

New Form of Value Provided by HCM Solution Linkage



HCM's construction machinery that underpins social infrastructure has evolved considerably over the years driven by various technological innovations. At the same time, the mining sector, which is searching for greater management efficiencies, and construction sites, faced with labor shortages, both require greater innovations in the production processes. Given this, in FY2017 the HCM Group rolled out a proprietary solution called Solution Linkage that accumulates know-how while working together with customers to solve their challenges. Solution Linkage represents a new form of value creation provided by the HCM Group, which has extensive experience in supporting customers' businesses using ICT and IoT.

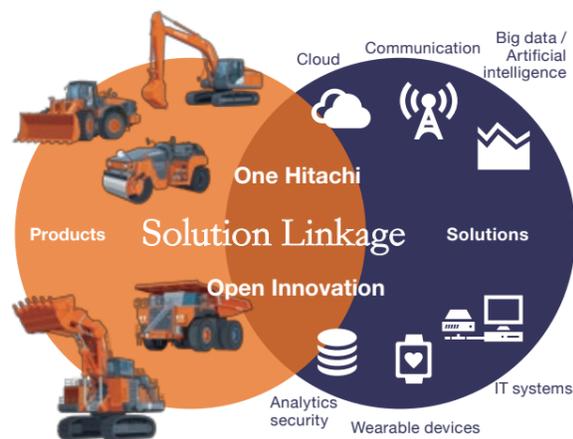
Combining the many advanced technologies of the Hitachi Group with the expert technologies of business partners

Solution Linkage is HCM's ICT/IoT-based solution that helps to address such customer work site challenges as improved safety, improved productivity, and reduced life cycle costs while working together with customers.

With HCM the focal point, using the "One Hitachi" approach to deliver the Hitachi Group's wide ranging technologies and propose solutions that utilize "open innovation" combining the expert technologies of business partners represent the key to finding solutions to these challenges.

Today, customers require not only high quality and high performance products from construction machinery manufacturers, but also solutions for working together to find solutions to challenges and generate value together. This marks a major evolution in customer needs. The HCM Group is committed to the further evolution of Solution Linkage so as to always be one step ahead of customer needs.

Conceptual Image of Solution Linkage



Developing more advanced mining operation management solutions

Wencomine / Wencolite

Wencomine and Wencolite are the names of Fleet Management System (FMS) provided by Wenco of Canada, a subsidiary of the HCM Group. These systems contribute greatly to streamlining and increasing the efficiencies of mining customer's operation by harnessing the most cutting edge information technologies available today.

Wenco's FMS are used at around 150 mines around the world

Generally, at a mining site, several mining trucks are assigned to one digger/loader so that minerals can be loaded steadily as they are removed from the ground and hauled to a processing facility or stock yard. In order to smoothly and efficiently undertake this work, the dispatcher, who is responsible for dispatching vehicles, issues orders to vehicle operators while judging the state of operations. This requires accurate position information and operating information for mining machines.

Wenco's FMS provide highly accurate information to the dispatcher using advanced functions and top-class operability. Wenco's FMS include Wencomine for large-scale mine operations and Wencolite, lite version for small- and medium-sized

mines. These FMS are in use at around 150 mines around the world.



Increasing efficiencies and optimizing mining operations through centralized management

Accommodating customer's new needs with add-on functions

Basic functions

- Operation-management
- Automatic dispatch
- Machine guidance

Add-on functions

- Safe operation support
- Operation data analysis
- Machine maintenance

Solution Linkage aims for the further advancement of FMS using the One Hitachi initiatives and open innovation. Avoca, a new solution for data analysis and visualization, is a function that enables the effective use of operating data stored in a database. In addition, there are various other functions that can be added on, including ReadyLine, which collects and analyzes sensor data on mining machine temperature and vibrations, Maintenance Monitor, which manages maintenance schedules, and TireMax, which helps to reduce tire failures and extend tire life, to name a few.

