Technical Case Study

The Anatomy of a Custom BlackBerry Field Force Application

BÖWE BELL+HOWELL

BÖWE BELL + HOWELL's field technicians work at customer locations to keep high volume mail production equipment running smoothly. Having accurate metrics is a key factor in both solid business analysis and a positive customer image.

In 2004, BÖWE BELL + HOWELL began working – with partners who specialize in developing solutions for BlackBerry – to build a custom wireless solution to automate data from field technicians who service mail production equipment. The BlackBerry Enterprise Server v4.0 with MDS and BlackBerry devices were deployed. A custom application, Service Data Automation, was built in-house to integrate with a legacy Vantive CRM solution.

Working to an aggressive three-month timeline, the Service Data Automation project succeeded because of solid partnerships between BÖWE BELL + HOWELL, Research In Motion® (RIM) and third party consultant, Dativoci. BÖWE BELL + HOWELL's solid project management approach, coupled with a structured technical plan, demonstrated the power of applying a sound mobile application methodology to extend the BlackBerry Enterprise Solution.

The Business Case

BÖWE BELL + HOWELL had considered wirelessly gathering metrics on the service side of their business for some time. The catalyst for moving ahead was a national sales meeting where the company wanted to demonstrate how it was reaching the next plateau of service, capability and performance. The only catch: the deadline to build a custom wireless application, with in-house IT resources, was only three months away.

"When I first joined the team on this project, there was a basic set of business requirements," says Don McKennitt, Project Manager. "It was more or less a high-level wish list. One of my first duties was to formulate it into a more concise set of business requirements, which included the kind of functionality we needed from the solution."

Industry:
Manufacturing/Technology
- Document Processing and Conversion

Company:
BÖWE BELL + HOWELL
As a leader in the document finishing and conversion industry, BÖWE BELL+ HOWELL's document processing and mail sorting services provide turnkey solutions that transform routine mailings into targeted paper and electronic customer communications.

Development Environment:
Email: Microsoft® Exchange
BlackBerry Enterprise Solution™: BlackBerry Enterprise Server™ v.4.0 with Mobile Data Service
Server: Microsoft .NET
CRM database: Oracle Vantive solution

Custom Application:
Service Data Automation (SDA)

Business Challenge:
- Wirelessly collect accurate data to improve service efficiency, revenue and overall image to customers
- Enable field technicians to create their own service tickets from BlackBerry® devices to service mail production equipment

Technical Highlights:
- Integrated with legacy Vantive CRM solution
- Created a Java ME BlackBerry client application – SDA
- Used .NET, Oracle and Java ME to connect BlackBerry devices to CRM system

Key Outcomes:
- Met an aggressive three-month timeframe for development
- Used BlackBerry to build a data integrity solution at 1/6 the cost of other options, with the added savings of lower telecom charges
- Successfully worked with a consultant to transfer knowledge of Java ME to internal development teams

BlackBerry

BÖWE BELL + HOWELL zeroed in on the following business goals to help target planning, which ultimately affected decisions about technical support, user involvement and deployment:

- Gain data integrity and gather timely information on servicing machines
- Increase the efficiency and productivity of customer service technicians
- Reduce infrastructure costs with improved accounting of inventory use
- Build competitive advantage in the marketplace

The solution needed to integrate with an existing, back-end Vantive solution. The CRM system was established in the organization, but was complex to use from the field. Remote access was an issue since many customers objected to having a VPN installed at their sites.

"There wasn't really an effective way of getting information into the system," says McKennitt. "That meant delays and potential inaccuracies in updating our records."

Unlike many field service organizations, where the service calls originate in the call center, BÖWE BELL + HOWELL's technicians create and dispatch their own tickets. Since the technician already works onsite, the service call is often a phone call or a tap on the shoulder from a customer who needs service.

This meant the new wireless solution had to be an intuitive, user-friendly way to self-manage service tickets. The onsite BÖWE BELL + HOWELL technician would need to open and close the ticket, enter the type of machine, the nature of the work completed, parts used and billable activities. Barcode scanning was investigated as a way to scan machine codes and parts inventory.

"Once that service ticket is closed, it needed to go into a system so that reports on metrics could be pulled on that service activity," says McKennitt. "Various levels of the business – from financial to product engineering – had to be able to look at these metrics to determine things like break history, response time, utilization and product performance."

BÖWE BELL + HOWELL anticipated that better data integrity would offer two advantages. First, they could determine where to apply engineering resources to improve the performance of their machines. Second, they could get an accurate picture of staff utilization onsite, helping them manage full-time versus on-call needs and potentially reduce contract costs.

