground of the auto industry and if some of its creative energy was channeled for the betterment of technologies that have an impact in the present and future quality of our daily lives.