WORK SITE X.0
THE CONNECTED CONSTRUCTION WORKER
In the recent years, engineering and construction companies have launched several digital initiatives, using mobile apps, augmented reality, sensors, etc. However, construction industry is still ranked 21st out of 22 in the HBR 2016 digital ranking.¹ This ranking can be explained by the fact that construction industry has just launched its digital revolution.

In the WEF survey² realized in May 2016, C-level participants indicate that the two most important areas of transformation are people and adoption of new technology. This confirms that the connected worker will be the first step of digital transformation.

Accenture Consulting proposes a business approach of the connected construction worker, leveraging its knowledge of the construction industry and recent projects on connected workers.
The objective of the connected worker is to equip a worker with sensors or tags in order to collect data from the field or receive important information from the office anywhere anytime.

It is based on IoT technology as the sensors or tags exchange the information through the Cloud, requiring an Internet connection (3G/4G depending on the location, WiFi with the installation of an access point).

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**WHAT IS THE CONNECTED CONSTRUCTION WORKER?**

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**RECEIVING SENSORS**
Collects field data on external conditions and workers health

**SENSORS/TAGS FOR MACHINE/WORKSITE INTERACTION**
- Entry Gate check
- Warning/alerts for hazardous zones
- Collision risk alerts
- Monitoring of worksite resources

**ANALYTICS**
Data on working conditions and workers to improve safety procedures and operations planning

**DRONES/UAWS**
Maintenance
Monitoring
3D mapping

**TRANSMITTERS**
Warnings on dangerous working conditions/workers health, helmet condition

**MOBILE DEVICES**
Collaboration
Dashboard/reports and monitoring
REAL-TIME DATA COLLECTION TO IMPROVE WORKING CONDITIONS

1. WORKERS AND WORKING CONDITIONS DATA COLLECTION

While workers perform their tasks, data relevant to their working conditions is automatically recorded.

Data can be either external (weather conditions, temperature, hours, chemical detection, pressure, sound, light) or related to the worker (movement, vibrations, heart rate).

2. WORKERS PREVENTIVE ALERT SYSTEMS

Automatic warnings enable the worker & management to prevent the worker from performing tasks in dangerous conditions.

DATA USAGE: IMMEDIATE
3. HELMET EXPIRATION NOTIFICATION

The helmet can send expiration notifications based on the history of shocks received.

DATA USAGE: IMMEDIATE

4. WORKING CONDITIONS ANALYTICS

Working conditions data can be further analyzed depending on the project type and project phases.

Improved safety instructions & operations planning (e.g., better distribution of tasks between workers) can be developed on the long-term based on performed analytics.

DATA USAGE: SHORT TO LONG TERM
ENHANCED DETECTION OF WORKERS FOR SAFETY AND MONITORING

1. WORKSITE ENTRY GATE CHECK

Workers’ entrance on the worksite is automatically verified using RFID while going through a specific gate (personal connected helmet), in replacement of actual badge.

The site manager can check the number of workers on the worksite in real time and gets notified immediately of an intrusion on the worksite.
2. HAZARDS WARNING

Helmet sensors help warning of physical hazards, which can be fixed such as electric infrastructure or hazardous zone, or mobile like an equipment or vehicle.

The worker is warned with a strong light (improved visibility, especially at night or in reduced light conditions), ensuring the respect of safe distances.

In case a worker remains in an unauthorized area, an alert is sent to the manager.

3. MONITORING OF TEAM’S POSITION

The workers’ position per team (split per company) are displayed on a map in order to check remotely the activities and presence.

- TEAM A
- TEAM B
- TEAM C
SENSORS
A combination of communicating sensors that will be used to collect data from the worksite or the worker. Typical examples could be GPS location, temperature, noise, chemical environments, but also biometric data from the worker himself.

DEVICES
A set (and yet optional) of devices that will enhance the worker’s capabilities: Augmented Reality Helmet, Smart Gloves, Exoskeleton, etc.

PLATFORMS
A back-office platform, composed of two major components:

- First, an IoT platform, in charge of data collection, processing and local analyze
- Second, a Data platform, in charge of advanced analytics (predictive analytics with machine learning/AI), with big volumes of data, from different worksites, different population types, etc.

HOW DOES THIS WORK FROM A TECHNOLOGY STANDPOINT?

WHAT VALUE WILL IT UNLOCK?

