New Technologies in Spain

Infrastructure

Through financial and technological innovations, Spanish companies lead the international market in the development of infrastructure concessions.

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Innovation in Motion

Spain is now the world's eighth-largest economy and the fastest growing in the European Union. It represents more than 2.5% of the world's total GDP and a third of all new jobs created in the Eurozone last year. Spain is fast becoming a leader in innovation and generating advanced solutions in the industries of aerospace, renewable energies, water treatment, rail, biotechnology, industrial machinery and civil engineering. Spanish firms are innovators in the field of public-works finance and management, where six of the world's top ten companies are from Spain. Where innovation thrives, so will the successful global enterprises of the 21st century.

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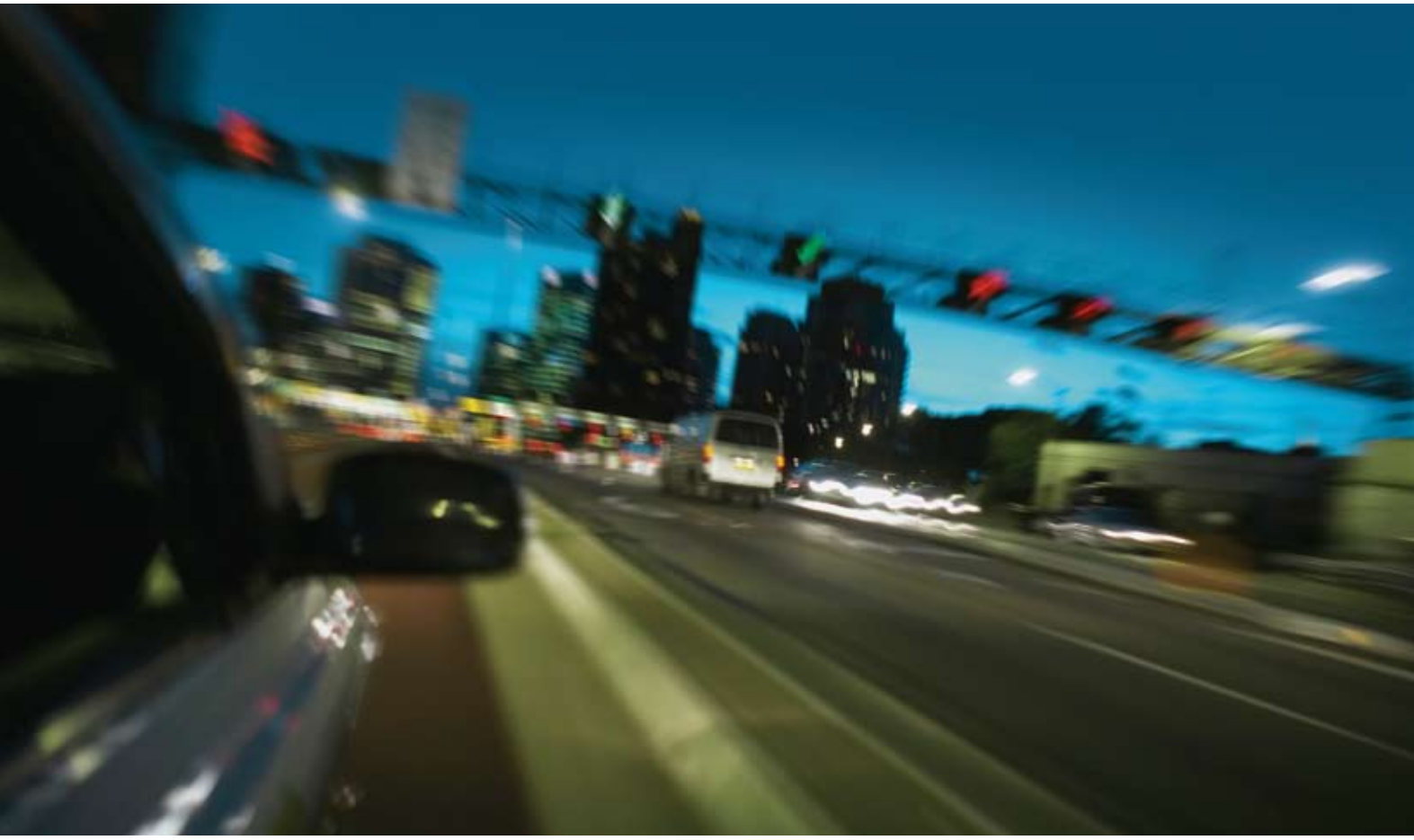


