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Ford SYNC and Microsoft Windows Embedded Automotive Make Digital Lifestyle a Reality on the Road

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ABSTRACT

With Ford SYNC, Microsoft Corporation and Ford Motor Company have democratized in-vehicle infotainment systems - delighting consumers and bringing a new kind of agility to the automobile industry.

Built on Microsoft Auto (now Windows Embedded Automotive), Ford SYNC is a factory-installed, voice-controlled communications and entertainment system that allows drivers to converge their digital lifestyle with their life on the road. Windows Embedded Automotive is an industry leading technology platform that provides integrated infotainment features and a rich user interface. Car manufacturers and suppliers worldwide can use this software to create differentiated, infotainment in-vehicle systems that are immediately attractive to consumers.

This white paper will examine:

• Past approaches to in-car infotainment system development;

• The evolution of the Windows Embedded Automotive platform as Microsoft addressed market readiness and other business/technical issues through collaboration with the automotive industry;

• How Ford and Microsoft had a common vision, validated it with research, and worked in partnership to bring the vision to market, giving consumers the ability to combine their digital lifestyle with their life on the road;

• How the auto manufacturer democratized in-car systems by delivering it first on the most affordable car in Ford's line-up, the Focus sedan and coupe, to the increasing surprise and delight of its customers;

• The collaborative marketing campaign that leveraged Ford and Microsoft brand name recognition around the globe;

• Positive business results generated by Ford SYNC, including broad consumer satisfaction with the technology; and,

• The future of Ford SYNC and Windows Embedded Automotive technology.

INTRODUCTION

From the home, to the workplace, to everyday communication and entertainment, digital technology is pervasive in today's consumer lifestyle. For the most part, the automobile has failed to keep pace with this digital technology revolution, due largely to systemic industry issues, such as a multi-year research and development cycle and a 3rd party partnership model that has traditionally kept auto manufacturers distanced from faster-paced, technology component suppliers.

Ford and Microsoft took a different approach to vehicle infotainment systems. Both companies were early to recognize the trend of digital convergence in the automobile, and shared a vision for an affordable, product that would reach beyond the niche markets of luxury auto buyers and after-market enthusiasts.

The result of this close collaboration is the Ford SYNC product (*See* Figure 1), which is the best-selling vehicle infotainment system to date. SYNC has redefined Ford's image, thrilled customers, and even revolutionized the car itself.

For Microsoft, SYNC was an opportunity for the software maker to further evolve its platform, in partnership with one of the leading companies of the auto industry. What's more,

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the lessons learned during the co-development and marketing of SYNC are benefitting auto manufacturers worldwide.

Figure 1. SYNC-equipped Ford Focus

Overview of Vehicle Infotainment System Development

Microsoft had a vision to extend the power and convenience of software to consumers on the road. The company collaborated with auto manufacturers over several years, allowing it to shape the technical backbone of vehicle infotainment systems-and what would become one of the most innovative of these systems to date-Ford SYNC.

Microsoft's automotive efforts began in 1996 with core technology based on Windows CE. The company chose this purpose-built operating system (OS) because it was designed for mission-critical embedded devices that had a minimal footprint. The OS has been used by industries that require reliable performance, such as healthcare and industrial automation, making it particularly suitable for demanding automotive applications.

By the late 1990s, the general view was that in-car systems would appeal only to luxury car buyers or after-market enthusiasts. Early attempts to meet the needs of this market lacked mass appeal due to high cost and a niche audience; however, they represented important milestones in Microsoft's development of an in-vehicle infotainment solution.

A New Approach Takes Shape

Throughout the late 1990s and early 2000s, Microsoft teamed with auto manufacturers, including BMW, Citroen, Toyota, Volvo, and Fiat, to enhance and further develop its automotive operating system and infotainment systems.

