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THE FUTURE OF BUSINESS INFORMATION TECHNOLOGIES

Are You Ready?



As **JOB-RELATED DATA** in construction becomes increasingly integrated into everyday work, an array of new information management technologies and tools are becoming steadily available.



 By Scott Rosenbloom 

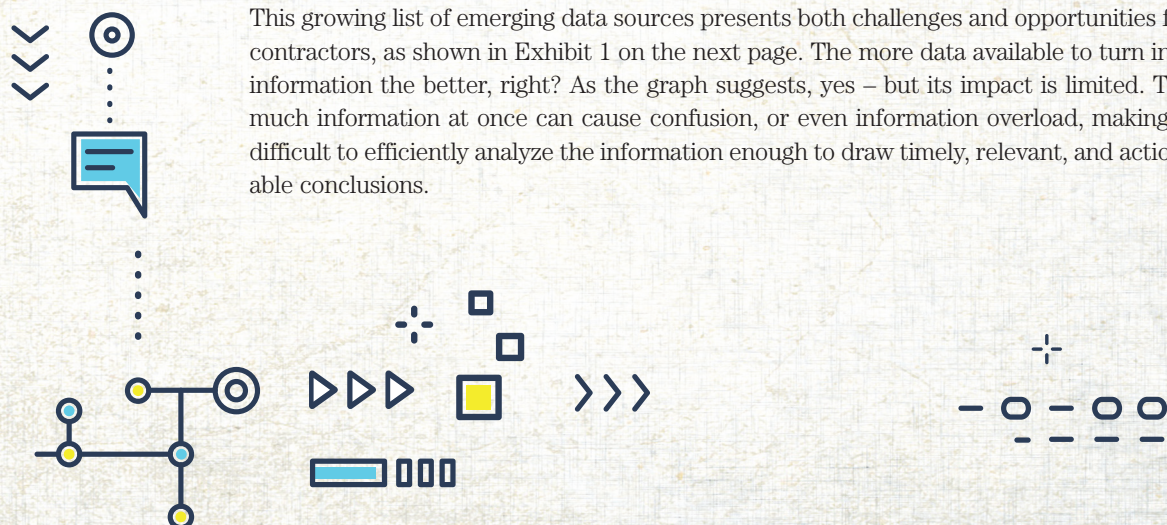
Selecting the right technology for one's company depends on understanding not only the software, hardware, and networking choices available, but also the role that data plays in such business ideals as increased profitability, reduced risk, and improved safety.

When considering investment in IT solutions, it is imperative to examine the business objectives of one's jobsites and how data, information, and intelligence can help meet them. From here, one can better assess how information technology will help achieve goals and identify the people and processes required to turn the new integration of IT solutions into bottom-line, data-driven growth.

From Data to Intelligence

The amount of raw data available to contractors could easily overwhelm anyone, whether transferred through mobile time entry via smartphone, digitally transcribed daily logs, fleet telematics, jobsite video data from drone surveillance, and more.

This growing list of emerging data sources presents both challenges and opportunities for contractors, as shown in Exhibit 1 on the next page. The more data available to turn into information the better, right? As the graph suggests, yes – but its impact is limited. Too much information at once can cause confusion, or even information overload, making it difficult to efficiently analyze the information enough to draw timely, relevant, and actionable conclusions.





The successful contractor will find a way to create more actionable business intelligence with the data at hand, without adding to the confusion. The following discussion will clarify terms commonly used interchangeably, but which carry significantly different meanings: *data*, *information*, and *intelligence*.

DATA

Data is the foundation upon which all business intelligence rests. While “raw” data implies that it is a part of something greater, data alone has intrinsic value and a vital place in any company’s IT infrastructure plan.

From mobile app data entry to drone survey video to internet-connected personal protective equipment (PPE), contractors are regularly bombarded by new ways to gather data from the jobsite. The temptation to keep up with technology may drive some to invest in new data capture methods before assessing the unique business objectives regarding data for their jobsites.

While technologies that organize and process data are important, they tend to be less visible and, at first, viscerally appealing.

For example, the “cool factor” of a standard job progress analysis report might pale in comparison to a drone’s ability to auto-survey a jobsite, automatically return to a recharging station, and repeat the cycle.

INFORMATION

Regardless of whether contractors are early adopters of new data collection technologies, most do not realize the full potential of the data warehouses they are building. Before extracting value from raw data, one must first establish structure. Gathering and organizing point values of data into related sets is the genesis of business *information*.

