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Digital Innovation at Toyota Motor North America: Revamping the Role of IT

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February, 2018

Paper No. GCAR-A002
Category: Research Article

Title: **Digital Innovation at Toyota Motor North America:**
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Date: **September 2015**

Abstract: Recognizing that digital was changing the landscape for automobile manufacturers, the IT unit at Toyota Motor North America took a leadership role in introducing digital innovation into the company's products and services. To instill a culture of innovation—beyond Toyota's longstanding Kaizen practices—IT leaders first encouraged innovation within IT. As those efforts blossomed, the IT unit was able to reach out to other parts of the company. Toyota wanted to be ready to seize the opportunities presented by such diverse technological developments as autonomous driving, social analytics, and the Internet of Things. This case reviews the process by which the IT unit established credibility for its efforts and fostered enthusiasm for digital innovation throughout the company.

13 Pages

Massachusetts Institute of Technology
Sloan School of Management

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Digital Innovation at Toyota Motor North America: Revamping the Role of IT

Throughout Toyota Motor Corporation's history, the company's Toyota Way[1] philosophy ensured bottom-up incremental improvements to company processes. This deliberately gradual approach had served the organization well, yielding various industry innovations in both the manufacturing process and vehicle technology. But the emergence of the digital economy in the first decade of the 2000s challenged the company to rethink its approach to innovation.

> *We are really good at "kaizen," and "kaizen" means small incremental improvements. If you are talking about a big shock to the system, we aren't as good at that.* —*Zack Hicks,*
> *Chief Information Officer*

Toyota wanted to address dramatically changing customer expectations. For example, the process of purchasing a vehicle had traditionally centered on the in-person dealership experience. As customers conducted a growing proportion of the purchase decision process online, they expected an experience that transitioned smoothly from digital to in-person at the dealership.

Meanwhile, as part of the driving experience, consumers were demanding the latest and greatest in-car technologies.

> *The nature of the product is changing. Cars today have significantly more embedded technology, and we will be talking about the connected vehicle into the future.* —*Robert C. Daly,*
> *Senior Vice President*

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[1] The Toyota Way is Toyota's long-standing corporate philosophy. Based around the core pillars of "Continuous Improvement" and "Respect for People," the philosophy is embedded throughout Toyota's global operations and is considered a source of competitive strength by the company. For more in-depth reading, see J. K. Liker, *The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer*, McGraw-Hill, 2004.

This case study was prepared by Paul Betancourt and John Mooney of Pepperdine University Graziadio School of Business and Management, and Jeanne W. Ross of the MIT Sloan Center for Information Systems Research. This case was written for the purposes of class discussion, rather than to illustrate either effective or ineffective handling of a managerial situation. The authors would like to acknowledge and thank the executives at Toyota for their participation in the case study.

Established firms responded to changing customer expectations by attempting to gain first-mover advantages on new technologies, such as GM's introduction of OnStar assistance and Ford's integration of the SYNC media platform into its vehicles. Meanwhile, newer entrants, not burdened by legacy technologies or entrenched business divisions and practices, tried to take advantage of the opportunity to scale up quickly.

> *They certainly have caught up with us. And certainly the new franchises that have come in (for example, Kia, Hyundai, etc.) that did not have a large legacy investment … they were able to step into the market today with wonderful solutions.* *—David Jackson,*
> *Division Information Officer,*
> *Dealer, Field, and Affiliates*

The demands of the digital economy challenged Toyota's IS division in particular to play a leadership role in introducing digital innovations. In 2013, Toyota Motor North America CIO Zack Hicks noted that digital innovation would require major cultural changes in both the IS Division and the company as a whole. The company had already begun the journey.

Competitive Challenges

Toyota Motor Sales, USA, Inc. (TMS) was founded in 1957 as the North American sales, marketing, and distribution arm of Japanese auto manufacturer Toyota Motor Corporation (TMC). By the 1970s, Toyota had become the best-selling imported auto manufacturer in the United States. In 2008, Toyota sold over 8.97 million vehicles worldwide, becoming the world's largest automotive manufacturer.