By 2002, it was clear that automobile drivers were going to want their personal devices integrated into vehicles. The standard for Bluetooth-an open wireless technology for exchanging data over short distances-was approved, enabling drivers to connect their mobile handsets with vehicles. In addition, the first portable media players were appearing on retail shelves, marking the emergence of the digital music revolution.[1]

The central problem for the automotive industry was that consumer electronics were evolving at a rapid pace, while automotive design cycles were still geared to multi-year planning and development cycles. In partnership with manufacturers, Microsoft developed an updatable device-gateway, which would effectively separate the fast changing pace of consumer device innovation from the relatively slow cycle of vehicle delivery.

The first major proof point of Microsoft's vision came about as a result of its partnership with Fiat Group Automobiles. Fiat wanted a way to integrate mobile devices with cars to meet the needs of the growing smartphone market in Europe and shared Microsoft's concept of creating a device-gateway with a rich user interface - soon to be known as Blue&Me. Microsoft contributed the critical software platform enabling Fiat to introduce the Blue&Me in-vehicle infotainment system to market just 24 months after it was conceived in 2004.

This voice-activated system featured Bluetooth wireless technology for mobile phones and USB connectivity for digital music players and other devices. It could read FAT file systems on MP3 players, allowing for voice commands. There were multiple Blue&Me product iterations for navigation, fleet, and other applications, and, by January 2010, more than 1 million Fiat vehicles equipped with Blue&Me had been sold.

Market Research Weighs In

In 2006, Microsoft engaged FITCH to research automotive customer needs. One key finding of the research indicated that consumers ranked safety, music, and navigation as more important than other factors, (*see* Figure 2).

Microsoft also discovered that for many consumers the importance of GPS navigation was falling, while the significance attached to connectivity with mobile phones and digital music players was rising. This made sense because mobile phones had more daily relevance in most people's lives than did the navigation features in a car. The phone was a more personalized device because it helped people keep in touch with work, family, and friends.

The research also revealed that drivers wanted access to the information on the mobile devices they carried daily (e.g.,

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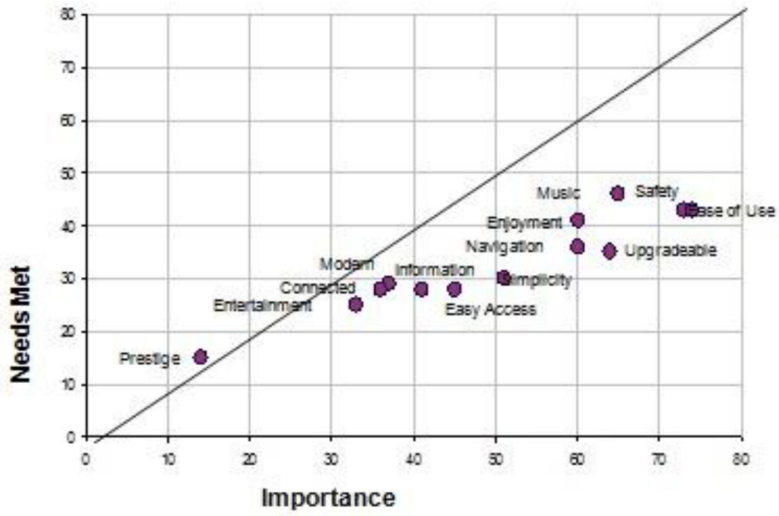

Figure 2. excerpt front FITCH 2006 Observational Research, Customer Segmentation, Analysis

songs on an MP3 player, phone numbers on a mobile phone) when they got inside their vehicles. Equally as important, people wanted to use these devices with convenient voice-control operation.

Ford's Vision and Collaboration with Microsoft Drives Development of SYNC

While Microsoft was evolving the technology, executives at the Ford Motor Company were also building on their vision - to reach broad numbers of drivers by developing an affordable infotainment system with widespread market appeal.

Ford was pursuing dual development tracks when it started discussions on in-car infotainment systems with Microsoft in early 2006. One engineering group at Ford had a mandate to integrate simple audio input jacks for MP3 players in to a car; another team was tasked with developing a Bluetooth interface for hands-free telephone operation.