Spain: Leader in Infrastructure Development

In the world of concessions for infrastructure development, Spanish companies lead the international market. Six of the 10 top transportation concession companies are based in Spain, constructing and/or managing about 40 percent of all major transportation concessions in the world. Spanish companies are taking their knowledge and experience into an increasing number of markets each year. This is the third in an eight-part series highlighting new technologies in Spain and is produced by Technology Review, Inc.'s custom-publishing division in partnership with the Trade Commission of Spain.

According to Greek mythology, when the shadowy souls of the recently departed made their way to the shore of the river Styx, they faced Charon, the one with the power to transport them to the world beyond. If the soul paid a toll, Charon ferried it across. If not, it wandered between death and life for eternity.

This use of tolls so vividly described by the ancient Greeks has roots in the real world as well. Historians note the use of tolls in the ancient Middle East and Asia, and England charged tolls for roads and bridges in the Middle Ages. In Spain more than a century ago, there are numerous examples of the crown authorizing a private individual to develop a public work such as a bridge or a wharf and recuperating the costs from individuals using the service.

Since the advent of the automobile, however, many governments in both developed and developing countries have assumed the responsibility for public spaces such as roads. Tolls have persisted, but most of these have remained in the hands of local or national authorities.

Today, there is a move afoot for private companies to run, manage, even at times to own what are primarily public spaces.

These are often done through Public Private Partnerships, and these models provide a method for governments to obtain much needed funds and for businesses to develop and invest in equally needed public infrastructure.

At the same time, advances in technology have allowed for a growing public acceptance of an increase in toll roads. The advent of electronic tolls, and even barrier-free toll roads, has created an ease of use that is contributing to the growth in tolls as a form of revenue for both public and private developers.

Due to the history of road development in Spain and the strength and experience of Spanish companies, these companies have assumed the lead in the global market for infrastructure concessions.

Why Spain?

The Spanish Civil War at the end of the 1930s left the country extremely poor, a situation that persisted for decades. In the 1960s, the government realized that building infrastructure such as roads was crucial for tourism and for the development of the country.

"At the time, we could only use peseta [the Spanish currency before the Euro] loans for investment, and peseta loans were limited to the accumulation of taxes," says Fernando Gutierrez de Vera, chairman of the concessions commission for SEOPAN, the major association of Spanish contractors. "But Spaniards were very poor with a very low income per capita. So this meant that there was not enough money in the system to be invested into the country's development."

In response, the government authorized the companies that would become the concessionaires to dip into the pockets of partners in richer countries. Those foreign loans provided the capital for the toll roads, with a backing from the Spanish government assuring a return on the investment if the toll income did not meet expectations.

"At the time, it was a daring decision, but it ended up working out very well," says Gutierrez. "The roads were paid off from the tolls themselves, and this contributed a great deal to the development of the country."

The process of using toll roads to build infrastructure began in the 1960s and 1970s, not only in Spain, but in other Mediterranean countries as well. Unlike Spain, however, France and Italy chose the model of having state-owned companies develop the roads, as opposed to the primarily private Spanish model.

According to Nicolás Rubio, business development director of Cintra, a leading toll road operator, another factor contributed to the strength of Spanish companies in the world market. The government awarded the first road contracts at the end of the 1960s, which meant that the roads would be built and open to the public in the early 1970s—then in 1973, the oil crisis struck.

"If you look at traffic development on those roads at the time, it was a tough start," says Rubio. The government came to the construction companies and offered to buy back the shares. "We looked at this business as a long-term investment," he continues. "Today it may not be performing, but this was a 35-year contract." Companies held onto their roads, despite the oil crisis. When the crisis ended and the market improved, the roads provided a solid return on the companies' investments.

Says Rubio, "We were looking at the future, and we saw value. And somehow that spirit and that strategy shaped the industry in Spain."