By this time, Toyota Motor North America (TMA) had grown and consolidated into distinct subsidiaries managed centrally by Toyota Motor Corporation:
- Toyota Motor Engineering & Manufacturing North America, Inc. (TEMA), the result of a 2006 merger between Toyota Motor Manufacturing North America (TMMNA)—with five manufacturing plants across the United States—and Toyota Technical Center, USA (TTC), with engineering and R&D functions in Michigan and New York
- Toyota Financial Services Corporation (TFSC), focused primarily on financing activities
- The original Toyota Motor Sales sales subsidiary, headquartered in Torrance, CA and overseeing and supporting a nationwide sales, marketing, and distribution network

Confronting Challenges: Financial Crisis, Recalls, Tsunami

Soon after reaching the top global sales position in the automotive industry, Toyota suffered a series of setbacks: an economic recession; unprecedented vehicle recalls; and in 2011, the Tohoku earthquake and tsunami. These events impacted Toyota's global operations, and in particular, Toyota Motor Sales in the United States. In 2009, Toyota reported its first operating loss in seventy years (see exhibit 1) and fell from the number one spot in global automobile sales.

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But Toyota soon recaptured its position as market leader. By 2012 Toyota reported record high sales, capitalizing on the strength of its supply chain and production systems, the scale of its manufacturing operations, and the company's head start in developing hybrid technology. In 2013, Toyota owned 18.9% of the global vehicle market with sales of 9.98 million vehicles.[2,3] Despite the setbacks, Toyota

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[2] B. Ruiz, "Car & Automobile Manufacturing Market Research Report | NAICS 33611a," January 2014. Retrieved from IBISWorld database.

[3] Vikas Sarangdhar and Debashis Tarafdar, "2012 Gartner Supply Chain Top 25: Asia/Pacific," July 2012. Retrieved from Gartner database.

had been increasingly focused on sustaining its leadership position through its response to the demands of the digital economy.

Positioning the IS Division for a Leadership Role in Digital Innovation

As Toyota leadership recognized the demands of the digital economy, the IS division became more central to the company's success. But like many industry veterans, the IS division at Toyota Motor Sales had traditionally served as an order taker for individual business project requirements. And although the IS division was centralized, individual business divisions each approached technology investments from a siloed perspective, often creating incompatible or redundant systems and capabilities.

> *Customer data was a classic example of this, where we had almost thirty different copies of customer data in our enterprise. We even had vendors selling the same data to multiple business units.*
> *—Jayadev Gopinath,*
> *National Manager,*
> *Enterprise Architecture, Integration, and Data*

Even within the business silos, the IS division was not viewed as a strategic enabler. Technology investments typically addressed immediate, often tactical needs. Two consecutive chief information officers, Barbra Cooper and Zack Hicks, worked to make IS investments more strategic.

> *You do not get there overnight. It has taken us many iterations, many different structures, and many different governance processes to enable us to achieve the vision of being a collaborative partner.*
> *—Zack Hicks,*
> *Chief Information Officer*

Over time, Cooper and then Hicks introduced four key changes in order to position the IS division for a leadership role in Toyota's increasing digitization: (1) the establishment of a divisional IS structure; (2) the enhancement of enterprise architecture as a discipline; (3) an increased emphasis on managing external partnerships for IT delivery and maintenance; and (4) the adoption of cloud technologies.

DIOs Help Business People Think More Strategically About IT

To better understand the specific business needs of each division within the organization, former CIO Barbra Cooper restructured the IS function into four internal verticals: Automotive Systems; Business Support Systems; Customer, Associates, Parts, and Services Systems; and Dealer, Field, and Affiliates (see exhibit 2). Verticals were headed by divisional information officers (DIOs) who reported to the CIO. An Office of the CIO provided standardized tools, processes, and controls to coordinate the DIOs' efforts.

> *This was a critical moment in our history. Without those verticals and the way they are structured, we would not be able to form the type of key business relationships that we are able to develop.*
> *—Steve Lurie,*
> *National IS Business Manager,*
> *Office of the CIO*

These dedicated vertical business partners within IS established significant long-term relationships with their respective peers in each of TMS's other divisions. Managers were committed to understanding the business operations of their counterparts and advocating on their behalf within the IS division.