The companies had a long history of working closely together at the enterprise IT level. Occasionally, IT meetings turned into discussions about how to grow and extend the Microsoft relationship at Ford. Microsoft also had representatives on Ford's Digital Lifestyle Council, which provided a forum for an extended interchange of marketing and engineering data and insights.

Out of this relationship and the discussions it fostered, important new concepts emerged at Ford:

Delivering value directly to consumers through software: Until then, software had been predefined by Tier One OEMs such as Delphi and Motorola, as opposed to Ford having a direct and collaborative relationship with technology providers (e.g., Microsoft).

Using software as an independent platform to build an infotainment system: Having a core software platform would give an auto manufacturer like Ford more flexibility and extensibility to innovate, speed up the product refresh cycle, and evolve SYNC at a faster cadence than is normal in the auto industry, matching the consumer electronics industry.

Accessing mobile phones, music players, and other devices: Infotainment systems had to be technology-agnostic to work with whatever handset or media player the driver brought into the vehicle.

Democratizing in-vehicle infotainment technology through software: Affordability and accessibility would be critical to the infotainment product's success. Ford planned to introduce SYNC across multiple product lines, in both economy and luxury vehicles.

Promoting hands-free use of cell phones and media devices: Ford focused on voice recognition as a key technology for helping drivers keep their hands on the wheel and eyes on the road.

Recognizing Microsoft as an automotive software supplier: The auto industry had built-in skepticism about the ability of software vendors to satisfy the special requirements traditionally met by Tier One OEMs. These include auto-grade quality and parts scheduling, plus the need to run reliably for decades or hundreds of thousands of miles.

Microsoft's years of experience in the vehicle infotainment industry, coupled with the proven success of Fiat Blue&Me

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and other projects, helped the software provider break through skepticism at Ford.

> *"We took a hard look at Fiat Blue&Me and concluded that Microsoft had an agnostic approach that would allow us to build a platform connecting to any consumer device."*
>
> ***Jim Buczkowski, Director of Global Electrical & Electronics Systems Engineering, Ford***

Technical Components of SYNC

Given the fast pace of technology evolution in the consumer digital lifestyle, the close partnership between Ford and Microsoft yielded important benefits. With Microsoft as a direct supplier, Ford gained a trusted and valued technical advisor, one that provided strategic guidance on product roadmaps and planning for upcoming protocols and standards.

The technical benefits of the Microsoft technology platform for Ford were numerous. Since Windows Embedded Automotive software is started from flash memory, boot time is reduced. With a staged boot process, the ability to control the load order of drivers, and custom development geared towards speeding the boot process, devices running on the software can enable their first functionality in seconds.

By 2009, the platform provided advanced software components for the SYNC infotainment system (*see* Figure 3), including:

• Phone stack, SMS messaging, and other communications software

• Connectivity with LAN, WiFi, GPRS, Bluetooth, or USB

• Hardware reference designs for rapid prototyping

• Support for multiple CPUs - ARM, Intel, TI, and more

• Media player with support for multiple file formats

• Rich set of visual development tools and Win32 Application Programming Interface

This powerful platform of standardized Windows technology allowed Ford to be more innovative and speed up the product evolution cycle. Ford leveraged the knowledge and skill sets of Windows desktop developers throughout the company to develop SYNC. Ford also expanded its vendor relationships, tapping into one of the largest pools of independent software developers throughout the industry.

Figure 3. Windows Embedded Automotive 7 Stack, available October 2010

This technical expertise was harnessed to help deliver new user experiences that would surprise and delight Ford customers. The platform's rich development tools and API allow Ford to develop new applications that synchronize with social media programs, such as text-to-speech access to Twitter (via OpenBeak). Pandora Internet radio is another example of a cutting edge application that SYNC has introduced first in the vehicle infotainment space. Drivers use a built-in USB port and their own memory stick to update SYNC software with these new and exciting applications without having to take the car to the dealer.

What is Ford SYNC

Ford SYNC is a factory-installed fully integrated in-vehicle communications and entertainment system built on a 400MHz Freescale i.MX31L processor with an ARM 11 CPU core, and uses 256MB of 133MHz DDR SDRAM, 2GB of NAND flash memory, and speech technology by Nuance Communications. The SYNC computer is housed separately from the vehicle head unit and interfaces with all vehicle audio sources as well as the high-speed and medium-speed vehicle CAN-buses.