As a company grows, so does the need to bring order and structure to business data. As separate functional groups develop – accounting, estimating, project management, procurement, etc. – they gather the data points needed to perform their jobs. In most cases, these groups also find and use their own software applications to process and store their data, usually leaving the applications to remain siloed.

To overcome any possible data disconnect, some companies incorporate more software to improve interdepartmental communication and information exchange. Common approaches include online document sharing hubs, business messaging apps, or custom integration work to push disparate software systems to operate together. There is value in this method, but it must be weighed against the cost of the additional software – as well as the cost of maintaining integrity as the different applications change over time.

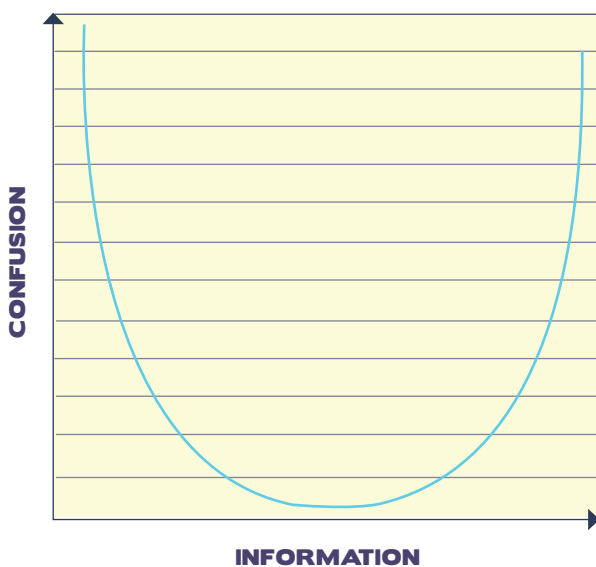
The fact that growing companies often work diligently to connect their disparate information technologies speaks to the value of maintaining interdepartmental connection. For example, it does not matter if a change request can be generated quickly if it still takes weeks to move through the onsite approval process.

Connecting the information silos within a company also enables the application of more powerful analytic tools – thereby enriching the data management process. In turn, managers are able to make more informed decisions.

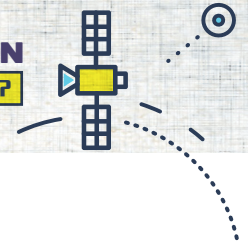
INTELLIGENCE

Computers and software systems have historically been integrated into jobsites to streamline work processes. However, operating such software can be difficult for novice users.

Exhibit 1: FINDING THE RIGHT AMOUNT OF INFORMATION



Source: Jessica Hagy, Seattle, WA



Luckily, business reporting has progressed along with the increased volume and complexity of business data and now assists users with much of the analytical work. From two-dimensional tables to multi-dimensional pivot charts and interactive executive dashboards, business reporting has evolved to the point where it can now provide a powerful window into company data and performance metrics.

However, business *intelligence* requires more than access to vast amounts of information at once. Business intelligence involves the application of an analytic engine to identify relationships, as well as the ability to adjust the focus of investigation to correspond with the task at hand.

To clarify, uncovering relationships and defining relevance are still tasks best performed, at least in today's world, by the human mind. New business intelligence applications provide tools that translate human rules and requests into predictive and adaptive technological algorithms. The results are then presented in a way that helps users make business decisions. In this way, one can scale the domain knowledge of a few individuals to the entire organization and have this knowledge persist even after those experts retire.

Referring again to the “change request” example, a business intelligence system primed with the right rules of engagement might reveal that the approval delays are due to one senior PM being overutilized across too many projects – a conclusion that would have required the system to be able to access completed and scheduled workloads across all active projects.

However, today's business intelligence systems are more powerful than ever before. In the (not too distant) past, business reporting required a user to specify something such as: “show how X depends on Y and Z.”

Today, with the right business intelligence tool, a user can make more generalized queries such as: “show me things that are related to making X larger.”

When at its best, a good business intelligence system will provide unexpected and accurate answers to questions like these that might have otherwise been overlooked by the very busy human minds on the jobsite.

Applied Intelligence

More powerful and useful business intelligence systems feed off of the continued growth of data and information management technologies. The ability to capture, collect, and categorize increasing volumes of raw data fuels the analytical engines of business intelligence. And, each level of this stratum actively contributes to the health of a successful construction business.

