Rethinking how knowledge is produced, disseminated and consumed.

ENGINEERING INTELLIGENCE REVIEW

SUMMER/FALL 2019

IHSMARKIT.COM/EI

Here Come the *DISRUPTORS*

+ Information Overload in Digital Product Development

Digital Threading in Engineering

More Blockchain, More Questions

ESDU — Excellence in Engineering "Data Items" Produces Asteroid

Using Games to Cultivate Standards Ambassadors

Engineering Workbench™

by IHS Markit

Your single point of access to the engineering content and tools needed to advance innovation, maximize productivity, and reduce risk

Leading organizations across industries turn to IHS Markit to ensure that their engineers achieve on-time, on-budget delivery of complex, capital-intensive projects and new products.

Engineering Workbench is an engineering intelligence solution that combines essential information for the technical enterprise with cutting-edge knowledge discovery technology and content analytics. It solves the 'information overload' challenge by providing a powerful yet intuitive user interface that surfaces answers from the universe of technical knowledge.

Beyond Information, Engineering Intelligence

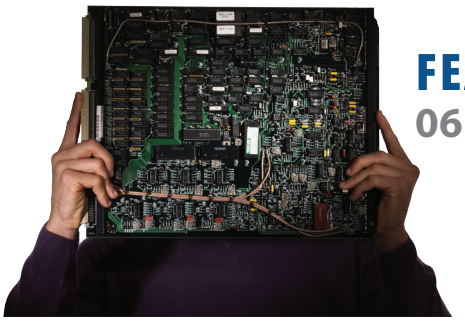
AVAILABLE NOW

Learn more at ihsmarkit.com/EWB or
contact Customer Care at 1-800-IHS-CARE

IHS Markit™

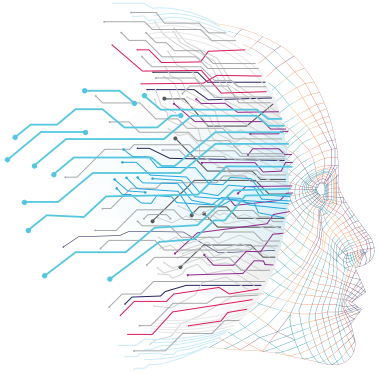
143454188-TS-0317

CONTENTS



FEATURE

EXECUTIVE FOCUS

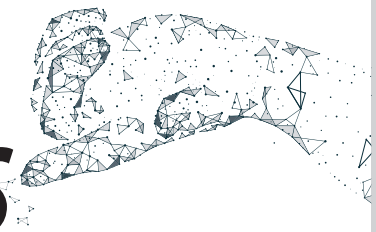


COLUMN

EXECUTIVE MEMO

By John R. Yuva, Editor
jyuva@ACBusinessMedia.com

DATA & *DISRUPTORS*



Having the right information at the right time is what separates the best engineering firms from the laggards.

Not all knowledge is created equal. And in today's AI- and machine learning-enabled world, that couldn't be truer. Engineers are inundated daily with volumes of data to sift, sort and scrub. How is the data entered, where does it reside and how is it housed for future projects? The answer to those questions can determine how efficient and effective the next product development initiative unfolds. Simply put: data determines success.

In the Summer/Fall edition of *Engineering Intelligence Review*, IHS Markit explores disruptors and how engineers are rethinking how knowledge is produced, disseminated and consumed. In a recent quantitative research study conducted by Lifecycle Insights and IHS Markit, the most common method used to track down information (62 percent) was employees going source to source collecting information—in many cases physically walking door to door.

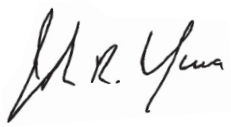
That is incredibly surprising given our current technological environment. It's a perfect entry point, however, for the theme of this edition of *EIR*. The survey also identifies the various types of information that respondents access on a daily or weekly basis, as well as outcomes of difficult-to-find information. An in-depth look at the survey results begins on page 6.

This is followed by articles about disruptive technologies (e.g., digital threading) and new standards for blockchain (see page 15). While many pilots have launched over the last few years, blockchain standards are critical to ensure conformity and remove complexity of use. Currently, the Institute of Electrical and Electronics Engineers (IEEE) is working with the food industry on a conformity assessment project. The ability to track and trace food from the field to the table using blockchain is a gamechanger for the industry.

The last two articles focus on data items to transform the aerospace industry and gamification to help employees understand standardization in the business environment. It's estimated that the PC global gaming market will reach $33.6 billion by 2020. And who is driving those numbers? The up-and-coming Gen Z employees. It's this generation that companies are relying on to explain the value and importance of business standards to colleagues and managers through the use of gaming—two games to be exact. Learn more about this initiative on page 20.

The content in this edition of *EIR* covers a variety of areas for engineers to evaluate and implement new ideas into their workflow.

Happy reading!



AC BUSINESS MEDIA
Supply Chain Network
SDCExec.com Supply & Demand Chain Executive
Food Logistics
Supply Chain Learning Center
A division of the AC Learning Hub

Published by AC Business Media
201 N. Main Street, 5th Floor, Fort Atkinson, WI 53538
(800) 538-5544 • www.ACBusinessMedia.com
www.SDCExec.com

Supply & Demand Chain Executive [USPS #024-012 and ISSN 1548-3142 (print) and ISSN 1948-5654 (online)] is published four times a year: March, June, September and December by AC Business Media, 201 N. Main Street, 5th Floor, Fort Atkinson, WI 53538. POSTMASTER: Please send all changes of address to *Supply & Demand Chain Executive*, P.O. Box 3605, Northbrook, IL 60065-3605. Printed in the USA. SUBSCRIPTION POLICY: Individual subscriptions are available without charge in the United States, Canada and Mexico to qualified individuals. Publisher reserves right to reject nonqualified subscribers. One-year subscription to nonqualified individuals: U.S., $30; Canada and Mexico, $50; and $75 for all other countries (payable in U.S. funds, drawn from U.S. bank). Single copies available (prepaid only) for $10 each.