SYNC provides drivers with hands-free voice-activated control over mobile phones and digital music players, and automatically connects phones and music players with the in-vehicle microphone and sound system. It was the first infotainment system to use new media transports which made the most popular media players work with SYNC, including Apple iPod and Apple iPhone, Microsoft Zune, and MTP devices. Supported audio formats include MP3, AAC, WMA, and WAV.

Drivers can use SYNC to browse their music collections by genre, album, artist, playlist and song title using simple voice commands, such as "Play Genre: Rock," "Play Artist: [Name]," or "Play Track: [Song Title]." They can also

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answer an incoming call with the push of a button, make a call with speech recognition, browse an integrated phonebook, see who is calling, view a call log, place a call on hold, and more. SYNC can even receive text messages, read them aloud, and interpret a hundred or so shorthand messages such as LOL for "laughing out loud."

Ford rapidly built updates and new features on top of the Windows Embedded Automotive platform. One of the updates was SYNC Traffic, Directions and Information (TDI), developed in partnership with TellMe, a Microsoft subsidiary. It provides hands-free access to traffic reports, precise turn-by-turn driving directions, and up-to-date business listings, news, sports, weather updates, and more.

Co-branding, Integrated Marketing, and PR

Microsoft marketing leaders convinced their counterparts at Ford to use the Microsoft brand, align teams, and co-fund marketing and PR efforts. This was a radical departure for Ford, which traditionally advertised vehicles versus a specific feature by itself. Ford's own research, however, indicated that the Microsoft name would give SYNC added credibility.[2]

> *"Consumers recognize the name Microsoft, and it provides a level of confidence and assurance about what they are buying. Co-branding with Microsoft was a very positive step."*
>
> ***Paul Mascarenas, Vice President, Engineering - Global Product Development, Ford***

Each company agreed to spend millions on a joint-marketing campaign, matching tactics to each partners' marketing strengths - digital for Microsoft, consumer events and big media for Ford, and public relations for both.

The marketing kick-off began with Microsoft and Ford formally announcing SYNC at the annual North American International Auto Show in Detroit and at the Consumer Electronics Show (CES) in Las Vegas, Nevada on January 7, 2007.

Ford CEO Alan Mulally and Ford President Mark Fields presented the new infotainment system at the auto show, while Microsoft Chairman Bill Gates joined via live satellite (*see* Figure 4).

Immediately following the announcement at the auto industry show, Fields took a plane to Las Vegas, where he joined Gates for his keynote address at the Consumer Electronics Show. This successful strategy profiled the top executives at both companies making same-day announcements at two of the most important industry tradeshows for consumers, and generated thousands of news articles in print, TV, radio and internet outlets.

Figure 4. Ford President Mark Fields and Microsoft Chairman Bill Gates jointly announce Ford SYNC on January 7, 2010

The "SYNC, powered by Microsoft" marketing campaign featured creative concepts such as placing SYNC on the Xbox Live dashboard and on digital billboard ads directly within Transformers: The Game (*see* Figure 5).

Additional marketing programs included, a viral campaign on MySpace.com, which incorporated SYNC into Ford's existing consumer events; featuring TV advertising for SYNC on popular network shows; and sending car dealers SYNC-branded swag like posters and five-panel pop-up displays.

The joint marketing and PR campaigns resulted in ongoing visibility for SYNC, including extensive press coverage and 15 awards for the product, all of which led to increasing consumer awareness, interest and demand.

Benefits to Ford and Ford Customers

SYNC continues to fuel Ford's positive business outlook. By the end of 2009, SYNC was available on over 20 of Ford's passenger vehicle models in North America, with the feature "take-rate" averaging approximately 70 percent across the vehicle line-up. The company has tracked business success metrics for SYNC from several sources[3] and reports the following:

• The turnover rate of SYNC-equipped vehicles on dealer lots is twice that of vehicles without SYNC.

