Ecomagination

Unlocking the low-carbon economy with digital technologies

Executive Summary

This world is entering a new era of productivity across business and industrial operations as a result of the emergence of new digital technologies. Digital solutions, enabled by the Industrial Internet, can now increase output, use natural resources more efficiently and lower environmental impact—we call this Digital Resource Productivity. Digital Resource Productivity is critical in today's competitive and volatile global landscape because industrial organizations need to find opportunities for growth, differentiation and cost savings wherever possible. At the same, environmental challenges threaten businesses and create new risks.

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In a hypothetical scenario where a handful of digital solutions are scaled across key industries, we estimate that they would return $81 billion in annual cost savings to businesses, while avoiding up to 823 mt of carbon dioxide emission per year. That's enough carbon emissions reduction potential to help close the gap between proposed carbon targets and expected emissions under a business-as-usual scenario.

In fact, Intel's power of computing and GE's Industrial Internet operating system, Predix, are already providing a foundation for a range of digital solutions that improve energy and water efficiency across aviation, railways, ground transportation, manufacturing facilities, power plants and buildings. We see a tremendous opportunity for a broad ecosystem across industry, data scientists, developers and other innovators —forming a movement to fully realize the potential of Digital Resource Productivity.

In 2012, GE estimated that a 1 percent efficiency improvement across industrial sectors could lead to an increase in global Gross Domestic Product (GDP) of $15 trillion (2005) US dollars by 2030 (General Electric 2012). Two years later, we highlighted the vast potential for the Industrial Internet—the integration of complex physical machinery with networked sensors and software – to enable industries to enhance the productivity of natural resources such as energy and water use in industrial operations (General Electric 2014). Since that time, we have seen that digital solutions are providing even greater economic gains and environmental benefits than we expected.

For example, Intel's Smart Building Management System (SBMS) using Internet-of-Things (IoT) technologies, has driven down costs, added new capabilities and changed the dynamics for building management software. The implementation of SBMS is expected to reduce power consumption by 8 percent (Intel IoT Smart Building Solution Brief 2015). Another example is GE's new Digital Power Plant, which optimizes power plant operations and can reduce fuel consumption by up to 4 percent.

Table 1, Planes, Trains and Automobiles: If just a handful of new digital solutions could be scaled across industrial systems and global transportation networks, businesses could hypothetically save $81 billion/year and global carbon dioxide emissions could potentially be reduced by up to 823 mt/year.

Industry	Application	Example	Resource savings Plants Fuel	Potential Cost Savings (Billions $/yr.)	Potential Fuel Global Carbon Reduction (Mt/yr.)
Power	Power plant fuel optimization	GE Digital Power Plant	4.00%	$14	495
Aviation	Airline flight network optimization	GE Flight Efficiency Services	8.00%	$14	45
Railway	Rail network trip optimization	GE RailConnect 360 Trip Optimizer	6.30%	$3	19
Ground Transportation	Vehicle fleet optimization	Intel Vehicle Fleet Management System	8.00%	$20	132
Buildings	Building energy management system	Intel Smart Building Management System (SBMS)	8.00%	$30	132
Global Total				**$81,329.86**	**823**
Estimated global gap in country-level carbon targets by 2030					**2,619**
% of Gap Filled by Digital Solutions					**31%**

Source: Illustrative digital technology potential in a hypothetical 100% technology penetration scenario based on input assumptions from the International Energy Agency (IEA), the International Civil Aviation Organization (ICAO), the International Union of Railways (IUR), the International Institute for Applied Systems Analysis (IIASA), the U.S. Energy Information Administration (EIA) and the U.S. Environmental Protection Agency (EPA).

We are not alone in our recognition of the vast potential of Digital Resource Productivity. The global e-Sustainability Initiative (GESI) recently found that an Industrial Internet-enabled world of 2030 can be cleaner, healthier and more prosperous. They found that Information and Communications Technologies (ICT) can bring about a 20 percent reduction in global carbon dioxide emissions by 2030 through the application of Internet-enabled solutions in energy, health, buildings, agriculture, education and manufacturing. This would also reduce costs by $4.9 trillion by 2030, with $1.2 trillion in reduced electricity expenditures, and $1.1 trillion in reduced fuel expenses (Global e-Sustainability Initiative and Accenture Strategy 2015).

With 50 billion machines expected to come online by 2020, the market potential for solutions based on the Industrial Internet is tremendous (Evans 2011). The insight gained through industrial data and analytics will allow businesses to find unique opportunities for growth such as new service offerings and business models. Businesses which don't explore the new growth opportunities of digital services could be disrupted by third parties who wield these tools to service new customers.

Likewise, the ability of digital technologies enabled by the Industrial Internet to provide global environmental benefits will be dramatic and provide large market opportunities in their own right. This is particularly clear in the context of the historic agreement at the UN Framework Convention on Climate Change (UNFCCC) Conference of the Parties (COP21) in Paris in December 2015. Our analysis indicates that by 2030, the global gap between individual country carbon dioxide targets and "business-as-usual" carbon dioxide emissions is expected to grow to 2.6 Gt CO2/year by 2030. This means that digital solutions alone have the potential to close nearly one-third of the gap between expected carbon dioxide emissions and stated country commitments.

The time is now for businesses of all sizes around the world to lead their own digital natural resource productivity revolution in order to increase their competitiveness and manage the environmental impact of their operations.

Indeed, the Digital Resource Productivity journey has just begun. At GE and Intel, we have seen early solutions take hold to drive meaningful value to business and impact major global environmental challenges. The time is now for businesses of all sizes around the world to lead their own digital natural resource productivity revolution in order to increase their competitiveness and manage the environmental impact of their operations.

References

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