Are you missing a piece of the puzzle?

Engineers use standards to ensure quality control, interoperability, compliance and safety. But while standards dictate the desired output or outcome of a project, they don't always provide the guidance that engineers need to best implement the standards' requirements.

To fill in this missing piece of the puzzle, IHS Markit offers applied technical reference works that help engineers implement and apply standards and related documents in line with industry best practices and thought leaders.

Customers of the Knowledge Collections by IHS Markit receive access to trusted, world-class, exclusive digital reference content, made easily discoverable via patented search technology and interactive elements.

Knowledge Collections help engineers:

- Accelerate research time by up to 30 percent by finding needed information quickly and easily;
- Reduce errors and other project risks by using the most up-to-date industry best practices; and,
- Mitigate knowledge loss via enterprise-wide knowledge sharing and by incorporating annotations

Visit ihsmarkit.com/KC to learn more about how the Knowledge Collections by IHS Markit can help your engineers put all the piece of the puzzle in place.

IHS Markit®

By Chad Jackson

INFORMATION OVERLOAD

A recent survey reveals that digitization of information is not always the remedy for project effectiveness and efficiencies.

Product development has fundamentally changed. Not that long ago, the processes and procedures that power design and development ran on paper. Engineering drawings required printing. Engineers filed change approvals as hard copies. Design release approvals carried physical signatures. Paper-in-your-hand documentation ruled development.

However, that paradigm has been flipped on its head. Today, development primarily operates digitally instead of physically. The authoritative source of engineering drawings is now online. Forms needed for change processes are electronic. Managers route approvals digitally.

While this shift from physical to digital product development execution yields many benefits, it is not perfect. It presents new challenges. One obstacle, in particular, is the need to find the right information for the right task at the right time. At times, it is like the proverbial needle in a haystack.

To learn more about this issue, Lifecycle Insights partnered with IHS Markit to conduct a quantitative research study. In it, we developed and fielded a survey that gathered responses from more than 400 participants. In this article, we'll review the results.

Is information overload a problem in today's product development? Let's take a look.

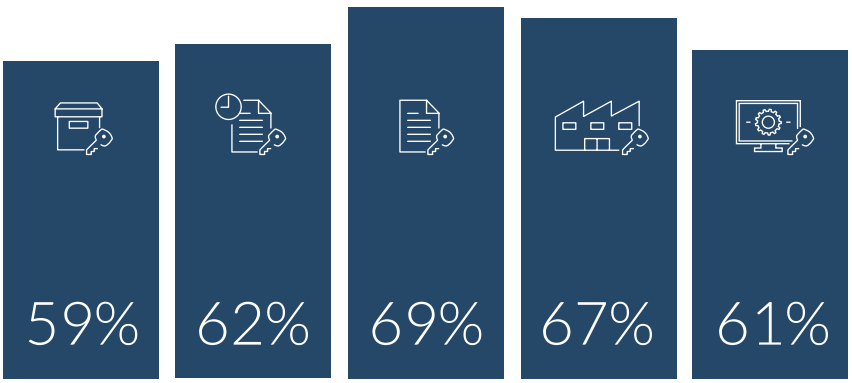
THE SCALE OF TODAY'S INFORMATION NEEDS

What information do we need in product development today? What methods are people using to get that information? What challenges might be related to those issues? Getting answers to these questions is where we'll start.

TYPES OF INFORMATION USED

In the survey for this study, we asked respondents to cite how frequently they accessed 13 different types of information. Respondents stated that they needed eight of these information types on a weekly or daily basis. There are natural categories of these information types that we'll use for analysis.

One crucial category of information in development comes from engineering. Fifty-nine percent of the study's respondents stated they accessed not only released design specifications and information, but also archived data as well. This is no great surprise, as design documentation is a touchstone for identifying how products need to be produced. Such information can be used in new development projects as a baseline of assumptions to make improvements. Interestingly, 62 percent also cited they access engineering notebooks from current and past projects. This is a revealing statistic because of the knowledge that such items often capture. Engineering notebooks represent a historical trail of information and calculations



TYPES OF INFORMATION USED

in Digital Product Development

that engineers used to make design decisions. New design efforts should build on past efforts. However, such artifacts are often very informal types of documentation, and engineers differ greatly in how they capture ideas and formulas.