Technical Challenges

One of the first technical challenges was determining how to integrate with their Vantive System to wirelessly access and update CRM data from the BlackBerry device. A server-side component would have to be written to complete queries against the Oracle database. The IT team knew the component would have to map out the stored procedures that would manage the data from the server to the device.

They also had to decide how to structure the business logic between .NET, Oracle and Java ME. Since BÖWE BELL + HOWELL did not have a Java ME expert in-house, they decided to bring in a consultant.

Dativoci, a software development company that develops, integrates and licenses mobile business solutions for wireless handsets, entered the picture. "We wanted Dativoci's Java ME expert to work with us in-house to do some mentoring and transfer knowledge to our team," says Mark Roberts, Application Development Manager. "It was important to the project that we build up these skills for future development needs."

Even though they now had Java ME expertise on-hand, Roberts decided to minimize business logic on the device. His internal team was stronger in .NET and Oracle, so he moved logic and coding onto the servers and off Java ME and the BlackBerry device. This resulted in a split in business logic of 40% .NET, 30% Oracle and 30% Java ME.

A final set of decisions for Roberts' IT team was finding a way to build an intuitive data access solution at the back end that was also user-friendly on the BlackBerry devices. The complex CRM database had already proven unwieldy. Roberts faced the challenge of converting volumes of material into simple, clear drop down menus that could be accessed and transmitted quickly over-the-air.

Custom versus Out-of-the-box Solution

Deciding whether to build a custom versus an out-of-the-box solution is one of the biggest decisions many organizations face when they want to extend BlackBerry. Options range from buying an out-of-the-box solution to building a custom application in-house, or hiring a consultant to build the custom application. Knowing which way to proceed often depends on a number of factors, including the IT resources available, budget, the type of customized solution needed and the compatibility of solutions already on the market.

BÖWE BELL + HOWELL already had the CRM application – they needed to improve data integrity by customizing it to a wireless footprint. That meant they researched the extensive range of BlackBerry partners who market field force applications. Since many focused on dispatching solutions, and this was not their primary goal, they decided to work with some key partners to build their own solution.

"Given our business is not boilerplate, and the objectives were idiosyncratic to us, you often can't just take things off-the-shelf and expect them to work – unless you're willing to make major changes in the approach to your business," says McKennitt.

They also decided upfront that they needed a client side application, versus a browser-based one, to meet their objectives. With a client side application, service orders could be cached or sent whether the technician was in or out of coverage.

Why BlackBerry?

As a Project Manager, Don McKennitt was responsible for making the business case for selecting the wireless platform and devices. He investigated various devices, including PocketPC and wireless LAN solutions. This analysis coincided with vendor negotiations about whether they would build a custom application or adapt a plug-and-play solution.

McKennitt received the blessing of the executive team when he proved BlackBerry met the majority of their criteria, such as:

- 1/6 of the development and operational costs compared to other solutions
- Achieved 97% of business goals
- Provided a timely solution
- Full 1:1 customer service representative deployment
- Converged handheld that replaced cell phone and pagers
- Push-to-Talk™ and text messaging capabilities
- Intuitive solution for the end user

"I would say that BlackBerry is the right marriage of technology and information management," says McKennitt. "It's already prepackaged – we only needed to drop our application onto the desktop of an already effective solution. Other devices may already have an operating system on them, but we would have had to build our own infrastructure."

In addition to meeting the business requirements, the BlackBerry platform also met the needs of Mark Roberts' technical team. "If you look at what's included – calendaring, email, browser, phone – there's really not another device that does all that, and allows you to write an application on it," says Roberts. "And, this project would not have been possible without the BlackBerry security capabilities. Having that already in place took about two months off the project plan."

System Architecture

The Strengths of Partnerships

DATIVOCI
The Power of Business Technology

Technical projects are often only as successful as the partnerships that built them. The Service Data Automation project involved solid working relationships between the BÖWE BELL + HOWELL IT team, who built the application; RIM, who supported migration to BlackBerry Enterprise Server v4.0; and Dativoci, who offered a mobile application methodology.

Dativoci offered not only in-house support, but also several value-added capabilities through Mobilelink.extend and their client-driven methodology. Mobilelink.extend is an application engine available through Dativoci that enables customers to access their existing back-office applications from their BlackBerry device. Dativoci offers the development and integration of front-end software, as well as back-end applications to enable access to corporate data.

"Our clients usually have a pretty good idea of their business objectives," says Dativoci President, Robert Cordova. "What we do is write or help write applications that use a best practice approach to getting it adopted by the user base."