> *My personal journey in this role has really focused first on a lot of the management disciplines, whether it is financials, governance, resource management, or relationship management. I am really focused on that side of the world and moving more toward what it means for us to be a more strategic partner with our colleagues.*
> *—Albert Ma,*
> *Division Information Officer,*
> *Customer, Associates, Parts, and Services Systems*

When Zack Hicks took over as CIO, he leveraged the credibility the DIOs were building by empowering them and their subordinates to proactively identify opportunities to create value for their business partners.

They used to talk about IT trying to get a seat at the table, so that the CIO of the corporation and the CFO of the corporation are not just looking at us as the expense side of the ledger. I believe we have shattered that. [Business leaders] are turning to us and saying not just "this is what I want you to do" but "can you help me solve problems?" That is a huge change. That is a remarkable change, where they are valuing what we bring to them. —David Jackson,
*Division Information Officer,
Dealer, Field, and Affiliates*

Enterprise Architecture Helps the Company Build Enterprise Capabilities

To further enhance the value Toyota received from the IS division, Hicks worked to create stronger enterprise capabilities. The Enterprise Architecture, Integration, and Data (EAID) team was empowered to establish technology standards and a more structured enterprise-wide technology framework. The EAID team was a reformulation of a flagging enterprise architecture organization.

Enterprise Architecture has been here a long time. It has had its ups and downs. When I took over [in 2009, the department] was in the dark completely; I would say [it was] irrelevant and basically created white papers that nobody read. —Jayadev Gopinath,
*National Manager,
Enterprise Architecture, Integration, and Data*

The EAID team defined business capabilities, data and business intelligence requirements, and the company's technology foundation. Around 2010, EAID empowered an architectural review board (ARB) to guide and review compliance with enterprise standards. Where appropriate, the ARB reviewed exception requests.

Rather than an architect convincing [a project team] about why they should follow standards and why they should do things the way we ask them to, the onus is on [the project team] to explain why they prefer not to follow standards. —Jayadev Gopinath

The board consisted of standing members from the enterprise architecture, infrastructure, and security teams. Other members from various application teams would participate depending on the specific project being evaluated. Additional attendees were also present when evaluating special case exceptions.

The ARB also reviewed the enterprise architecture standards developed by the EAID architects for organization-wide adoption. These standards created clear guidelines for project development and helped reduce the likelihood that rework would be needed at later stages.

If there is not a standard out there, we create the standard, we create the frameworks. Our number one focus is getting something in the hands of the business as quickly as we can so they can see value. —Brian Kursar,
*Data Scientist,
Research and Development*

Having an established and enforceable enterprise architecture framework enabled the IS division to build shareable technology platforms that facilitated reusability for future projects. The standardized platforms reduced complexity for new project development. Teams from across IS verticals and business divisions could plug in to and build on existing infrastructure capabilities without having to start from the ground up.

We already have all the infrastructure ready to go. All they have to do is to come and use it. That is where we are trying to go. —Jayadev Gopinath

Shared platforms made the organization leaner while also increasing the level of agility in responding to business and customer demand. The platforms paid dividends as Toyota's IS unit developed functionality for newer devices.

> *We will reuse as many of the services as we can. That is, quite frankly, what makes some of the mobile work so easy and quick.*
> *—Albert Ma,*
> *Division Information Officer,*
> *Customer, Associates, Parts, and Services Systems*

Strategic Outsourcing Allows Toyota to Focus on Delivering Value

Another extension of IS's evolving role as a strategic business partner was to rely less on internal development and maintenance. By 2013, the IS division's workforce was 80% outsourced employees. Outsourcing technical work allowed Toyota to take full advantage of the rapidly expanding set of vendor services available on the market.

> *That is our first question, "Can we rent it?" If we cannot rent it, we will buy a package. As a last resort, we will build it. Because of the cloud movement and the mobility movement, [support services] tend to be commodity products, so there is quite a lot you can rent or buy.*
> *—Greg Cannan,*
> *Division Information Office,*
> *Business Support Systems*

Outsourcing commodity technology enabled Toyota to cut IS costs while increasing its ability to quickly deploy new technologies. Leveraging vendors' core competencies around IT systems further allowed IS managers to maintain their focus on business issues. Effective outsourcing demanded that IS leaders identify the most strategic partnerships and that project leaders learn how to manage external partners.