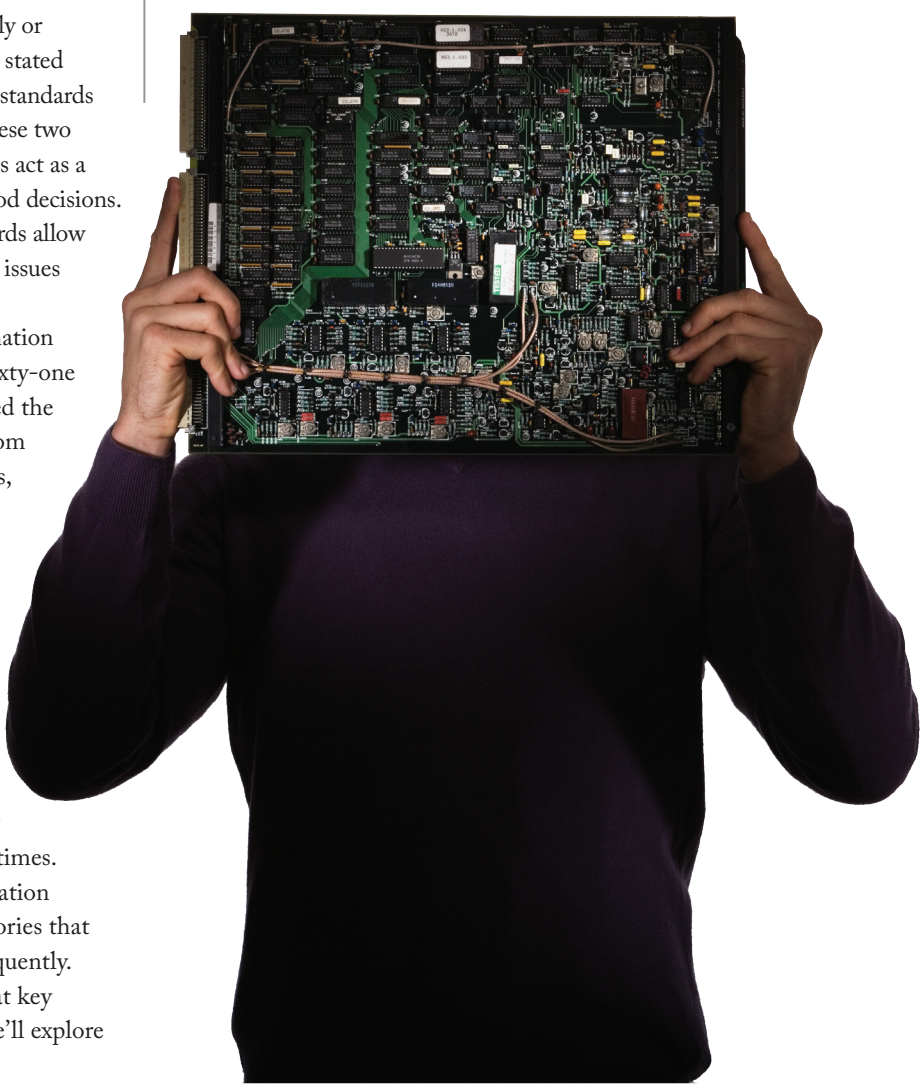
Another key source of information in development are standards and references. Sixty-nine percent of respondents cited the need to access applied reference works daily or weekly. Sixty-seven percent stated the need to access industry standards in the same time frame. These two types of information sources act as a different foundation for good decisions. Such references and standards allow engineers to address design issues with proven knowledge.

A third source of information comes from IT systems. Sixty-one percent of respondents cited the need to get information from enterprise software systems, which includes enterprise resource planning, product lifecycle management, supply chain systems and much more. These tools contain a vast array of data, ranging from effectivity dates for parts to the status of change orders to inventory volumes and delivery lead times.

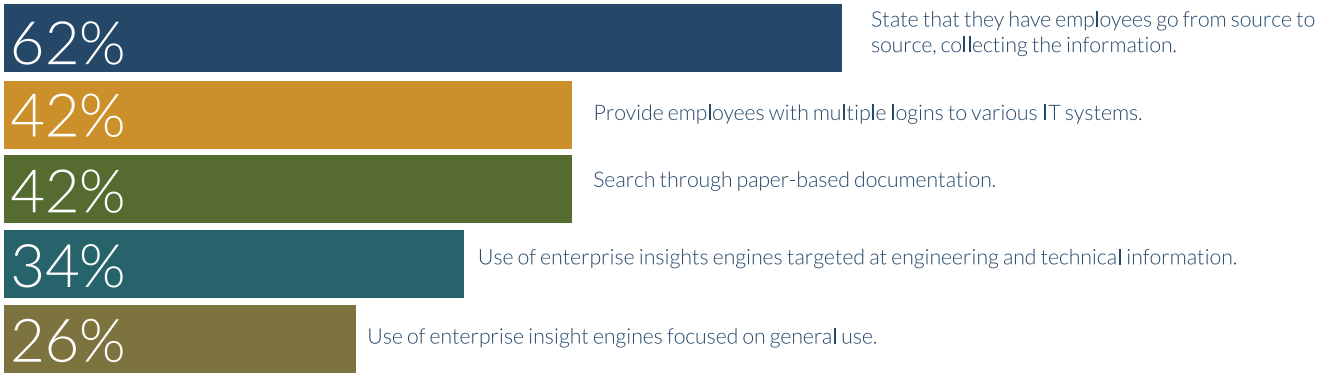
These sources of information merely represent the categories that must be accessed more frequently. Many more are necessary at key phases of development. We'll explore those in more detail in future articles. But the point is clear. Stakeholders in development need access to substantial information to make the right decisions at the right time.

METHODS FOR FINDING INFORMATION

We now know what types of information are needed most often in



METHODS FOR FINDING INFORMATION



product development, with clues that many are needed intermittently. But how do users access that information? What are the inherent advantages and disadvantages of each approach? Let's look at what the study's findings tell us.

Can you guess the most common method used to track down information? Sixty-two percent state that they have employees go from source to source, collecting the information. For some, this means reaching out to a point of contact for an information type using digital methods like email or messaging tools. However, for many more, this means physically walking across the building, knocking on an office door and asking someone face-to-face for the information. Some organizations assign new hires this responsibility, calling them "go-fors," an apt name for the dedicated employee that has to go-for-this and go-for-that. There may certainly need to be more face-to-face interaction in modern companies. However, this isn't the most effective method of accessing information.

The second most frequently used method of information access is to provide employees with multiple logins to various IT systems (42 percent). This method is more effective than physically looking for information. However, it has drawbacks. Employees must find a way to safely and securely manage many credentials. But more importantly, they must learn how to use a wide range of IT systems. Keep in mind that sometimes specific types of information are only needed once a month. Employees will find it challenging to use an IT system effectively using it that infrequently.

Forcing employees to physically and visually search such physical records is an incredibly inefficient method of finding information.