For BÖWE BELL + HOWELL, Dativoci was most valuable in guiding them with their client-driven methodology. This approach is based on 30 tool kits – which include approaches from project design to statements of work and user acceptance (UA) testing. Since BÖWE BELL + HOWELL had done a great deal of work up front, they primarily made use of the technical design and development toolkits.

"One aspect of this approach that benefited us was having access to a large library of existing common components," says Roberts. "One of the strengths of working in Java ME is you can reuse code involved in some application integration. It was really helpful when Dativoci came on board that they brought some code for structuring tables that could be quickly rewritten and saved us a great deal of ramp-up time."

Both Roberts and McKennitt agree that RIM's direct project and technical assistance was crucial to the success of this project. "I would never have taken on a project like this without RIM's commitment to help us overcome some hurdles," he says. "We came up against issues that were unique to this project and they were very quick to respond to what we needed."

BlackBerry™

Managing the Development Plan and Resources

Since the initial goal was to have all application knowledge in-house at the completion of the project, Roberts used an agile extreme programming model as the template for managing his IT team – which included his internal .NET team, another department's Oracle team and the Java ME contractor from Dativoci. The Dativoci contractor worked side-by-side with the internal developer, each taking turns writing each other's code. The advantages of this approach were obvious: the thought process was verified and multiple people knew how to write the code.

"With this kind of approach, the schedule can take a hit," says Roberts. "Since there is a learning curve, you have to be very flexible. When we had to make changes and move things around, the staff was more than willing to accommodate it as part of the process because the project really excited them. When we started talking about wireless Java ME and being able to talk to a system that could be miles away, that's just exciting technology. And, you don't see those capabilities on any other device besides BlackBerry."

Roberts' initial decision to keep all business logic off the devices meant an ability to better manage time and resources. The Oracle and .NET experts on his team could work in tandem to address the development and learning curve around Java ME.

Another factor in building a mobile application is determining what data will be tracked and how the information is mapped from the database to the device. This decision affects how teams and workflow are structured. The Service Data Automation application involved mapping a large volume of data to 14 main screens and 28 drop down menus.

Roberts planned the workflow to make maximum use of his resources and the company's existing investment. The server side team determined what data needed to be pushed to the devices. Screens were mocked up in HTML by the Java ME and in-house experts. Once approved, those screens helped establish the kinds of tables and structure needed on the server side. The experts in Oracle used the tables to determine the stored procedures, or programming modules inside the database, required to pull the data.

"The HTML page was the testing point," says Patrick Shannon, Senior Mobile Architect, and the Dativoci Java ME consultant. "The server side would do their queries and hand massage the data if they had to. For example, if there was a column that wasn't in the database, they'd modify it, or the HTML page would be reworked. We'd take those final pages and make it all work client side. We also handled debug logs from there, while server side team worked on getting the stored procedures to generate the data correctly."

Putting the User Experience First

BÖWE BELL + HOWELL put as much effort into sound programming logic as they did into thinking of the user's needs. Since the field technicians needed to act as their own dispatchers, and manage the service ticket throughout its lifecycle, an intuitive user experience was critical.

The onsite BÖWE BELL + HOWELL technician needed an easy way to open and close the ticket, enter the type of machine, the nature of the work completed, parts used and billable activities. Bluetooth barcode scanning was also adapted as a way to scan machine bar codes and parts inventory.

"That was a challenge to Mark Roberts' IT team," says McKennitt. "I had worked on the user analysis, and we knew what data we needed to collect. But, it was up to the team to come up with something that was reasonably intuitive for the field technicians."

The advantage of building a custom application was BÖWE BELL + HOWELL could make screen flows match the business processes. That meant, when designing the user interface on the device, they focused on how field technicians naturally work through their jobs, rather than the way the UI was already structured in the Vantive CRM system.

"We had a full blown project methodology, with technical specifications," says Roberts. "But we kept our eyes on the user information we had already gathered. We rarely changed a field in the screen flow without talking to the users first."

A success factor in the project was mirroring terminology in the menus to match the way field technicians actually spoke about the maintenance process. Menus were sorted and grouped in a logical fashion so the user knew where to look for different tasks.

"We added a lot of details that made it easier for the user to read and understand what was on the screen," says Shannon. "For example, we used text that was italicized, bolded and normal, in various fonts. Those different styles were visual clues to the user about whether or not they could edit a field. We used stars to indicate that incorrect information had been submitted and needed more input from the user."

The added feature of a Bluetooth barcode scanner on the BlackBerry device also meant that technicians had the option to scan the barcode on a machine or part directly to their device, eliminating the need to input information.