The early years of concessions, and the strength of the Spanish construction market, left the companies with a great deal of capital and decades of experience in building and operating toll roads. This has placed them in a strong position to take a leading international role as the market grows in Spain and around the world.

The Workings of a Toll Road Concession

In theory, building and operating a toll road may seem like a rather straightforward venture: build a road, then operate a toll to recuperate the investment. In practice, however, these types of projects are significantly more complicated.

From a financial perspective, when a private company submits a bid for the construction and/or management of a new road, or the improvement and management of an existing road, predicting the future is a crucial component of determining the bidding price. The company must be able to ascertain what improvements are needed and how to provide the types of amenities, such as increased signage and road condition information, that will attract new users. Bidders also have created models to attempt to predict what the usage of the road will be and how long it will take to reach peak usage.

"These are incredibly complex algorithms to try to predict travel behavior," says William Reinhardt, publisher of *Public Works Financing*. "Each company uses fundamentally the same information, but I think it's much more refined for those with on-the-ground ownership and operating experience. If you own a toll road, you understand in incredible detail travel behavior and pavement life and all other various variables."

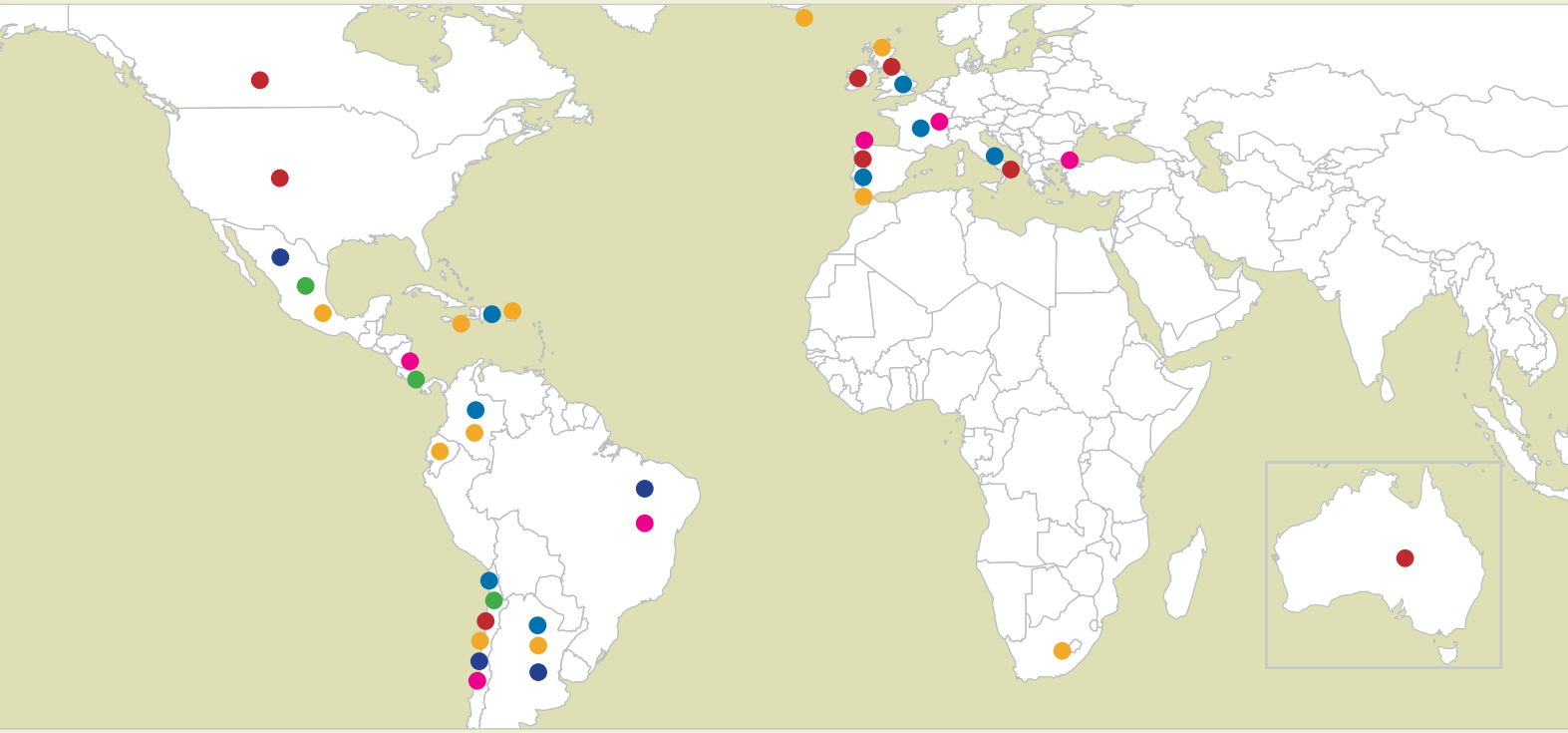
Managers have to negotiate the toll and toll increase potential with the local public authority. The private company expects a return on its investment while taking care not to raise the tolls so high as to push users to find alternative routes, while elected officials look to keep their constituency satisfied.