Lastly, 42 percent of respondents search through paper-based documentation. Modern product development may very well run digitally, but we all know that development efforts ran on paper at some point in the past. Those past development projects are a key source of information that can help engineers make better decisions today. Some companies go through an initiative to digitize that documentation, but not all do. Forcing employees to physically and visually search such physical records is an incredibly inefficient method of finding information.

Note that insights engines and search tools were on the list, just farther down. Thirty-four percent

cited the use of enterprise insights engines targeted at engineering and technical information. Twenty-six percent cited the use of enterprise insight engines focused on general use.

IMPACT ON THE BUSINESS

Based on the study's findings, we know that engineering departments must access a wide array of information frequently during development. The findings also tell us that they use some fairly old methods to access that information. We know the combination of these findings point toward some real pain points. But let's be frank: does it matter? In this section, we'll shift our focus to look at the performance of development organizations to see if everything is humming along smoothly.

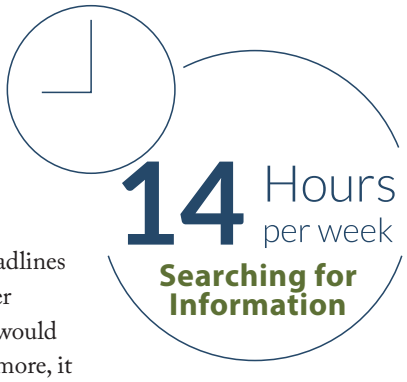
TIME SPENT FINDING INFORMATION

A key question from the study asked how much time development stakeholders spent simply looking for all that information we discussed earlier in this article. What was the average for the study's respondents?

Fourteen hours per week.

That is not a typo. The average amount of time that a product development stakeholder spends looking for information is 14 hours per week. Now, let's assume that one of these employees works 40 hours a week. The average time spent looking for information represents 35 percent of their workweek, leaving only 26 hours to dedicate to design work or research. Of course, we all know that isn't how it goes. If you have an impending deadline, your hours spike to achieve that goal, even if you work nights and weekends. It is not uncommon for engineers and scientists to work a 60- or even 80-hour week during those times.

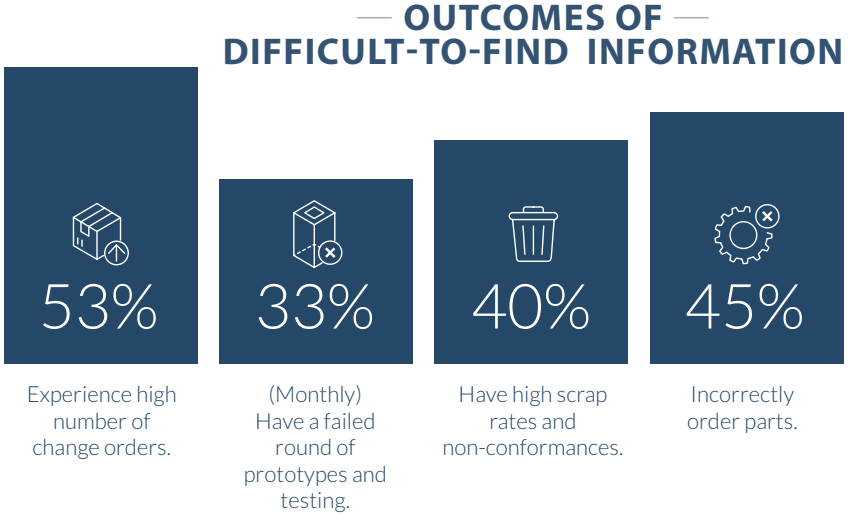
What would these stakeholders do if they could recoup just half of those 14 hours a week spent searching for information? If it means they hit their deadlines faster, they could recover the personal time they would otherwise lose. Furthermore, it might enable them to investigate new alternatives or uncover better designs. There are implications for both the individual and the organization.



THE OUTCOMES OF DIFFICULT-TO-FIND INFORMATION

Recovering lost time isn't the only organizational performance issue related to the timely access of accurate information. In the study, we quantified other problems that are hints of development issues. The respondents to the study's survey cited the following issues on a monthly basis.

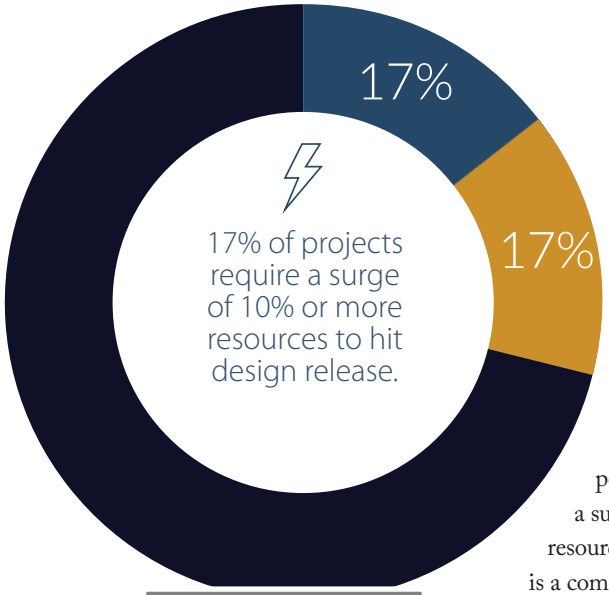
- Fifty-three percent experience a high number of change orders.
- Thirty-three percent (33 percent monthly) have a failed round of prototypes and testing.
- Forty percent have high scrap rates and non-conformances.
- Forty-five percent incorrectly order parts.



Many factors, of course, contribute to these issues. However, gaining access to the right information at the right time for the right decision plays a major part in each of these issues. So information access isn't just about time and productivity. The lack of access manifests in product development in a variety of ways.