> *Five years ago we were not mature enough to manage those relationships. Now we have figured it out. Along the way, you have to get better at it. And it is low cost, so we can get work done pretty quickly.*
> *—Zack Hicks,*
> *Chief Information Officer*

Utilizing Cloud Computing to Increase Technological Efficiency and Agility

CIO Hicks also sensed that cloud services were especially important to avoid huge outlays for routine maintenance of commodity technology. In one example, TMS migrated email and collaboration services, once managed by third-party vendors, to Microsoft cloud services. This resulted in substantial savings in implementation and future maintenance costs while increasing security.

Leveraging the power of cloud computing also facilitated rapid deployment of and remote access to technology services. An enterprise agreement with Amazon Web Services reduced the time and cost in building out infrastructure for new or temporary technology platforms and services such as Workday.

> *We ask that question, "Why can't I put it in the cloud first?" Only if there is an absolute reason why you cannot put it in the cloud should we even try bringing it in-house—especially for these new [software as a service] technologies.*
> *—Jayadev Gopinath,*
> *National Manager,*
> *Enterprise Architecture, Integration, and Data*

Adoption of Workday software as a service (SaaS) allowed rapid implementation—and easy maintenance—of a mature state-of-the-art platform to support HR. This was a shift away from single enterprise resource planning (ERP) systems. Instead, the IS division chose a strategy of selecting individual SaaS solutions provided by firms with core competencies in specific services.

Together, strategic outsourcing and cloud technology worked together to limit the internal demands for unique technology skills.

> *A couple of years ago Flash was hot, so we went out and had a Flash consultant that worked for a specific vertical. HTML5 comes out, and we replace the [technology and the consultant]. We need that flexibility.* —Paul Rucker,
> *National Technology Manager*

Toyota Works to Make Digital Innovation Part of Its DNA

Recognizing the Cultural Challenge

During the years that the IS Division had served as order taker for business unit project requirements, innovation had not been a core IS mandate.

> *We had been in a position where it was just "keep the lights on" and not looking to do anything additional with the business unless [it] asked for it.* —Brian Kursar,
> *Data Scientist,*
> *Research and Development*

However, the demands placed on TMS's technology systems during recall crises in late 2009 and early 2010 revealed the limitations of persistently building incremental improvements on outdated legacy systems:

> *Every day it got worse. We went from about 3,000 phone calls a day to a call center to about 60,000. We were doing all these warrantee [processing] jobs. Our batch processes were so big that they were not finishing before our lines were coming up in the morning. Everything was breaking.* —Zack Hicks,
> *Chief Information Officer*

In exposing the need for an uplift of core platforms, the recall crises demanded innovative solutions. IS leadership encouraged innovativeness in addressing business needs. The IS division responded with solutions that ranged from new implementations of analytics products to the creative application of tools across division verticals. The impacts were significant. One solution reduced warranty claim batches to 30% of their original size.

> *They started doing other things that were so innovative that I thought, "Why is it taking this recall crisis for all this amazing, cool stuff to emerge?" Then after the problems went away, the innovation went away, because people went back to their day jobs. That was when I thought, "How do I tap into that innovation without a crisis?"* —Zack Hicks

Hicks instigated multiple initiatives to establish a culture of digital innovation at Toyota. Leveraging the IS division's enhanced credibility, he promoted a more proactive approach to digital innovation.

Increasing Awareness and Excitement Around Innovation Throughout TMS

An early step in promoting innovation within the organization was the introduction of an innovation fair in 2006. Held once a year, the event provided employees the opportunity to create and submit original innovative solutions to business problems. The fair created a sense of excitement around innovation and increased awareness of the innovative potential that existed within the organization.

> *I don't think there was a full understanding that we can do this, that we can make it happen. It is almost liberating saying, "The cool stuff that you guys want, you can have it all." It was a true conversation changer.* —Zack Hicks

The Office of the CIO and the Innovation Fair committee headed the effort, setting the theme and specific criteria for competition entries. Finalists were chosen through a multi-step process that engaged managers from across the organization. During the daylong Innovation Fair, a panel comprised of the TMS CIO, TMS executives, and guest CIOs from other organizations judged the entries. Prizes were awarded to the most valuable innovations, with the possibility that an idea might ultimately be chosen for implementation.