This relationship with the local authorities is crucial in terms of enforcement of nonpayment as well. Technological innovations allow companies to determine which drivers have paid and which haven't, but the regional authorities retain authority over fines for noncompliance.

Finally, the company must convince potential financial partners that an investment that will see no return for as much as a decade, and which may even register losses, makes good fiscal sense. "This is one of the most difficult elements to convey to potential partners," says Cintra's Rubio. "I think the innovation on our side has been to develop a way of proving to the market that it's a very good business, that entering into businesses that first generate accounting losses is a huge

Spanish Companies at the Top of the Global Market

Today, the international market is dominated by Spanish companies. In fact, of the top 10 toll road concession companies, six are Spanish: Grupo ACS, Ferrovial, Sacyr Vallehermoso, Abertis, FCC, and OHL. This map represents road concessions held outside Spain.



Abertis

Abertis is the largest operator in Spain, owning companies that manage more than half of the country's toll roads. Concessions make up 85 percent of Abertis's business, with 63 percent of the total business in roads alone. Internationally, Abertis has a strong presence in Latin America and is now expanding into the European market as well.

International Road Concessions: Argentina, Chile, Columbia, France, Italy, Portugal, Puerto Rico (U.S.), U.K.

FCC

FCC is a major construction and urban-services business, operating in more than a dozen countries. Its concessions business is concentrated primarily in Spain, with a handful of concessions located in Latin America. Though FCC is a major player in the concessions market, this is a relatively small sector of the company's overall business.

International Road Concessions: Chile, Costa Rica, Mexico

Ferrovial

Ferrovial is a major Spanish construction and services company, with operations around the world. Cintra, the name of the concessions company within Ferrovial, has currently taken the lead in the North American market. The company reported that in 2005, 64.5 percent of its concessions earnings were derived from its foreign concessions.

International Road Concessions (Cintra): Australia, Canada, Chile, Ireland, Italy, Portugal, U.K., U.S.

Grupo ACS/Dragados

Grupo ACS, a major construction and concessions company, is the largest concessions company in the world and has led the international ranking for the past 10 years. Concessions contributed 15 percent of the company's net profit in 2005.

International Road Concessions: Argentina, Chile, Colombia, Ecuador, Iceland, Ireland, Jamaica, Mexico, Portugal, Puerto Rico (U.S.), South Africa, U.K.

OHL

OHL is a major Spanish construction company with roots in the construction business stretching back to the early 1900s. In recent years, the company has been focusing increasingly on international contracts and currently operates in 16 countries. The concessions company, OHL Concesiones, has holdings primarily in Spain and Latin America, though goals are to expand into the European and North American markets.

International Road Concessions: Argentina, Brazil, Chile, Mexico

Sacyr Vallehermoso

Itinere, the concessions company within this global construction and real-estate company, contributes 30 percent of the company's earnings from concessions around the world. Through Itinere, Sacyr Vallehermoso is the largest motorway investor in Chile and operates 20 percent of road concessions in Spain.

International Road Concessions: Brazil, Bulgaria, Chile, Costa Rica, France, Portugal

opportunity." Their unusual approach, according to Rubio, involves creating worth through continually growing their business, adding new roads and projects, and holding on to the roads during the lean years with an eye to the long-term value and decreasing risk of the investment.