FINAL OUTCOMES

Change orders, failed prototypes and incorrectly ordered parts are all problematic. But they are often not the primary means by which product development success or failure is measured. One of the primary benchmarks is the ability to successfully release documentation from engineering on time. When missed, it becomes incredibly difficult to recover, compromising the on-time launch or delivery of products. We measured this key metric in the study.



17% of projects miss release completely, likely even with a resource surge.

How did the respondents' organizations perform in this study? On average, 17 percent of their projects required a surge of 10 percent or more resources to hit design release. This is a common practice in engineering. When projects fall behind, they pull engineers off projects with later design release dates to have them work on the most urgently lagging one. The projects represented by this 17 percent would have missed design release without this extra effort. That extraordinary effort, however, doesn't always work. Some projects fall so far behind that they can't be saved. An additional 17 percent of projects miss design release completely, likely even with a resource surge.

These projects that require extra resources and hit and miss design release, represent the culmination of all the other issues cited in this article. The change orders, failed prototypes and high scrap rates are affected by poor methods to find the right information for the right decision in development. Those problems, in turn, directly affect an organization's ability to hit design release, to their detriment.

TAKEAWAYS

In recent years, the product development process has increasingly transformed from a physically-driven process to a digitally-powered one. With that, product development stakeholders are leveraging a broad array of information for key decisions. While much of that information are now in digital forms, the methods of accessing that information are still basic, with go-for employees tracking down things manually.

The outcome of this scenario isn't just painful. It has a real impact on organizational performance. Today, product development organizations frequently experience multiple change orders, many rounds of failed prototypes and high rates of scrap. Even more concerning, many of today's development projects miss design release, despite desperately shifting resources from project to project.

Note that leveraging tools that provide access to the right information at the right time for the right decision can help stem this tide. Enterprise insights engines are specifically designed to solve this problem. We'll talk more about this in another article in this series. Stay tuned.

ABOUT THE AUTHOR

CHAD JACKSON is an analyst, researcher and blogger providing insights on technologies used to enable engineers. He is a frequent publisher, speaker and researcher on critical topics that empower executives to reap more value from technology-led engineering initiatives in less time, with more surety, and less disruption. Learn more at www.lifecycleinsights.com.

By Adam Gromko, Executive Director, IHS Markit

DIGITAL THREADING: IN ENGINEERING

The human brain is really good at processing and recognizing patterns. Within the brain, each neuron can transmit 1,000 nerve impulses per second and make as many as tens of thousands of synaptic contacts with other neurons. Replacing it is impossible (at least today), but augmenting the human brain with advanced technologies has become a hot topic for companies across all industries.

With machine learning (ML), for example, we give a machine an input data set, and then teach the machine to identify patterns and make predictions. To do that, we have to supply a machine with a data set ("assisted learning") that's annotated by engineering experts. That way, the machine knows the patterns to look for and can learn very quickly from the annotations that you give it, to make predictions.

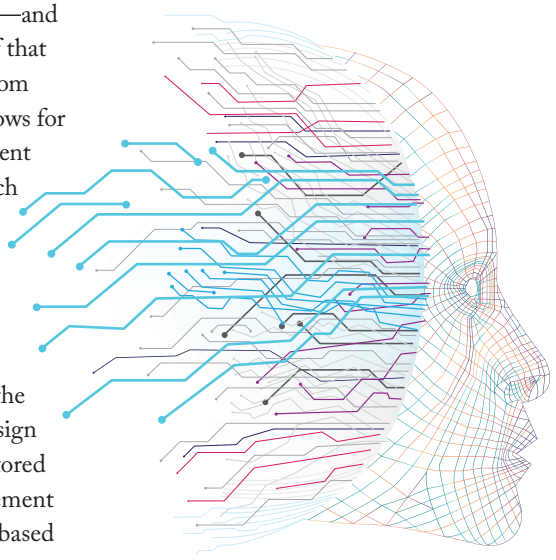
We can look at the Gartner Hype Cycle for emerging technologies and see that two years ago ML was at the peak of the Hype Cycle. Today, it's not even on the 2019 version of the Gartner report. That's because ML is now ubiquitous; that's how fast things are happening. This is just one example of why it's important to know where technology is on the growth curve and how quickly technologies get to market, including innovations like augmented reality, the digital twin, the knowledge graph, and the Industrial Internet of Things (IIoT).

THE DIGITAL TWIN

Right now, the "digital twin" is all the buzz, and has reached the peak of the Gartner Hype Cycle. The Digital Twin is essentially a digital model (or twin) of an asset that includes everything from design specifications to operational data. It's how we can effectively take a physical asset—a turbine, an automobile, a motor—and create a digital representation of that asset throughout its life cycle, from birth to obsolescence. It also allows for continuous monitoring, assessment and diagnostics. Right now, much of that is being done with IIoT.

It's an amazing edge-computing technology where you're collecting performance data on these assets, and then matching that data up against the digital representation of the design of that asset, which is usually stored in the product lifecycle management (PLM) system, or with model-based engineering in a 3D PLM system.

> Companies can use advanced technologies like machine learning and digital threading to solve even the toughest problems faster and more efficiently.



THE DIGITAL THREAD

Even more ambitious and promising is the digital thread, also referred to as "digital threading." Broadly defined, the digital thread is a framework that connects data and data flows for an item or asset across all phases of the product life cycle. It really comes down to the number of data points for an asset. Even the simplest asset can have a mind-boggling number of links to information about that item that reside in multiple disparate systems. Think of where information resides—in PLM systems, ERP systems, SharePoint, project files, third-party sites, emails and much more—and you begin to understand the scope of connecting the dots. This is where digital threading holds promise by emulating the way we solve problems and understand complex issues within our own brain.