Initially, the Innovation Fair attracted interest primarily within the IS Division. Over time the Innovation Fair's reputation grew beyond the IS division, as did the number and diversity of participants. With time, an increasing number of entries came from outside the IS division. Teams made up of associates from different divisions worked to develop entries addressing cross-functional business demands. Eventually, the event grew to include Toyota Motor North America's affiliates, Toyota Financial Services, and Toyota Motor Engineering & Manufacturing.

The increased visibility of several innovations from prior innovation fairs also fostered interest among Toyota associates.

> *I think the Innovation Fair is critical. It is a great way for us to understand what new ideas people are thinking about. It is a great way to engage our associates and it can lead to ideas that can be game changers in different ways.* —Steve Lurie,
> *National IS Business Manager,*
> *Office of the CIO*

While the Innovation Fair solicited innovative ideas from TMS associates, the IS division also worked to introduce executives to innovative ideas from outside Toyota. Working with Intel Capital, the Office of the CIO established Toyota Technology Day. The event featured start-ups with innovative technologies potentially relevant to TMS. Over the course of a day, the start-ups presented their work to a small group of executives across the organization. This created an opportunity to generate enthusiasm for what was possible with emerging innovative technologies.

> *I think the Innovation Fair helps with what we can do for [the business] and what is possible. [With] the Intel Capital group, we target the vendors that we think would have high applicability to a business problem. Some of this technology is not really ready for prime time, but we are changing the conversation.* —Zack Hicks,
> *Chief Information Officer*

The success of these events—and the desire to stimulate greater innovation—inspired the IS division to form the Innovation Council. This council brought together associates and suppliers to develop, outside the scope of their regular work, ideas that could be awarded seed funding.

> *[The Innovation Council] is going to be a channel that we hope people really leverage in a meaningful way.* —Steve Lurie

IS Encourages Digital Innovation Through Internal Research and Development

Historically, innovation had come in response to business demands for new capabilities. As the Innovation Fair, Toyota Technology Day, and the Innovation Council generated enthusiasm for digital innovation, the IS division saw an opportunity for more proactive digital innovation.

In 2012 the EAID established an internal R&D group with the purpose of exploring new and disruptive technologies. The team worked to identify potential applications and execute initial proofs of concept with specific business capabilities in mind. This aim was achieved by working closely with business customers and strategic planning groups throughout the organization.

The role for R&D really takes [new] technologies, maps them, builds up proofs of concept, and then works with the business partner to co-fund and move a perfect concept into production.
—Brian Kursar,
Data Scientist,
Research and Development

The desired end result was twofold. The first goal was to provide IS's business counterparts with evidence of new or improved business capabilities. The second goal was to prove the value of investing in the enabling technology. Successful adoption of new technology would then be followed by integration into EAID's overall architecture through a center of excellence.

Some of the processes we have created are around how to take something from R&D to a center of excellence. Then we build out all the capabilities. Then from the COE, we collaborate on production, and then all the proper departments take ownership of their corresponding pieces.
—Jayadev Gopinath,
National Manager,
Enterprise Architecture, Integration, and Data

Working its way through this process was the R&D team's application of Endeca, a data analytics product (since acquired by Oracle). By leveraging the power of Endeca's enterprise search capabilities, the R&D team was able to identify external social media profiles of Toyota customers. With the Marketing and Public Relations team, they used the Endeca capability to develop an enhanced customer sentiment platform. This improved TMS's ability to understand real-time online customer sentiment toward Toyota. Eventually this would lead to the capability to potentially identify opportunities for real-time interventions.

This project has been successful in mapping our customer data and our internal data to social media data, then seeing the correlations, and really understanding the interesting stuff that can help the business take that next step. *—Brian Kursar*

Having successfully implemented the new technology, the R&D team moved to identify new opportunities using the same technology. In one example, the Warranty group used an Endeca-enabled solution to better identify and reduce warranty processing errors and fraud. The group was able to increase the speed and effectiveness of its work while lowering operational costs. This helped move the Endeca project further along EAID's innovation pathway.

Digital Innovation Enables Changes in Toyota's Processes

The two areas perhaps most impacted by new digital technologies at TMS were marketing and product development. Toyota's marketing division intended to leverage technologies to provide extraordinary experiences for customers and seamless, valuable support for dealers. The product development team was focused on the role of telematics in enhancing the driving experience.