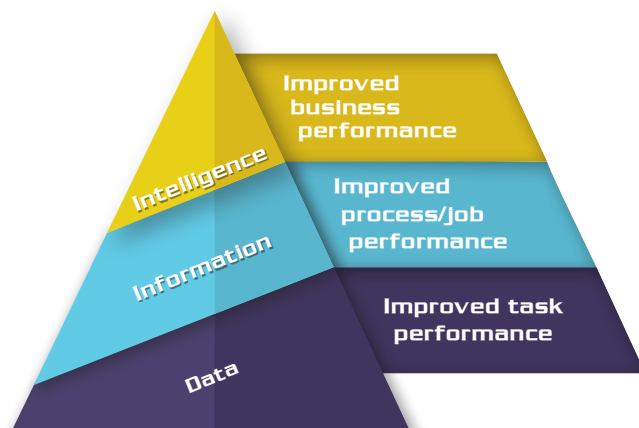
Exhibit 2 shows general levels of IT management and the role each level plays in an organization. Again, it is important to note that each level is not static once built, but requires constant reevaluation and regular investment as technologies advance.

Every company has a data system, or a way to capture and communicate information from the field into the systems that rely on that data. A data system might be as basic as a folder full of paperwork that is driven from the job trailer to the office, or as sophisticated as wireless connected devices that automatically send real-time data to an ERP system at the office. Data systems typically combine old and new techniques and technologies.

Regardless, the objective here is to obtain as much relevant, timely data as the information and intelligence systems can handle.

Referring again to Exhibit 1, past a certain point, more data simply causes confusion – information overload. This brings up an important point about building an effective IT infrastructure. It makes little sense to invest heavily in leading-edge data capture technology without having a reliable data system in place as a foundation.

Exhibit 2: THE BUSINESS INTELLIGENCE PYRAMID





That said, each layer of business intelligence has its own independent value to company success and its own set of emerging technologies. Here is a brief snapshot of both the value propositions and some of the emerging technologies in each layer:

INVESTING IN DATA SYSTEMS

Even if a company goes no further in IT investment than improving field data capture processes and technology, it stands to benefit from improved productivity in the field and reduced time and error in the office.

To fully realize these benefits, field data capture must be quick, simple, and automated for the folks working at the jobsite and into office systems without manual intervention. This means looking for field data solutions that present simple, intuitive user interfaces that work on multiple devices, as well as searching for integrated solutions.

With those general criteria in mind, Exhibit 3 presents a brief summary of existing and emerging data capture technologies in the industry.

INVESTING IN INFORMATION SYSTEMS

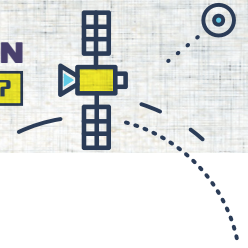
Once data is properly categorized, the business processes within those silos – accounting, project management, purchasing, equipment management, etc. – can be supported by the processing work done by the software applications also housed in those silos.

Successful business information management implements systems that help users manage the ever-increasing volume of field data by enabling rules, thresholds, and active alarms that alert the right users at the right time. However, these systems can be as simple or as complicated as the jobsite demands.

For example, a sophisticated business intelligence system would not be required to trace a work delay at a jobsite back to an unapproved change request sitting on an owner’s desk. But, it would necessitate an information system capable of tracking the progress of change request approvals and letting the appropriate users know when approval due dates have past.

Exhibit 3: IMPORTANT & EMERGING DATA TECHNOLOGIES IN CONSTRUCTION

TECHNOLOGY	WHAT IT DOES	HOW IT HELPS
Mobile Apps/Kiosk	Puts basic but vital data capture tools into the hands of field staff	Eliminates duplicate entries and errors and speeds time-to-data
Drone	Captures and/or transmits jobsite video for evaluation	Emerging uses include estimating job percent complete, monitoring site equipment utility, and measuring material supply levels
Augmented Reality	Provides additional data on objects/systems in the real world, typically via mobile device or heads-up display	Gives field technicians and construction crews access to plans, specs, repair and warranty information, and other data relevant to the work in front of them
Virtual Reality	Immersive experience in simulated environment – for example, “walking” through a 3D rendering of a building based on plans prior to construction	Enables virtual design and helps identify construction conflicts before they result in rework and/or change requests
Internet of Things (IoT)	Provides connectivity to nontypical devices in order to track and in some cases control them through software	Adds entirely new sources to a contractor’s set of data, helping to put more aspects of operations under control and make business intelligence queries more robust



When at its best, a good BUSINESS INTELLIGENCE SYSTEM will provide unexpected and accurate answers... that might have otherwise been overlooked by the very busy HUMAN MINDS on the jobsite.

