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Final Copy of Case Study

Status:
Laureate

Year:
2013

Organization Name:
Microsoft Corporation

Organization URL:
www,microsoft.com

Project Name:
Microsoft's Energy Smart Buildings Initiative

Please select the category in which you are submitting your entry:
Sustainability

Please provide an overview of the nominated project. Describe the problem it was intended to solve, the technology or approach used, how it was innovative and any technical or other challenges that had to be overcome for successful implementation and adoption. (In 300 words or less.)

Microsoft is committed to software and technology innovation that helps people and organizations around the world improve their environment. Through the power of software, our internal goals are to reduce energy consumption, reduce the impact of operations on the environment and drive responsible environmental leadership. The corporate headquarters in Redmond, Washington, consists of 125 buildings with nearly 15 million square feet of office and lab space, overseen by 7 disparate building management systems connected to 2 million data points collecting 500 million transactions daily. Microsoft realized that we weren't effectively leveraging the "Big Data" being generated from these systems to fully

understand performance, optimize operations and reduce environmental impact. Large building portfolios developed over a period of years commonly have disparate building management systems that don't effectively harness the data produced to provide insight and enable operational improvements. Microsoft determined that its own technologies could be used to harness this data to reduce energy consumption and waste and improve building operations by prioritizing effort against the most important issues. Following the completion of a yearlong pilot across 2.6 million square feet of the portfolio with multiple vendors and multiple potential solutions, one solution was selected and is being deployed across the entire campus. By layering software on top of all existing building management systems and applying analytics to real-time data, we have achieved our goal to reduce maintenance costs, automate manual reporting, improve the detection and diagnosis of faults and therefore reduce the amount of energy wasted. Our solution relies on a number of components from the Microsoft platform. For example, the solutions are built on the .NET framework, SQL StreamInsight provides the analytics, Bing Maps allows us to see the health of the campus in seconds, and the platform runs on Windows Server OS.

When was this project implemented or last updated? (Please specify month and year.) Has it incorporated new technologies and/or other innovations since its initial deployment? (In 300 words or less.)

Our energy-smart buildings program was first publicly announced at the Greenbuild Conference in Toronto, Canada, in October 2011. At the conference we released a white paper detailing the preliminary results of the pilot. The paper was authored in collaboration with Accenture and Lawrence Berkeley National Laboratory. Following the conclusion of the pilot program in December 2011, we confirmed that we didn't need to invest in capital-intensive retrofits to reduce energy consumption, optimize building assets and improve labor efficiencies. Instead, we saw buildings become dramatically more efficient by introducing a software overlay overall across the disparate building management systems to harness "Big Data". Combined with using algorithms against the data sets, we were able to prioritize work based on the cost impact. And by integrating off-the-shelf software built on the Microsoft technology stack, our buildings would get smarter and more efficient. Based on the results of the pilot, the roll out of our smart buildings program commenced in March 2012. The manual process of evaluating data sets to determine where electricity is being consumed once took 4-6 weeks, but now it can happen every 15 minutes, giving us an extremely accurate picture of demand per occupant and per square foot. The other, and most impactful capability, is the ability of the software in the program to provide Fault Detection. By using the data from the buildings to identify where mechanical equipment is not operating as designed, or where equipment settings are outside of RE&F's standards, we continually "tune" the building assets. This has lowered our energy consumption by 10% and minimized our carbon

emissions, and as a result of these rich capabilities driven by software, we see a broader application of this technology outside of Microsoft's HQ Campus.

Is implementation of the project complete? If no, please describe the project's phases and which phase the project is now in. (In 300 words or less.)

The deployment of the program across our campus buildings will be completed by August 2013. The next phase of the project is the integration with our Computerized Maintenance Management System (CMMS), the introduction of a Windows 8 App for smart phones and tablets, and the rollout of the program to other Microsoft campuses worldwide. In our Smart Buildings campus lab, we are piloting 2D barcodes on equipment so that by scanning the code, Building Engineers will be able to review operation and maintenance manuals, as well as work order history. Armed with this, the Engineer will be informed of other repairs that need to be completed while they are on site, at the equipment. We are creating algorithms to determine changes in the control system or if system parts need to be replaced. The primary way maintenance is performed across the industry is "time based". An example is the need to change air filters of air conditioning systems every 3 months. For Microsoft, adopting the traditional approach represents changing 26,000 filters every quarter. In the future, algorithms will tell us when filters need changing based on their condition, extending equipment life, reducing waste, and lowering labor and material costs. Algorithms will also be used in new ways to automate manual business processes. An example of this we are testing is for buildings to have the ability to initiate their own work orders. When building equipment is not running as designed or the set points are outside of RE&F standards, the asset itself will send a "fault" to the CMMS, which will then generate the work order, instead of being reliant on a person to do this. We will also use these analytics for "demand management" to procure power more efficiently with insight into our future power supply.