Future Developments

In addition to FMS, the Autonomous Haulage System (AHS) for mining trucks is another cutting-edge technology that contributes to a dramatic increase in the operation and energy efficiency of mining operations. HCM's AHS is currently undergoing various verification testing aimed at commercialization in FY2019. The know-how accumulated in FMS is being utilized in the technologies for safety and efficiently operating multiple AHS trucks in the site. Going forward, we will contribute to solutions to customer challenges while capitalizing on the benefits of both FMS and AHS.

An example of AHS for mining trucks is introduced in CSV Theme 2.

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Core ICT Construction Solution Solution Linkage Cloud

Solution Linkage Cloud is oriented as platform of solutions provided by HCM. Applications provided on the cloud are used based on the contents and the process of work, contributing greatly to improved productivity on work sites.

Using work site visualization to optimize the relationship between people and work

In September 2017, HCM released Solution Linkage Cloud as its proprietary cloud solution optimized for ICT Construction, including i-Construction advocated by Japan's Ministry of Land, Infrastructure, Transport and Tourism. Solution Linkage Cloud delivers a number of useful applications for ICT Construction. Through these applications, customers can improve safety, improve productivity, and reduce life cycle costs.

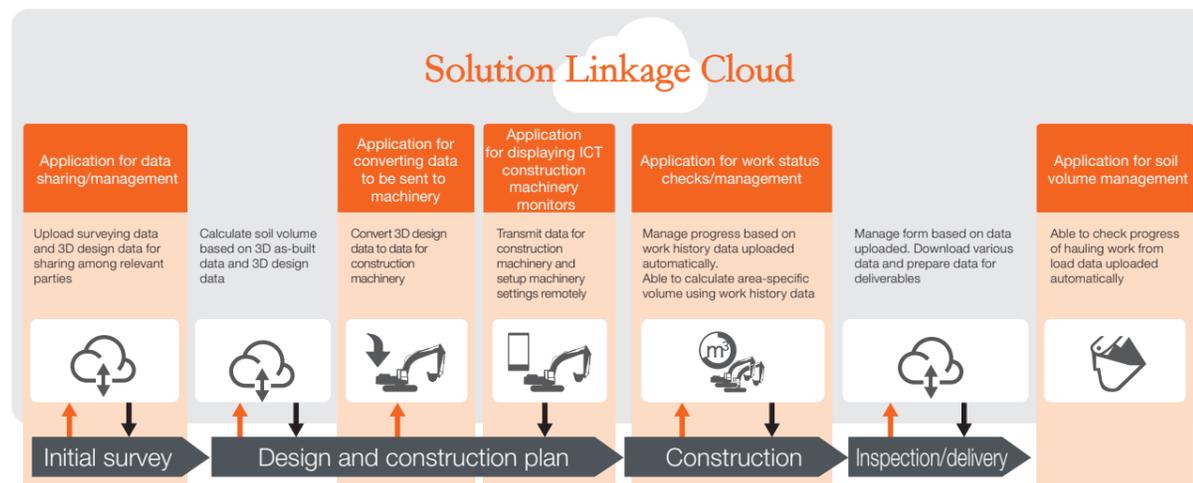
Applications provided by Solution Linkage are used based on the contents and the process of work, making it possible to carry out work more efficiently on site. For example, surveying data or 3D design data can be uploaded to the cloud for sharing among relevant parties and progress can be managed based on work history data transmitted from ICT construction machinery.

Solution Linkage Cloud offers the possibility of creating global value creation by connecting 3D data seamlessly and encouraging collaboration through open innovation in all stages of the work process, from surveying to maintenance.



Sample image of the Solution Linkage Cloud portal site

Applications connected by the cloud



Future Developments

Looking ahead, we will create a portal site that can respond flexibly to sites where construction machineries from various makers are being operated, by providing a wide range of applications.

Our goal is to expand solutions for solving customer challenges through co-creation activities with customers in a host of different sectors, including not only civil engineering and construction, but also quarrying, dredging, forestry, and steelmaking, among others.

An example of Solution Linkage Cloud applications is introduced in CSV Theme 2.