Spanish companies have thus far led in this sector because their years of experience have allowed them to develop successful models for predicting road improvements and usage, and to find creative ways to develop these complicated financial models.

According to Gutierrez, another reason the Spanish companies have been successful in the international market of road concessions, as opposed to straightforward construction, is that the main business of most of these large companies is difficult to export. On the other hand, the knowledge, skills, and financing experience are easily transferable when foreign markets open up tenders for concessions.

As it takes years, if not decades, to recoup the investment and begin seeing a significant return, the fact that Spanish companies are already seeing the maturation of some of the original investments places them in a strong financial position. Further, backing the concessions business are large construction companies with plenty of capital for investment.

Expanding Beyond Spain

As early as the 1970s, Spanish companies began building on their experience in Spain and capitalizing on a shared language to begin constructing and operating toll roads in Argentina, then moving onto Chile, Colombia, and Brazil. Recently this Latin American market has begun to grow, with Spanish companies as the primary foreign builders and operators. After a rough start and an unsuccessful period with toll roads in the early 1990s, due in part to poorly developed government financial models, Mexico is once again opening the country to toll road concessions. In 2003 OHL was awarded the bid to build and operate a 135-kilometer toll road that will allow drivers to avoid the entrance to Mexico City.

Though the Spanish market slowed in private road investment as later governments once again assumed the responsibility for road development, in the past decade this model is once again gaining importance in Spain and around Europe. In 1992, the 15 members of the European Union signed a commitment called the Maastricht Agreement, which strictly limits the annual deficit of each member country to three percent of the gross domestic product. Due to this, in Europe, governments can no longer greatly increase their debt to fund major public works.

In the U.K., the government coined the term "private finance initiative" (PFI) to refer to a private company developing a public infrastructure, in which users pay the company directly. The government has said repeatedly that this is not simply to reduce public debt but rather that private companies have proven to be more efficient and effective. Many examples of PFIs have been opening in the U.K. Across the water in neighboring Ireland, Cintra and Grupo ACS won toll concessions, and Grupo ACS is the top contender for another.

Abertis, the primary toll road operator within Spain, recently more than doubled the miles of their operations by purchasing Sanef, a French state company operating motorways in the north and east in the country. "That network in the north of France connects with Belgium, the Netherlands, the U.K., and Germany, and we think it's logical to try to explore future opportunities that may arise in those countries," says Toni Brunet, communication director at Abertis.

As the concessions model had already proven successful within Spain, in 2003 the Spanish government enacted a new law extending beyond toll roads to allow PFIs to build and manage all types of infrastructure, such as airports and ports.

Into North America

No Spanish companies were operating toll roads in North America in 1999 when Cintra, working in conjunction with Australia's Macquarie Bank, won the tender in 1999 for Toronto's Highway 407 —a 99-year contract and the largest privatization in Canada's history. "This fundamentally relied on the reliability of Cintra's estimate, based on their experience, that the toll road still had far to go in terms of reaching its peak travel," said Reinhardt. "They could see how much it would cost to improve the roads. And incredibly boldly, they saw that there was a business in the United States that was going to evolve. So they bet heavily on the Toronto toll road, which included a major construction component and a number of other kinds of risks. They now turned this into a very profitable asset."

As part of the improvements to Highway 407, Cintra installed the first system of boothless tolls, called gantries, and invested in other improvements to increase ridership. This proved successful: within the first three years, the road quadrupled in appraised value.

Continues Reinhardt, "They've used the success of this very risky venture as a horse to ride through the U.S."

While the rest of the world began to embrace privately-funded toll roads, the U.S. has been significantly slower to open its doors to this type of investment.

Despite the fact that American citizens today may assume that the local, state, or federal government always retained authority over infrastructure, in fact the history of the U.S. mirrors that of the rest of the world in private infrastructure development. "Before railroads took the freight away, we had hundreds and hundreds of privately owned, privately chartered toll road companies all around America," says Peter Samuel, publisher of *Toll Roads News*. "But pavement couldn't compete with steel rail, and turnpikes fell by the wayside." By the Depression in the 1930s, nearly all private roads were under the ownership and operation of state authorities.