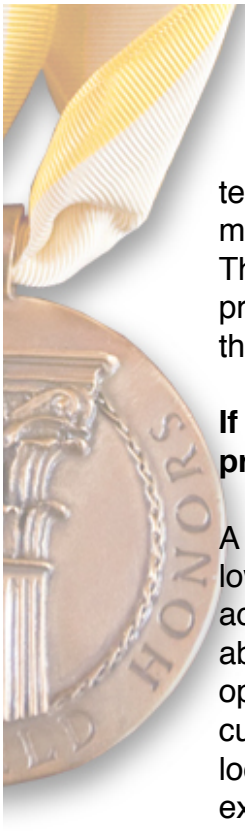
Please provide at least one example of how the technology project has benefited a specific individual or organization. Feel free to include personal quotes from individuals who have directly benefited from the work. (In 300 words or less.)

Numerous benefits have been delivered to Microsoft through the technology deployed in this project, the depth and velocity with which we can continually commission building assets. Previously, the RE&F Operations Team would commission or "tune" approximately 800 assets a year by setting up trend logs in control systems and conducting on-site building inspections to identify energy savings. The Energy Smart Building solution has provided us with the ability to leverage a continuous data flow with fault detection algorithms to commission

30,000 assets in a single year, an improvement of 3,650%. "This tool is a force multiplier because we have the ability to turn the mass amount of building information into actionable data." – Tearle Whitson, Building Controls Manager, CBRE, Microsoft Account. "We went from walking around the building to find issues to walking to the issues that matter the most." – Jonathon Grove, Mechanical Engineer, DB Engineering, Microsoft Account. The ability to reduce business risk with automation: A piece of equipment supporting a critical area of a building may be distressed but the alarm may get buried with hundreds of alarms that are received each day. Engineers required legacy knowledge of systems to sort alarms and identify potential risks. Having the ability to automate the process and replace the "human factor" with clear and concise automated actions to prioritize alarms based on potential business impact significantly reduces business risk. The solution has changed how RE&F performs maintenance work. As with the majority of the industry, RE&F's maintenance program was time series based. For example, air conditioning filters may typically be scheduled to be replaced quarterly regardless of condition. The smart building solution provides the ability to move to a "condition-based" maintenance program to perform the correct maintenance at the right time.

Would this project be considered an innovation, a best practice or other notable advancement that could be adopted by or tailored for other organizations and uses? If yes, please describe that here. (In 300 words or less.)

The solution introduced several innovative capabilities and is now an off-the-self product that can be used by building owners or property managers to reduce their own carbon footprint at a lower cost than a physical retrofit: Accessibility: Aggregating and analyzing data from disparate building sources mashed up with contextual information and making it accessible for a variety of end users. We are seeing a reduction of 10% of our energy consumption because this tool converts building information into actionable data. The payback is less than 18 months. Washington State has the third lowest U.S. energy cost. In other geographies with higher energy costs, the payback period would likely be much shorter. Scalability: In this pilot, Microsoft's main campus generated about half a billion data transactions daily from two million data points across 125 buildings. The power of Microsoft's SQL StreamInsight allows complex analytics and modeling, such as correlating external data points (e.g., weather), against use patterns to lower utility demand costs. Ease of deployment: Microsoft's energy smart buildings pilot program shows that while there are various adoption barriers, these can be overcome by following a set of key design principles. Most importantly, the underlying technologies are now more widely available and easier to implement. The potential for information technology to improve building energy efficiency is huge. The Global eSustainability Initiative (GeSI) 20, a consortium of leading high-tech companies, estimates that smart building



technology has the potential to reduce carbon emissions in the U.S. by 130-190 million tons of CO2, equivalent to the annual emissions of about 30 million cars. The related electricity cost savings amount to US$20-25 billion. Quite simply, this project has shown firms seeking to enhance their bottom line need look no further than the offices they're sitting in.

If there are any other details that the judges should know about this project, please note them here. (In 300 words or less.)

A significant opportunity exists to use software to better manage energy use and lower carbon emissions. Buildings are the largest contributor to global emissions, accounting for about 40% of the overall footprint. Commercial buildings represent about half of the total and, for many organizations, are one of the greatest operational expenses. Retrofitting projects are often considered the best way to cut energy usage, but this approach is capital-intensive and hugely disruptive. By looking to software as a solution, organizations can make the most out of their existing building portfolio and systems. Most modern commercial buildings have built-in systems that let engineers and managers observe and manage equipment. A smarter building places an additional layer of IT intelligence on top. These analytics can drive energy savings in three primary ways: 1) Detecting and diagnosing faults in equipment to address problems quickly, 2) Managing alarms so engineers can focus on critical events, 3) Integrating building data with external sources, such as utilities and weather data feeds, to manage energy use holistically and encourage employees to save energy. Microsoft’s pilot found that a "smarter building" solution can be established with an upfront investment of less than 10% of annual energy expenditure, with an expected payback period of 18 months. Accenture, which helped advise during the pilot, observed similar results in its work with other corporate clients. Through the pilot program and white paper, available on Microsoft’s Environmental webpage, Microsoft wants to share this knowledge so other organizations can use IT successfully to improve the bottom line and reduce environmental impacts. The question is not whether a company can afford a retrofit, it’s whether they can afford not to make their buildings smarter.