It's also important to build information systems across an organization in a way that allows them to communicate and share data efficiently.

Application integration solutions range from basic flat-file export and import to automatic data synchronization between systems using techniques. These techniques vary from custom programming for proprietary application programming interfaces (APIs) to a more open web services integration for cloud-based systems.

Exhibit 4 presents a brief summary of existing and emerging business information technologies that should be considered as part of a company's overall IT strategy.

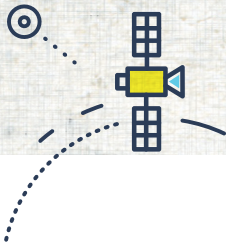
INVESTING IN BUSINESS INTELLIGENCE SYSTEMS

What is the best way to distinguish between new business intelligence solutions and more traditional business information systems? Both traditional and more modern views are important, and it is wise to take into account not only past queries, but also proactive, future-focused solutions.

Exhibit 4: IMPORTANT & EMERGING BUSINESS INFORMATION TECHNOLOGIES IN CONSTRUCTION

Technology	WHAT IT DOES	HOW IT HELPS
Cloud Computing	Provides access to data storage and processing resources, and when combined with browser-based user interfaces, allows for access to powerful software from virtually any internet-connected device with a browser	Allows people to access information and applications from most any device, whenever and where ever they need it, and to easily share information with others
Web Service Integration	Provides a mechanism to provide data exchange between cloud-based software systems and other data sources	Allows for import of data from multiple sources into a cloud-based software system
Document Collaboration	Electronic work rooms with tools to share, control versioning, and securely manage project document distribution	Keeps teams working from the same page and provides a rich source for unstructured data* for use by business intelligence systems
Workflow Management	Applies business rules to software systems to automate frequently repeated processes	Improves the flow of information and work across an organization by automating the routing of documents, task requests, and approvals
Active Reporting	Provides customizable views based on role and drill-down tools to uncover the details behind the information presented	Gives individuals the ability to create views of the business that are relevant to their roles, alerts them in advance to potential problems, and lets them quickly access the details behind business issues

*Unstructured data does not have a predetermined model or organizational structure, such as e-mails, but may contain information very relevant to business intelligence analytics.



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And while business intelligence alone cannot necessarily help ask the right questions, a well-designed and properly integrated business intelligence system can help find answers to more open-ended and often unanticipated queries.

For example, a traditional reporting request might be: “list the labor cost breakdown by job phase on project X.” Business intelligence systems can support structured questions like this, but can also give the user freedom to be more general with queries, such as “What factors are associated with higher than average labor costs on commercial remodeling jobs?”

While traditional reporting works well when specific questions are asked, business intelligence shines when one is looking for new connections and relationships that might not have been obvious, or even considered. This makes reporting more than a tool for reviewing past performance, allowing it to interpret findings and then integrate them into future decision-making.

Some examples of business intelligence systems include: complete stand-alone systems, hardware packages and front-end user interface software optimized for business intelligence, or a custom-built system from scratch. Many industry-specific ERP systems are also now offering business intelligence tools built into the platforms.

Exhibit 5 presents some technology considerations regardless of how one approaches a business intelligence investment.

From Data to Dollars

The real value of a business intelligence system is the extent to which it elevates an entire company’s knowledge. Contractors that embrace these technologies, implement business practices, and take advantage of their benefits will rise as tomorrow’s industry leaders.

The most successful, growing companies strive to be data-driven organizations. While the process starts with data, much depends on turning that data into intelligence that is sourced and shared by everyone in the organization. The future is building, literally and figuratively – and digitally savvy contractors will be best positioned to build it. ■

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Exhibit 5: IMPORTANT & EMERGING BUSINESS INTELLIGENCE TECHNOLOGIES IN CONSTRUCTION

TECHNOLOGY	WHAT IT DOES	HOW IT HELPS
Extract/Transform/Load (ETL)	Takes data from multiple sources and loads into data warehouse	Allows for custom import of data from multiple sources
Data Modeling	Establishes a common data format and data set relationships and organization	Reduces the loading and complexity of the data warehouse
Data Warehouse	Provides “one version of truth” to be used in all business analysis	Separates bandwidth hungry data analytics from normal business data processing operations
Front-End User Interface	Provides intuitive, typically graphical, screens for building, viewing, and sharing business intelligence data	Opens up business intelligence capabilities to everyday system users