The state and federal authorities, however, are facing a challenge today in funding necessary improvements and new construction. In the U.S., highway funding has been provided by a gasoline tax,

Lights illuminate the Chicago Skyway, the first major toll road in the U.S. to be privatized, which is now operated by the Spanish company Cintra.

the proceeds of which are earmarked for transportation expenditures. This tax began in Oregon in 1918 and soon spread to all other states. Today, the states impose an average tax of 20 cents per gallon, while the federal tax is a little more than 18 cents. The federal government has not raised the gasoline tax in more than 20 years.

At the same time as the gas tax has remained steady, vehicles have become more fuel efficient. "It was a popular idea to fund the highways with what is basically a user fee. But now, for every mile you drive, you're using half as much fuel as in the past," says Martin Wachs, director of transportation, space, and technology with the Rand Corporation. Around the country, this has led to a lack of dedicated funds for roads.

"In the past 15 years," says Wachs, "there has been a reluctance to either impose new tolls or increase the gas tax."

In addition, the market mechanisms in the U.S. have until recently provided a challenging environment for private investment. Bonds issued by public authorities for the development of infrastructure are not subject to federal and state tax, meaning that "the cost of

public debt is less expensive than the cost of private debt," says Reinhardt.

Reinhardt explains that the way to get around this, and to assist private investment, is by the formation of something called a nonprofit public purpose corporation, which provides the legal framework for a public private partnership (PPP). Further, Congress's highway reauthorization bill of 2005 contained sections that extend this tax-exempt status to private companies funding toll road development. This provision allows companies to raise up to $15 billion through tax-exempt bonds for highway projects, a way of leveling the playing field.

States have also needed to change laws to allow for these PPPs in the management and operation of toll roads and other infrastructure systems; approximately 10 states have already changed their laws, and a handful of others are finding ways within the existing legal structure to allow for PPPs.

The combination of dwindling funds for roads, an awareness of the success of PPPs overseas, and the deliberate adjustment of tax and legal systems to allow for these new private initiatives has opened the doors to new, major toll roads—thus far dominated by one Spanish company, Cintra.

There are numerous examples of small, local toll roads built and managed by private companies, but the sale of the Chicago Skyway, the city's only toll road, for an unprecedented $1.83 billion in 2004 marked the first time an existing U.S. toll road had been sold. A partnership of Cintra and Macquarie Infrastructure Group purchased the rights to improve and operate the Skyway, a 12-kilometer stretch of elevated highway that reaches the border with Indiana, for the next 99 years.

The City of Chicago's windfall, and the success thus far of the concession, has piqued interest around the rest of the country in these high-stakes sales. Indiana received an offer of $3.85 billion from the Cintra partnership for a toll road crossing the state between Ohio and Chicago. This offer, for a 75-year concession, trumped the Chicago Skyway as the most money offered to a U.S. municipality for an asset. Cintra says it plans to spend about $700 million over the first nine years for electronic tolling and other improvements, and to add about 20 kilometers of new lanes.

Though Cintra won the bid, Spanish companies accounted for all four of the companies qualified to bid for the road.

Cementing its leadership position in the U.S. thus far, Cintra also was chosen as a strategic partner with the state of Texas for the development of the Trans-Texas Corridor. At first analysis of the needs of the planned corridor, Cintra has proposed developing at least five toll roads and investing approximately $6 billion.

Despite the apparent success of private toll roads and frequent municipal enthusiasm for the cash infusion, there have been examples of local opposition to private toll road concessions. Most in opposition decry the higher toll rates that will go into effect, and the idea of a private company—especially a foreign one—managing and making a profit off local infrastructure.

"People think they can use political influence to keep toll costs down if it's a state enterprise, but a private concession has a formula in which it allows regular toll increases on an annual or biannual basis," says Samuel. "They just think they'll be paying a lot more tolls, it's as simple as that."

Governments respond that tolls would need to rise in the near future, whether managed by a private company or a public authority.

There have also been security concerns expressed about toll roads, which are public assets, being owned or controlled by foreign companies. Experts, however, conclude that such concerns are unfounded, as local and state police departments remain in control of security.