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Recognitions and Awards

Major Recognitions and Awards in FY2017

Name of award / Month and year awarded	Sponsoring organization	Organizations receiving the award	Evaluation
Excellence Award at the 21st Environmental Communication Awards [February 2018]	Ministry of Environment, The Global Environmental Forum (GEF)	HCM Group's CSR & Financial Report 2017, and Environmental Website	Awarded for our consistent policies from the top commitment to selection of key performance indicators (KPI) reflected in products, as well as mapping the SDGs against the value chain to clearly illustrate the issues and linkages to sustainability within our entire value chain.
Organizations (large enterprise category) Recognized under the 2018 Certified Health & Productivity Management Outstanding Organizations Recognition Program - White 500 [February 2018]	Ministry of Economy, Trade and Industry, Nippon Kenko Kaigi	Hitachi Construction Machinery, Hitachi Construction Machinery Tierra	Awarded for initiatives to energize organizations to achieve health management, including 1) the "Health Management Declaration" from top management and initiatives to maintain and promote health, 2) addressing health issues faced by employees including mental health, in collaboration with the health insurance society, 3) involvement of certified professionals (industrial physicians or public health nurses), 4) optimization of work hours and realization of a comfortable work environment, and 5) promotion of work-life balance.
First Prize in the Zambia KAIZEN Awards [February 2018]	Zambia KAIZEN Council, Japan International Cooperation Agency (JICA)	Hitachi Construction Machinery Zambia	FINAL DRIVES, the team representing the Hitachi Construction Machinery Zambia Components remanufacturing Center participated in the Zambia KAIZEN Convention held in Lusaka, the capital of Zambia. Received first place out of 12 teams of manufacturing unit competing in "improvement of toolbox set up methods" as part of the case example presentation.
Outstanding Integrated Report chosen by domestic equity management institutions [January 2018]	Government Pension Investment Fund (GPIF)	HCM Group's CSR & Financial Report 2017	GPIF asked 16 organizations involved in managing Japanese stocks to select candidates for Outstanding Integrated Report and Highly Improved Integrated Report. HCM Group's CSR & Financial Report 2017 was chosen as the top report among candidates from a total of 70 companies.
HCM received the Judges' Honorable Mention Award at the 6th Contest for Corporate Activities on Biodiversity [December 2017]	National Land Afforestation Promotion Organization, Aroma Environment Association of Japan, Water Earth and Green Foundation, Global Environmental Action	Hitachi Construction Machinery (Shanghai), Hitachi Construction Machinery (China)	Implemented desert afforestation balancing forest restoration and community revitalization through water bucket relay for the future in support of the philosophy of NPO Green Network, with the dual goals of forest restoration in Horqin desert in China and regional revitalization. Received the award for practical efforts in preserving biodiversity and sustainable usage.
Fiscal 2017 Kanto Region Invention and Innovation Award at the Commissioner of the Patent Office Awards [November 2017]	Japan Institute of Invention and Innovation	Energy saving system for hydraulic excavators TRIAS (Patent number 5572586)	The proprietary three-pump hydraulic system enables precise control of hydraulic actuators with little throttle pressure loss. Awarded for its contribution to meeting customer needs for outstanding operability and improved fuel efficiency.
Artisan's Masterpiece Award at the Construction Machinery Industry Internet Conference (CMIC2017) [November 2017]	HC360.com	ZX490LCH-5A large hydraulic excavator of Hitachi Construction Machinery (China)	The ZX490LCH-5A large hydraulic excavator was chosen based on over 1.8 million votes on the Internet over a 6-month period, user reviews, and expert judgment for being a product that meets market needs. This marks the fourth consecutive year we received this award since the EX8000E-6 electric-powered ultra-large hydraulic excavator received the award in 2014.
Received the Hefei City Project Hope Award [August 2017]	Hefei City, Anhui Province	Hitachi Construction Machinery (China)	Hitachi Construction Machinery China has been taking part in social interest events in the city of Hefei with an emphasis on giving back to society. In particular, in the area of children's education, the construction of Hitachi Construction Machinery Songgang Xi Wang Elementary School in 2010 was financed in part with an education fund HCMC donated to Hefei City. HCMC continues to interact with the children of this elementary school through regular visits, the donation of educational supplies, and by providing opportunities to the children so they can have various experiences.