When it comes down to the value brought by the connected worker, it can be classified into three areas:

1. BETTER HEALTH AND SAFETY FOR WORKERS THROUGH:

Decrease in incidents recorded on worksites due to:

- Digital indication of access rights and accreditations to ensure safe zones/distances are respected
- Interaction between the worker and machine when safety distance are not respected (collision avoidance system)
- Smart warnings sent to workers and management based on data collected (risk of heart attack, gas leakage, etc.)

Leverage advanced analytics to better manage risk factors and trends such as fatigue, site congestion and proximity to high risk activities

- Monitoring of pneumatic drill working hours
- Follow-up of time worked in extreme weather conditions

Accenture analysis estimates an impact up to 30% reduction in musculoskeletal disorders.

Renew focus on safety and embed a safety culture by utilizing innovative Digital technologies

Safety equipment worn and guarantied not damaged:

- Safety equipment become digital and desirable
- Workers without a connected helmet can’t access the site
- Helmet expiration notification sent to managers

Accenture analysis estimates an impact up to 30% reduction in musculoskeletal disorders.
2. COMPLIANCE WITH SAFETY STANDARDS AND RULES, LOCAL REGULATIONS AND POLICIES DUE TO:

Better application of worksite safety rules through remote monitoring by management

- Reports generated through consolidated collected field data, warning on regulation thresholds

Better knowledge of number of workers per company on each site area

3. INCREASE OF PRODUCTIVITY ON THE SITE BASED ON:

Collection of new data from the worksite enabling immediate access to information regarding working conditions

Digital identification of the worker, equipment and space/zones thanks to the embedded sensors/RFID tags.

Easier monitoring of resources on the worksite due to:

- Helmet GPS system and space interactions (beacons, RFID tags)
- Workers and working conditions warnings and real-time updated dashboards

Automatic collection of operational data from the field: temperature, humidity, etc.

Accenture analysis estimated an impact up to 10% reduction in effective worktime.

The Connected Worker gives also a digital image to the construction company, helping them attract and retain best talents.

WHAT POTENTIAL LIMITS?

LOCAL REGULATIONS
Personal data privacy and usage restrictions according to local regulations and policies (management tracking)

WORKERS’ APPROVAL
Organization (workers unions acceptance) and worker’s approval of the NEW helmet using conditions and correct use of the helmet

SPECIFICATIONS
Equipment weight and price increased by embedded technology including potential medical restrictions

FIELD CONDITIONS
Technical ability to measure (lifting operations, chemical gas, GPS) and provide/transfer reliable data in real time (network conditions, distance covered, variation and repetition of movements, etc.)

SECURITY ISSUES
Data and devices security issues
EXAMPLES FROM CONSTRUCTION AND OTHER INDUSTRIES

OPTIMIZED LOGISTICS ON SITE

Skanska is developing a Tag & Tack system, pioneering the use of radio frequency identification (RFID) tags and barcodes on products and components in construction projects.

By facilitating real-time monitoring of delivery, storage and installation this way, the new system is achieving reductions of up to 10 percent in construction costs.

HANDS-FREE WORK ORDERS AND INSTRUCTIONS

KPN, a major Dutch telecommunications company, explores how wearable devices might support its field force activities.

Together with Accenture, they piloted a solution that provides hands-free visual instructions, checklists, pick lists, work orders and other instructional information to the company’s employees as they perform field work.

It helps KPN engineers better manage and execute their work orders, as well as enabling expert collaboration and data capture in the field. KPN has identified productivity improvements of 30 percent as a result.

REAL-TIME MONITORING AND DECISION MAKING

Accenture teamed with a major resources client in the use of RFID location triangulation technology. To support improved turnaround execution, our solution provides the company with real-time visibility of the location of over 1,800 contractors and pieces of equipment during major industrial shutdowns.

This kind of technology not only facilitates real-time decision making, but also provides the basis for detailed trending and improvement analysis.

The capabilities of the solution have supported improvements in safety, in productivity and in proper cost auditing for vendor work management.
OUR RECOMMENDATION TO GET THE BEST OUT OF THE AUGMENTED CONSTRUCTION WORKER

Based on our experience of connected workers, we recommend to:

**THINK BIG**
Be obsessed by business value: drive the program roadmap by incremental and tangible value generated for the company and its ecosystem

**START SMALL**
Look for quick wins and avoid usual tunnel effect that may affect some IT projects

**SCALE FAST**
Find a solid and scalable technology partnership to avoid tools to be outdated in few years - or months

If you are ready for the challenge, Accenture may accompany you from the definition of the connected worker strategy to its implementation, contributing to make Engineering & Construction a top digital industry.