As the experience of PPPs handling toll road concessions grows in North America, an increasing number of municipalities have expressed interest in reaping the benefits, and all major Spanish companies have plans to submit bids for future projects.

Technology

The significant growth of toll road concessions is in part due to technological advances of the past decade. "Tolling is now much more acceptable to the public. It's much less hassle, less onerous, you don't have to line up and wait," says Samuel, publisher of *Toll Road News*. "You can just buzz through. And now especially with open-road tolling over a normal section of highway, you don't even have to slow down."

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Many drivers have recently come to appreciate the ease of new systems, where cars with a tag or transponder, connected to an account with a deficit or credit card, can sail through the toll barricades without stopping to hand over money. The next generation of toll roads, already in evidence on a handful of roads around the world, employ a system of what are called gantries, which hang over the road and read a vehicle's transponder. The gantries also capture other information such as a car's license plate number so those users without tags can be charged.

"The assurances have to be very high," says Reinhardt, publisher of *Public Financing Works*. "You have to provide the ability to take incredibly accurate video images of license plates, so the system will hold up in court. Also there's the issue of privacy and security. This has to be a fail-proof system. The banker wants to know that you can toll and identify everybody on the road." Privacy laws in some countries do not allow the use of gantries.

Cintra employed the first free-flowing toll road in the world in Canada, and today these systems have been developed in South Africa and Chile, where Spanish companies have employed them to great success.

Advances in imaging technology have allowed for collection of license plate information at high speeds. Laser scanners are employed to recognize the dimensions of the vehicle for classification and charges.

The development of gantries is based in large part on defense technology—the ability to detect and identify objects in the distance or determine friend from foe—and many of the top companies developing gantries have been involved in defense research. The systems work by employing a combination of imaging, radio frequency, and laser technology to read a car's transponder as it speeds by, and also to accurately identify vehicles without transponders. This last challenge has been the biggest one, but recent advances in imaging technology have allowed for the collection of license plate information at high speeds. Laser scanners are employed to recognize the dimensions of the vehicle for classification and free collection.

The Spanish company SICE has been able to take advantage of its long experience in the field and extensive knowledge of toll-road technology and present complete packages to interested companies. Grupo ACS used the gantry technology integrated by SICE in the first free-flow toll road in South Africa.

Telvent, another Spanish company, spends a significant portion of its revenue on R&D and has developed its own proprietary free-flow technology. In addition, Telvent is developing what's known as Sat-Toll, a system of open-road tolling based on satellite systems such as GPS or the European system Galileo. This is the most advanced form of tolling in the world, based on an onboard transponder that communicates the vehicle's position based on the satellite system. The location is then routed through a computer system that gauges the necessary tolls. Though no toll roads offer this system yet (it is being tested on trucks using highways in Germany and Australia), Telvent plans to be among a limited number of international companies marketing this new technology. "Thanks to our range of products, we're competing internationally in a large number of countries, on five continents, with the top companies," says José Montoya, Telvent general manager for traffic technology.

These toll-road technology companies have also developed the information systems necessary for real-time processing of the information collected and the database systems necessary for the management of that information.

Charging models for tolls vary: some toll roads charge different amounts based on the time of day (higher for high-traffic periods), while others may develop specific toll lanes that will provide faster access for those willing to pay a premium. Innovations in technology and financing have contributed to the success of all these models.

Another technological challenge facing those developing the latest toll road technology and software is how to coordinate between different and potentially incompatible systems of electronic tolling.

Tecsidel, a Spanish information systems company, dedicates a significant segment of its operations to traffic and tolling. Their main product is the software that integrates a wide range of traffic information, including real-time signals from road sensors that must be processed quickly. This information goes to a central software system that manages large databases.

Tecsidel recently won a bid to design and deliver a system in Norway that can recognize and integrate different tagging standards: Norwegian, Swedish, Danish, and the general European standard. There are different communication protocols for tags of different standards, and any interoperable system must also be able to communicate with and charge the different clearing centers.

The company's current R&D involves using laser systems to classify automatically vehicles within a variety of parameters, such as the length, height, and width of the vehicle, and the number of axels.

Indra, a major international Spanish

company heavily involved with defense information research, also devotes significant resources to traffic and transportation. The company uses their intelligent systems in conjunction with a wide variety of technology to provide all systems of tolls.