Consumer Portal Delivery Group Coordinates Toyota's Established Processes with Digital Innovation.

The Consumer Portal Delivery (CPD) group, headed by national technology managers Paul Rucker and Engels Tang, worked on enabling a seamless customer experience across digital channels and physical dealerships. Their work interfaced with customers, dealerships, and third-party advertising agencies.

This is a big ecosystem. When the VP of Marketing looks at this, the question is not just "how can I optimize www.toyota.com?" it is "how can I optimize the entire consumer experience?" Because you are at their desktop, tablet, mobile; everything is fully connected, even the dealership experience.
—Engels Tang,
National Technology Manager

This required a delicate equilibrium between established business processes and digital innovation. Working under the Automotive Systems vertical, CPD worked on enabling the marketing division's customer experience efforts. These efforts demanded greater agility than was the norm at TMS. The Office of the CIO provided the CPD group with a dedicated contracting team to expedite work while meeting organizational requirements.

> *We can be considered the cowboys of IT, because we are always trying to move a little faster and push change quicker than the rest of the organization may be comfortable with.   —Paul Rucker,*
> *National Technology Manager*

The unique requirements of CPD also led to new kinds of vendor relationships. Frequent work on one-off projects with nascent start-ups demanded new approaches to and greater flexibility than long-term engagements with major vendors.

> *[CPD] has a very different model. They are spending more in the web space than I am spending on all of IT. They need vendors that can build very quickly, and then tear it down the next day. And we are dealing with smaller shops. When you were first able to spin a car graphic, there were only a couple of shops that could do it, and most of those guys were working out of their garage.*
> *—Zack Hicks,*
> *Chief Information Officer*

Despite the unique model, CPD was still able to leverage enterprise capabilities. In particular, EAID platforms accelerated CPD's time to market by facilitating access to data.

> *I have invested in supporting Paul's team. In the past their sites used to replicate customer and vehicle data, but now he uses the same services, back-end systems, and customer database.*
> *—Jayadev Gopinath,*
> *National Manager,*
> *Enterprise Architecture, Integration, and Data*

An example of CPD's abilities was core work around creating a single data portal to TMS's dealership partners. Due to the differences in individual dealership, it was important to provide flexibility in dealership-facing capabilities. Dealerships varied from small, rural, family-owned locations to major metropolitan, multi-location mega-dealerships. Each needed access to the same data, yet budgets and customer relationships differed greatly by dealership.

> *We feed the dealer a lot of information. But how the dealer then contacts the customer, what the salesman does with the customer, those kinds of things tend to be the individual dealer deciding how he wants to go to market.   —Robert C. Daly,*
> *Senior Vice President*

As a solution, CPD established a centralized internal customer database with a standard access portal for external parties. Team members then worked directly with the National Dealership Council to vet and finalize a list of nineteen developers for individual dealerships to choose from. As a result, TMS and its dealership affiliates had improved access to customer information. Dealerships also retained the necessary flexibility to address customer demands.

> *We are aggregating more information about the customer and providing it so that when someone shows up the dealer will know this person has a Camry, they bought it five years ago, they might be due [for a new vehicle], they bought it from the Camry dealership down the street, they went to NASCAR events, [and] they are an enthusiast. [Dealerships] have more information.*
> *—Jordan Fisher,*
> *Former TMS Employee,*
> *IT Consultant and Founding Partner,*
> *The Portal Group*

Another benefit of centralized data was the opportunity to analyze real-time customer and dealership interactions. The data could then be looped back to the marketing division to enhance business strategy development around customer engagement.

> *Traditionally, a challenge is that OEMs send leads to dealers. Some dealers do a fantastic job, some dealers do not even open them. [Now] it is like a command center. You can actually see in real-time where all the leads are going geographically, what models, how dealers are responding to them.*
> — *Paul Rucker,*
> *National Technology Manager*

Telematics and Coordination with TMS Divisions and TEMA affiliates

Telematics made its industry debut in 1996 in the form of GM's proprietary OnStar platform. OnStar began as a security-oriented feature, providing drivers live assistance in emergency situations. The platform eventually matured to provide navigation built-in via satellite.