Lessons Learned: Customizing the BlackBerry Platform

Many view BlackBerry and Java platform as the most robust choice for customized or out-of-the box solutions. BÖWE BELL + HOWELL put that capability to the test by working with BlackBerry partners to build a complex wireless CRM solution.

"There are definitely a lot of reasons why BlackBerry was the right platform for this application," says Shannon. "Just the fact that it is Triple DES encrypted is big. But other features are important selling points -such as, from the device side, it auto detects the email and includes it so that you can route information back without having any involvement from the user. The idea that you can proactively push data down at scheduled times is important, so the user isn't waiting while the GUI processes the data. There are APIs with a lot of standard controls that are usable straight out-of-the-box."

Throughout the application development process, BÖWE BELL + HOWELL gained a significant amount of knowledge on the BlackBerry platform, both in building on its strengths and customizing its features. The following list outlines some of the challenges they faced and overcame during the process.

Challenge	Description	Solution	Result
Managing Data Volume	Need to push as much as 24K chunks of data to devices in thread safe manner. BlackBerry Enterprise Server v.4.0 is optimized to efficiently push data to devices - often faster than large volumes of information can be processed on devices.	RIM recommended sending more data with less pushes. By throttling the BlackBerry Enterprise Server through the RIM public properties file, it's possible to control the connections and delays between packets being sent.	" When we broke up the data and bundled it together to send less often, it became more efficient and didn't lock up the device. – Mark Roberts
Use of Tables for Persistent Storage	Had to determine the database structure to determine where data is created and how it is pushed to the device.	Each data catch was represented as a table and would define the number of columns in the code. The column names would determine which data was pushed. Dativoci offered existing code for catching and manipulating data to accelerate the development.	" Because we accessed everything as a table, we were using vectors and putting the vectors into persistent storage. That meant we had a written method to pull data by column or row." – Patrick Shannon
Managing Data In or Out of Coverage	Wanted a way to verify that data generated on the device always returned to the server. Technicians were not always in coverage and service orders needed to automatically cache and send when connectivity returned.	Used pending transactions and auto sends to ensure that if network signal failed, the device would try to send again later.	" Every five minutes we have the capability to check the points at which we have connectivity all the way down to the device, so we can push information. From the server side, I can check up on the connectivity of up to 1,000 people." – Mark Roberts
Auto Detect and Route Email Addresses	Wanted to ensure that there are few delays on the device when commands are sent to the server.	Specified in RIM public properties file that a request coming from the wireless device automatically includes the device's email address in the HTTP headers.	" It means we don't have the client side waiting around. It does what it has to do and the server side runs its procedures and when the data returns it uses the email address to route it to the mobile device." – Patrick Shannon

User Acceptance Training

A key aspect of any development methodology is user acceptance testing. The end users ultimately need to review the solution and accept it as something viable that they are willing to use.

"I think Java ME and BlackBerry are fairly straightforward – that's not where your issues are going to be," says Roberts. "Your issues come in user acceptance, in resistance to change."

As a project manager and veteran of mobile and wireless, McKennitt knows that training is paramount to a successful deployment. That's why they engaged their BÖWE BELL + HOWELL Corporate University to provide comprehensive face-to-face user education.

"There are usually three classifications of users," says McKennitt. "The people who struggle, the people in the middle who manage proficiently and, what I'd call super users, those who immediately visualize exactly how things work and eat it up."

McKennitt views the super users as key to the deployment process. He uses these advanced technicians as an extension of the technical concept in practice. They are actively involved in testing and offering feedback on the configuration of various components.

As their partner, Dativoci also believes that the user analysis up front affects the acceptance down the line. "You need to spend a lot of time thinking about what the user really needs," says Robert Cordova. "Do they really need 15 different pages on their BlackBerry device? Do they really need all that data to do their jobs? Narrowing the focus upfront means the solution will be its most useful in the field."

Going Forward: Measuring the Successes

BÖWE BELL + HOWELL customized their own complex field force solution to automate data from BlackBerry devices to their administrative CRM systems. There have been several successes in this project, including:

- Met aggressive three-month timeframe for building a custom application
- Implemented BlackBerry Enterprise Server v4.0 as platform for building custom Service Data Automation application
- Successfully integrated a mobile solution with Vantive CRM
- Applied Bluetooth bar code scanning to BlackBerry functionality to manage machines and inventory
- Built knowledge transfer of Java ME capabilities through partnership with Dativoci

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For more information on Dativoci please visit www.dativoci.com

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Don McKennitt,
Project Manager

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