Many of these companies, including another Spanish firm, Etra, use similar information technology to provide world-class intelligent transportation systems, a computer-based system that optimizes the movement of urban traffic.

Technological innovations can be employed in more than tolling technology. "We were recently awarded a highway in the north of Italy," says Rubio of Cintra. "So we thought, how can we make it more attractive to users? We had an idea; this is an area with many foggy mornings. And there's a new system being developed whereby, every 50 meters, a special electric sign with lights and radar will tell you on foggy mornings what is the optimal speed to drive or if you have to stop, if there are cars stopped up ahead. So we built this into our proposal: it increased the investment, but it allowed us to imagine that we'll be able to attract additional cars."

Using their knowledge and experience to integrate all the available technologies from around the world allows companies to win bids. But, Rubio says, companies always have to be watching the market for new advances. "Nobody had proposed using that system," he says. "But once it's built, everybody bidding will put the same feature into future bids. So we have to look for new ideas. We always want to be one step ahead of the others."

The Future

Though governments control most airports on the European continent, airport privatization has slowly been gaining interest in Europe and around the world, and Spanish companies have used their experience in toll road privatization to take advantage of this trend as well. In addition, Spanish companies have holdings of ports, parking lots, even hospitals, all as part of the overall concessions portfolio.

When it comes to the growth of private toll roads, Samuel sees a number of places in the U.S. opening up to these types of projects. Says Samuel, "This is being studied in Houston for a road that could bring about $7 billion or $8 billion for the state. And I think New Jersey is also going to be a big one, because the finances are in a horrendous state, and they have such small amounts of money to service the debt of the transportation trust fund." Texas is home to a great deal of toll road excitement: many toll roads are in the planning or construction phase, and a number may well be developed as PPPs.

Samuel says that, around the country, "state toll authorities are heavily in debt and would need to raise their toll rates quite steeply in order to support new projects. They're loathe to do it as public authorities, and the thought is that it's easier to explain toll rate increases if the toll concessions are explicitly businesses."

Companies in this sector are closely watching the U.S. market. Though Cintra has already firmly established itself as a leader in the U.S., other Spanish toll road concessionaires operating overseas also hope to find a niche in North America.

In Europe, an increasing number of countries are turning to this model. Wealthier European countries are open to private financing to reduce public debt, while poorer Eastern European countries rely on the private market to invest in needed infrastructure development.

At the same time, companies flush with capital search for relatively stable, long-term investments. Toll road concessions have already proven to be one option in a diverse portfolio. And increasing advances in toll technology allow for greater accuracy and ease of use in the next generation of toll roads, those employing open road tolling.

Spanish companies, with their strong standing at the head of this international market and their extensive knowledge of the entire field, hope to continue to take the leading role in constructing and operating infrastructure concessions around the world.

Resources

ICEX (Spanish Institute for Foreign Trade)
www.us.spainbusiness.com

Abertis
www.abertis.com/en/

FCC
www.fcc.es/fcc/2003/ing/presentacion.htm

Ferrovial/Cintra
www.cintra.es/index.asp

Grupo ACS
www.grupoacs.com/eng/home.html

OHL Concesiones
www.ohlconcesiones.com

Sacyr Vallehermoso
www.gruposyv.com

SEOPAN (The Association of Spanish Contractors)
www.grupoexport.seopan.es

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New Technologies in Spain Series

Spain is a technologically and industrially advanced country committed to innovation, research and development, both through its government and through its private sector. The country is determined to deepen and intensify its productive specialization in industries that depend on technology and innovation. The Ministry of Industry, Tourism and Commerce has launched an ambitious plan combining its available human and financial resources and setting out specific lines of action with the goal of strengthening the international outlook of the most technologically advanced companies in Spain.

As part of this initiative, *Technology Review*'s custom-publishing division has produced the New Technologies in Spain Series, which will appear as a special advertising supplement in MIT's *Technology Review* magazine. This powerful eight-part series showcases the technological development and excellence of Spanish companies in several important industries, such as wind energy, water desalination, infrastructures, high-speed rail, aerospace, industrial machinery, biotechnology and renewable energy.

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