THE DIGITAL TWIN AND DIGITAL THREAD

Right now, digital threading is missing from the Gartner Hype Cycle; it's under-defined. According to an *Industry Week* article, "Demystifying the Digital Thread and Digital Twin Concepts," the communication framework that allows a connected data flow and integrated view of the asset's data throughout its life cycle across traditionally siloed functional perspectives, the digital thread raises the bar for delivering "the right information to the right place at the right time."

So how does digital threading improve and expand on the digital twin? The digital twin falls short when it comes to unstructured data. For example, what if the performance data on an engine goes wildly out of spec? Platforms today are implementing rules and some ML to try to tell that system what to do and how to respond to that failure. But digital threading utilizes technologies and concepts such as natural language processing (NLP), deep learning and semantic analysis to connecting information to the digital twin.

The digital twin falls short when it comes to unstructured data… But digital threading utilizes technologies and concepts such as natural language processing (NLP), deep learning, and semantic analysis to connect information to the digital twin.

The applications of digital threading are literally mind-boggling because organizations like IHS Markit are aspiring to use digital threading to, in a sense, create a digital replica of a human brain's function. The brain has trillions of neurons, so we're talking about really "big data" here. It's also about matching performance to design in a very structured way.

The human brain takes data, makes connections, processes those connections, and then develops an understanding about the world or about that data set. Expand that concept across the enterprise, where there are many different brains (not just one). There are many different subject matter experts (SMEs) who can make many different connections with data to create diverse expertise. So now, to solve an enterprise problem, teams of people process data on a daily basis and then use that information to solve even the most complex enterprise problems.

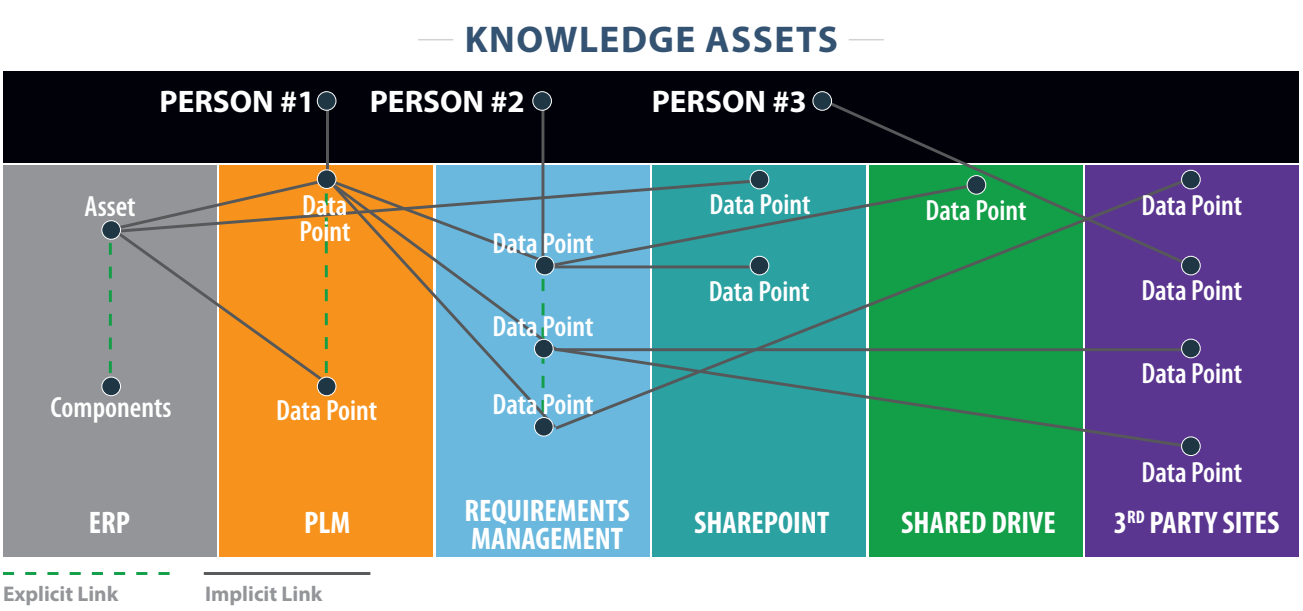
DIGITAL THREADING TO SOLVE ENGINEERING PROBLEMS

The question really becomes, how can digital threading solve the types of mega-engineering problems we see in the headlines today? Many of these problems cross multiple complex systems and may involve billions of data points across all the connections. It's a painful process that, quite frankly, many companies are not equipped to handle. They sometimes simply give up, cut their losses and move on. Needless to say, it's a huge impact to the organization and the people within that organization.

Digital threading solves the challenge around the sheer number of data points that need to be connected to solve problems and make better decisions. Digital threading uses AI technologies to automatically sift through big data, connect critical information and create navigable relationships that don't currently exist outside of your brain.

DIGITAL THREADING LEADERS

IHS Markit is at the forefront of Digital Treading using artificial intelligence capabilities of their Goldfire software, utilizing advanced AI concepts such as deep learning and semantic analysis. IHS Markit utilizes a proprietary deep search algorithm for Digital Threading which is on the bleeding edge of AI technologies, trained on technical content and tuned to solve problems and mine answers deep in a virtual "neural network" of technical

