Sustainability with Waste Management in a Circular Economy

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Key Trends Impacting Waste Management

Much like other industries, technology has had a significant impact on the waste management industry. Machine Learning and Robotics are just some of the innovations that the industry seeks to become more efficient and effective. The buzzword here is sustainability. Not just that, but enhancing quality, reducing costs and streamlining processes to make more informed business decisions is where technology lends itself effectively.

Then there is the emergence of smart cities. By definition, "a smart city is a designation given to a city that incorporates information and Information & Communication technologies (ICT) to enhance the quality and performance of urban services such as energy, transportation and utilities in order to reduce resource consumption, wastage and overall costs." With increasing globalization, high degree of urbanization and the resultant global warming has led to this concept. The idea of a smart city is to leverage technology to improve the quality of life in our cities. Reducing emissions, managing resources effectively and enhancing sustainability are just some of the objectives of a smart city.

Yet another important concept emerging in the sustainability endeavor is 'circular economy'. "A Circular Economy is an alternative to a traditional linear economy (make, use, dispose) in which we keep resources in use for as long as possible, extract the maximum value from them whilst in use, then recover and regenerate products and materials at the end of each service life." With the global population inching towards 9 billion by 2030, the traditional growth notion of acquire resources, utilize and then dispose easily will not work. Resources need to be recycled and reutilized. That is what the circular economy is about.

Cities, and not just smart cities, will need to adapt to the circular economy. It is reported that our cities currently consume 60% of the world's energy and generate 70% of greenhouse gas emissions and global waste. As cities/ urban areas continue to grow, we cannot afford to ignore the toll it's taking on our planet. The rules of consumption and waste must change. Perhaps, in the next 30-50 years, the concept of waste can become redundant.

Circular Economy: Extracting Value from Waste

While there is a lot of chatter about waste, enterprises can actually extract valuable resources from waste. Waste must be treated as a resource – one, because our resources are limited and two, because as a planet, we don't have the capabilities to dispose off the waste generated. World Bank estimates indicate that municipal solid waste generation levels are expected to increase to approximately 2.2 billion tons per year by 2025. Countries like Norway landfill only about 1% of their waste. There are several initiatives in the capital, Oslo for waste management systems to extract maximum value from waste with minimum impact on the environment. Until the advent of this concept of circular economy, plant managers and municipalities were focused to extract the maximum out of the resources available and then disposing off the residues.

Internet of Things (IoT) in a Circular Economy – Enhancing Sustainability

IoT is already present in some areas of manufacturing, transportation and aviation, where sensors help to schedule maintenance, indicate fuel consumption, and reduce waste. Other industries still have a long way to go. Implementing IoT must include the notion of reuse and repurpose in a circular economy. Today smart city solutions depend on the IoT, with millions of devices connected to a network. Data can be gathered from these devices not only to track their efficiency, but also for reuse and recycling. IoT technologies, coupled with artificial intelligence, machine learning, augmented and virtual reality and distributed ledger technologies, such as blockchain, can have significantly contribute to a circular economy.

Let's take the example of application of IoT technologies and the concept of circular economy in the food processing industry. There are two dimensions here - reducing food wastage and identifying optimal usage of items. Global research indicates that there is 20-40% wastage of food in any household. There are solutions right from the supply chain, packaging and at the household level to reduce this wastage. A Chicago based company, Ovie , offers a connected app for a smart food storage system in a household to eliminate waste. In a fresh food processing plant, IoT sensors monitor fruit respiration rates and freshness so that packaging can be customized in order to extend the shelf life and reduce waste.

Consider the example of China. China produces 520,000 tons of garbage every day, of which a staggering 6,000 tons is plastic. This is generally burned in incinerators, leaving around 98.9% of waste such as wood, paper, organic solvents, non-ferrous metal, and e-waste etc. China has only 7% of the world's water resources for 20% of the world population. While there are over 4,000 municipal waste water treatment plants and trillions of dollars have been spent over the last 5 years, conventional means of water and waste management are not yielding results.

However, the use cases that IoT technologies provide are compelling. Urban optimization for civic planning, sensitized waste containers for tracking generation, agro-based technologies to minimize water consumption and instrumented infrastructure for KPI driven maintenance allow for billion-dollar savings for municipalities and cities.

Promising Pilots

The added transparency that IoT technologies bring in terms of asset modeling and pattern recognition has been used by many players to bring about sustainable waste management pilots. Upmade is a digital solution in the textile industry that allows fashion brands to predict the volume of textile waste and leftover materials in a production job. This information is fed back to the contracted garment manufacturers and built in as raw material for future jobs. 3D printing, a technology which produces little to no waste, is being used by Airbus to experiment for printing cabin dividers to reduce the weight of the aircraft. Digital technologies are lowering the thresholds for economies of scale, allowing producers to build localized and energy-efficient factories closer to the regions of consumption.

Electric car batteries are another example. Companies like Renault are leasing electric car batteries, rather than selling them to customers. Sensors installed on the battery, engine, and charging ports send information to the company about the life of the part. Once its life in the car is over, the part is taken back by the company and repurposed, perhaps as electricity storage for renewable energy or to balance the grid.

The Road to Circular Economy in the Future

Circular economy is not an overnight phenomenon. Behavioral change is required. Recycling, repurposing and reinvesting are key criteria for a sustainable economy, both from a business and global standpoint. However, focusing on recycling alone does not ensure sustainable waste management. The circular economy also focuses on adding value and a protecting the planet and its people against hazards.

With IoT at their disposal, it is only a matter of time before organizations find innovative ways to interconnect geographically dispersed physical systems and derive benefits from resulting efficiencies. Technology has long been used for economic sustainability. It's time that we look towards it for addressing the other two dimensions – Social and Environmental Sustainability.

About the Author
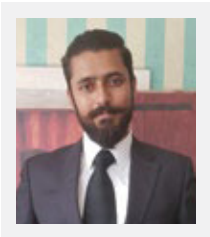
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