Toyota began development on a telematics system in 1999. Initially the project was an engineering effort within Toyota Motor Engineering & Manufacturing North America (TEMA), then Toyota Technical Center (TTC). Toyota Motor Sales' IS division became a partner in the telematics project in 2006. This marked the first time that TMS's IS division was directly involved with the manufacturing side of Toyota's operations.

It was not until 2009 that Toyota introduced its own telematics platform in the form of Safety Connect. Two years later, in 2011 Toyota debuted its integrated telematics and multimedia package, Entune. Once seen as a relatively peripheral technology, telematics had become an important product with its own profit and loss center.

> *The folks who took us into the connected vehicle world did so with a lot of struggle and with active opposition from some areas. But as time has gone on, it has proven to be a pretty good thing. It is not perfect but it is a good business for us to be in.*
> — *Robert C. Daly,*
> *Senior Vice President*

Next-generation telematics was evolving into the connected vehicle platform. The technology would enable vehicles to constantly communicate with the internet via wireless signal. In theory, the connected vehicle would allow passengers to constantly interface with data-hungry applications. The technology could eventually allow the vehicle's systems to constantly interface directly with Toyota's information systems.

> *Now not only do we have all of the interface data of entertainment systems, but the car itself is now generating data. It is generating data on gas mileage, vehicle maintenance, and on component effectiveness or ineffectiveness.*
> — *David Jackson,*
> *Division Information Officer,*
> *Dealer, Field, and Affiliates*

In the past, the IS division's contribution to the telematics effort had been to assist with contracts with and management of external vendors for systems ranging from roadside assistance to wireless carriers. Now the looming challenge was the responsibility of structuring the architecture and ecosystem for the connected vehicle.

> *You have a maintenance schedule every 5,000 or 10,000 miles. Not everyone needs it at that time. We want to know when you actually need it so we can send somebody and tell the owner that they really have to do that. Well, that requires a sensor. That requires engineering to think about that.*
> — *Greg Cannan,*
> *Division Information Officer,*
> *Business Support Systems*

The combined volume of customer and vehicle data represented huge potential value to Toyota. In order to maximize the value of incoming data, the IS division became involved in providing input during the design and engineering of sensors and components. The IS division's value as a strategic business partner had become critical in its work with its North American affiliate, Toyota Motor Engineering & Manufacturing North America, Inc. (TEMA).

> *Is telematics truly seen as a partnership where everyone is bringing ideas, or are we more order takers? I think that is a very interesting conversation. For our objectives, we want to be just as much in that conversation. We do not want to overtake the conversation; we want to collectively have a meaningful conversation.*
> —*Steve Lurie,*
> *National IS Business Manager,*
> *Office of the CIO*

Addendum: Ramping Up Digital Innovation

In the summer of 2014, Toyota announced that Toyota Motor North America would become a single entity comprising the North American marketing and sales, engineering and manufacturing, and financial services businesses. By the fall of 2015, senior management had moved into new offices in Plano, Texas. Functions such as logistics and corporate communications had joined management in Texas, as would much of the remaining staff by the end of 2017.

Toyota Motor North America's new offices were designed for collaboration with 50% "me space" and 50% "we space." The new workplace design was just one indication of Toyota's growing emphasis on innovation. CIO Zack Hicks' Toyota Innovation Fair was gaining momentum. In 2014, Toyota Motor Europe staged its first innovation fair, and by 2016, CEO Akio Toyoda was slated to present the award to the winning innovation globally.

The logistics of the North American Innovation Fair had grown beyond the capacity of volunteers, so Hicks appointed as dedicated resources a researcher in the architecture group and an IT communications person. Together they managed not only the fair but also a speaker series that brought in 6 innovation experts each year. In 2015, the Innovation Fair in North America offered 40 presentations selected from about 140 submissions. While only the winning innovations were assured funding, all presenters had the opportunity to secure the funding necessary to implement their ideas:

> *The reason why the Innovation Fair is so important is because it's the one time a year when I have all the business leaders looking at all the innovations. They have to pick the ones they like the best. And generally their question is: "Why aren't we investing in all these things?" And I say, "It's up to you. Reach for your wallet."*
> —*Zack Hicks,*
> *Chief Information Officer*

For ideas that weren't funded—or perhaps even selected for presentation at the fair—Toyota introduced a number of other paths to funding.