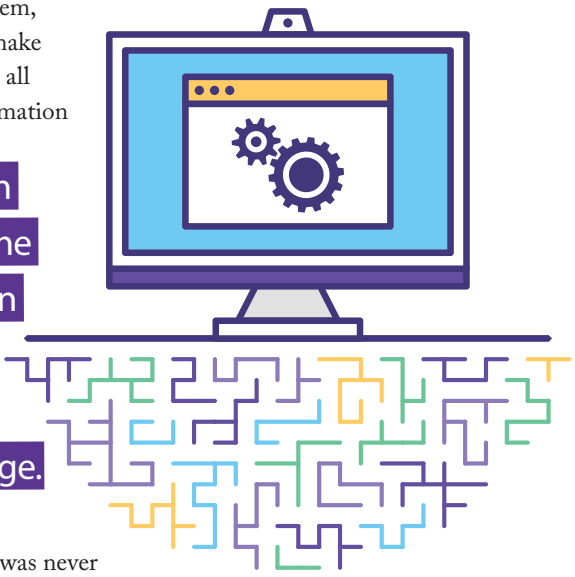


knowledge. IHS Markit does not look at it as structured content or even text. Instead, everything is a vector upon which a series of mathematical equations analyze the information and identify connection/linkages. These are then used to populate a "knowledge graph"—think of this as "plotting the stars" in your enterprise knowledge universe. The connections between those data points form the ability to create insights and make informed decisions. Data with interpretation becomes knowledge.

DIGITAL THREADING – THE NEXT 'BIG THING' IN AI?

Digital Threading uses artificial intelligence to mimic the human mind's ability to recognize and process patterns. It finds and connects all the data points that are implicitly or explicitly linked and then "threads" those connections to try to understand a concept, solve a problem, answer questions and make informed decisions. It's all about connecting information that, in a digital realm, was never before possible. It will transform how engineers solve problems in the coming decade. EI

IHS Markit utilizes a proprietary deep search algorithm for Digital Threading which is on the bleeding edge of AI technologies, trained on technical content and tuned to solve problems and mine answers deep in a virtual "neural network" of technical knowledge.



To learn more about IHS Markit's Goldfire solution, powered by world-class Artificial Intelligence technologies including cognitive search, machine learning and natural language processing, visit **www.ihsmarkit.com/goldfire**.

IHS Markit™

Stop making engineering decisions in the dark

Make better decisions faster – no matter how big the decision

In global manufacturing and process industries, there are no small engineering decisions. Yet, more than half of all decisions are made with incomplete or inadequate information.*

The Engineering Intelligence solutions from IHS Markit help companies bridge this knowledge gap with an exclusive combination of trusted, engineering-rich content, advanced research capabilities, and strategic problem-solving tools.

IHS Markit gives engineers and technical professionals the information and insights they need, when they need it, so that companies can achieve operational excellence directives, enter new markets, and speed time to market by accelerating and informing decision-making.

- Boost engineering productivity
- Reduce project and product delays
- Leverage and reuse enterprise technical knowledge
- Ensure compliance and minimize risk
- Stay abreast of the latest technologies and advances in materials
- Understand the competitive landscape

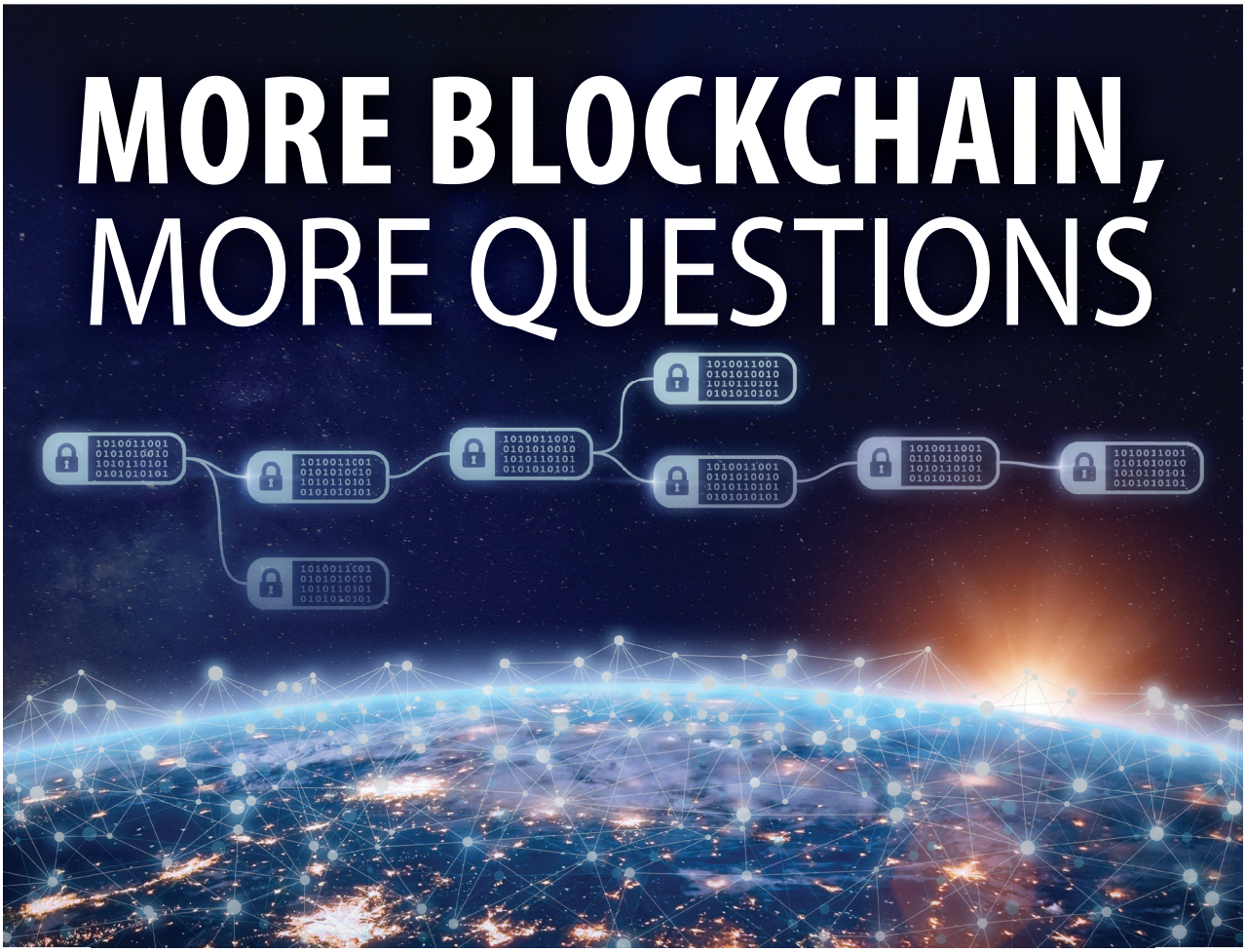
Learn more at ihsmarkit.com/ei, or Call 800-854-7179