• The resale value of SYNC-equipped vehicles is more than $200 greater than vehicles without SYNC.

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Figure 5. Ford SYNC ad in Microsoft Xbox 360 game Transformers: The Game

• SYNC was installed on the two-millionth vehicle less than a year after hitting the one million unit milestone.

• After receiving SYNC demonstrations, 80 percent of potential customers report it improves their opinion of Ford and 70 percent are more likely to consider purchasing a SYNC-equipped vehicle.

• Among Ford customers who have SYNC on their vehicles - and use its voice command features - 87 percent are satisfied with how the system operates, and 88 percent would recommend the purchase of a vehicle with SYNC to others.

• Hands-free calling is used daily by two-thirds of SYNC users, with 89 percent using the feature at least once a week.

• More than half of drivers use SYNC's voice-activated dialing features, helping them keep their eyes on the road and hands on the steering wheel.

Looking Ahead

In October 2010, Ford will launch a next-generation version of SYNC, MyFord Touch, demonstrating the extensibility and innovation of the Microsoft platform. MyFord Touch will first launch on the 2011 Ford Edge (and as My Lincoln Touch on the 2011 Lincoln MKX), then on the 2011 Ford Explorer, followed by the all-new 2012 Ford Focus.

MyFord Touch redesigns the in-car interface, mirroring how consumers interact with most devices in their lives by using touch-sensitive buttons, touch screens and voice recognition. It displays information using two 4.2-inch full-color LCD screens flanking an analog speedometer and an 8-inch touch-screen LCD at the top of the center stack. A five-way switch on each side of the steering wheel crossbar - similar to the one found on most mobile phones and MP3 players - controls the information displayed on the corresponding instrument panel screens.

Also in October 2010, Microsoft will launch Windows Embedded Automotive 7, the new version of the award-winning technology platform that powers unique and innovative in-vehicle infotainment devices. By building on an industry leading platform with integrated infotainment features and a rich UI framework, auto makers and suppliers can quickly get to market differentiated solutions that connect with consumers. They can take advantage of powerful new features, including: multi core processor support; new internet browser; rich interface with voice activation; new scenarios such as email and calendar support; and support for hundreds of software components.

SUMMARY/CONCLUSIONS

The catalyst for collaboration between Microsoft and Ford was their common vision of the mass consumer adoption of digital and communications products and how consumers' rapidly growing digital lifestyle would influence the development of in-vehicle infotainment systems. With Ford SYNC, Microsoft and Ford have democratized in-vehicle infotainment systems - delighting consumers and bringing a new kind of agility to the automobile industry.

> *"Microsoft and Ford enjoy a long-standing business relationship, and Microsoft is pleased to be able to provide the software and services foundation for Ford's in-vehicle infotainment systems with the Windows Embedded Automotive platform. With Microsoft's platform, Ford can continue to quickly innovate and deliver engaging and interactive solutions as demonstrated with their latest infotainment offering, MyFord Touch. We look forward to the road ahead in our continued partnership to deliver consumers the connected experiences they've come to crave."*
>
> ***Kevin Dallas, General Manager, Windows Embedded Business, Microsoft Corp.***

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REFERENCES

1. Apple iPod portable media player launched in October 2001.

2. Microsoft and Ford were #3 and #49 respectively on the Interbrand Best Global Brands list in 2008 and 2009. Source: http://www.interbrand.com/best_global_brands.aspx

3. Data points are from various Ford internal market research reports and market data tracking systems, including a March 2010 Customer Satisfaction Survey.

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DEFINITIONS/ABBREVIATIONS

AAC
Advanced Audio Coding

IAP
Integrated Access Point

LAN
Local Area Network

MP3
An audio file format, based on MPEG (Moving Picture Expert Group) technology

MTP
Mail Transfer Protocol

NAND
A type of flash memory commonly used for mass storage application like digital cameras and MP3 players

SMS
Short Message Service

WAV
Waveform Audio File Format

WMA
Windows Media Audio

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