One option was a presentation to the iCouncil. This group of volunteers, mainly at the director level, met most months to help people develop unfunded innovative ideas. Toyota positioned the iCouncil as a kind of *Shark Tank*—the American reality television series—only nicer. The idea was to help innovators "get to yes." They might help the owner of the idea develop a business case; they might authorize funding from one director's business unit; they might team up an innovator with an IT person who could develop a simple app; or they might authorize funds from the small pool of investment money that the CIO set aside for the purpose.

The iCouncil was one way that leadership attempted to avoid the discouragement that often resulted from an early rejection. Some ideas that might just be "ahead of their time" could secure funding from

the CIO's pool. Other ideas might simply be underdeveloped. iCouncil members, by asking important questions about the business case, could help a person develop the idea for subsequent adoption.

I've been to conference sessions where people talked about fast failure. I don't want to fail fast; I want to succeed sooner. That's what this group helps you do. —Zack Hicks,
Chief Information Officer

A second option was referred to as The Garage. This was a small area within IT where two developers from Cognizant provided up to thirty hours of development time for a new idea. The Garage allowed people to circumvent typical funding processes to create a prototype that might demonstrate the viability of a concept. The Garage also offered equipment like iPads and server space to individuals who wanted to experiment with an idea. These ideas might then be shopped around to a specific business unit or entered into the Innovation Fair.

Finally, Toyota IT developed a Kickstarter type of application where individuals could post ideas for innovations and receive feedback. This app was a good way to engage those whose ideas might be creative but too raw for action. A user would share an idea on a forum and others would respond with a thumbs up or down and suggestions that might help clarify the concept.

Toyota's innovations primarily targeted the customer experience. Some innovations were relatively simple and quickly developed, such as a barcode-type application that produced significantly higher purchase rates. Using the app, customers early in the search for an automobile could receive via email pictures of themselves with automobiles of interest and the vehicles' specifications. Another app helped customers who had already started to configure their preferred vehicle online interact efficiently with a dealer.

Many of the innovations were built on a foundation of IT experiments that had matched corporate data with social media. Toyota was developing analytics expertise that used this combined data to greatly enhance the ability to understand the customer. These applications were testing the boundaries of what customers would want Toyota to know and under what circumstances they would share data. For example, for customers who allowed Toyota to track their driving patterns and who were active on social media, Toyota could predict—with 80% accuracy—where they were headed when they veered off usual driving patterns. By calling on even more data (e.g., traffic data), this capability could allow Toyota to map routes that avoided traffic.

Additionally, Toyota enriched its analytics with government data or data on traffic or weather. This benefited from work by the IT unit that had isolated and exposed central data needed for a variety of applications:

We spent years in IT where IT controlled all the data. Then we spent the 90s and 2000s explaining to the business units that this is your data—you need to own it, you need to keep it clean. And now I've spent the last five years explaining to the business units that it's not your data, it's the enterprise's data; you have to share it. In that process, we made data accessible and exposed it so you can use it. —Zack Hicks,
Chief Information Officer

As Toyota developed expertise in analytics, it was focused on leadership in telematics and the connected vehicle. But management was also considering bigger changes in customer habits. In September 2015, Toyota announced a partnership with Stanford and MIT in the area of artificial intelligence, particularly around robotics and autonomous driving. Clearly, the opportunities for digital innovation would continue to grow.

Exhibit 1
Toyota Motor Corporation Global Sales and Income (in millions)

Global*	2007	2008	2009	2010	2011	2012	2013
Vehicle Sales	8.5	8.9	7.6	7.2	7.4	7.4	8.9
Vehicle Production**	8.2	8.5	7.0	6.8	7.2	7.4	8.7
Operating Income (USD)	18,964	22,661	(4,693)	1,586	5,632	4,327	14,045
Net Income (USD)	13,927	17,146	(4,448)	2,251	4,909	3,450	10,230

*Amounts correspond to fiscal year, which runs April 1 of prior year to March 31 of stated year.
**Does not include vehicles produced by unconsolidated affiliates.

Exhibit 2
TMS IS Organization Chart