*Infocentric Research AG

143162538-JH-0317

By Maria Palombini

MORE BLOCKCHAIN, MORE QUESTIONS



As more companies launch blockchain pilots, the IEEE is working on new standards for easier and safer use in industrial applications.

Blockchain is on the minds of many people—and for good reason.

The value of blockchain in our day-to-day lives came to light when I took my father-in-law to the emergency room earlier this year. During the check-in process, he was asked a series of questions such as the state of your current health? What medications are you taking? And what type of insurance do you have? As we moved through the admittance process—and from the emergency room to the cardiac room to a private room—the same questions kept coming up.

Meanwhile, the hospital staff wasn't really taking care of my father-in-law; they just needed answers to their questions. I became frustrated at one point and blurted out, "Wow, blockchain could fix this whole problem." I asked the nurse why we kept going over the same questions, and she said they needed to verify the information was entered into the system correctly.

Again, blockchain could really fix that problem, streamline the hospital admittance process, and make life a lot easier for the patient and for the healthcare providers.

BLOCKCHAIN ISN'T BITCOIN

Everyone's talking about blockchain right now, and not all of the conversations are positive. Bitcoin, for example, has a nefarious background. But bitcoin isn't blockchain, nor is blockchain bitcoin. Blockchain is simply a ledger that accounts for the exchange of bitcoin. It's a set of transactions or an accounting system that is replicated in each "block."

Blockchain is simply a ledger that accounts for the exchange of bitcoin. It's a set of transactions or an accounting system that is replicated in each "block."

As the blocks are replicated, the original transaction is appended but never altered. This makes blockchain immutable and tamper-proof; it's one recorded source of the truth. In other words, you can enter a transaction into blockchain and it resides there forever, beginning with the original transaction.

Some people like blockchain because it's a sort of "anti-establishment" financial system. The concept is now entering into industrial applications, with a focus on using blockchain for processes like data tracking and auditability. A perfect setting for emergency rooms, for example.

A clinical trial is another great example of how the technology can significantly streamline a complicated, lengthy process. These trials involve myriad entities, including CROs, trial sponsors, patients and labs. All of the data gathered eventually goes to the Food and Drug Administration (FDA) for approval. Because that data is being shared in multiple ways, the auditing process is extremely difficult.

This is where blockchain shines. By providing one-recorded source of the truth, it can reliably tell us everything about Patient A—from the time he or she started the trial until it's finished—and in an immutable environment. No recorded information can be changed. It can only be "verified," with all data being accurately tracked and traced. Once the FDA receives the data, it's confident the information is verified and unaltered.

EFFICIENCY THROUGH AUTONOMY

Autonomous systems tend to make people uncomfortable. Let's say you engage in a smart contract with a patient named Adam, who signs the informed consent. The contract then continues executing itself until all of the conditions are met. That's how an autonomous system works, but it also raises questions like, who wrote the contract? What are the terms and conditions? Can they be adjudicated? These are the potential issues that give us pause and concern.

We also have to consider end-user empowerment through data agency. Thus, when we talk about a patient owning his or her profile on the blockchain, that means whomever designs the blockchain must have ethical design considerations. After all, we're talking about a complete patient user profile. Hence, there are concerns about security, the environment, data transparency and anonymity of that data. All of these ethical issues must be considered when using blockchain—a technology with great potential but still requiring human intervention.

Put simply, creating smart contracts without the idea of real adjudication—and verification without validation—is one of the biggest issues we'll have to work through with blockchain. The notion that "if it's on blockchain then it must be true" isn't accurate. If all you've done is put garbage on the system, then only time-stamped garbage comes out. You can't fix a problem. It's only made worse with poor data on an infinite blockchain.

THE NEW WORLD

Right now, no one is really regulating bitcoin. It's a peer-to-peer (P2P) system being backed by people who set their own rules. And while we would hope that the system keeps everyone honest, whether that actually occurs remains to be seen. Now, there are ways to validate blockchain. One way is with consensus-designed validation rules. Designed to "push" blockchain through the system, consensus validation presents ethical implications— particularly on the security front.

For example, when you use human intervention to speed up the system and help more organizations adopt it, you can taint the security of the blockchain. This is critical to remember in a world where new consensus-design validations are born every day.

Also emerging are new blockchain consortia focused on helping companies transition from blockchain proof of concept to pilot to actual production in their operations. But what happens when those projects are completed? What's the exit strategy? These are important points because you can't create a blockchain and hand it over to Adam (the patient) and let him take over. Blockchain doesn't work that way.

Finally, we have to think about the impact of blockchain silos. If every group has its own blockchain, for example, then they're not interoperating. Instead, they're going from chain to chain.

The question is, how do we fix the problem of decentralization and move toward everyone sharing information? In the spirit of driving blockchain adoption, a new problem is created amid tech startups simply trying to survive in this "new" world. But is anyone paying attention?

BREAKING DOWN THE BARRIERS

The biggest challenge with blockchain currently is not so much the technology itself. The technology's there. It's about how we're going to change all of our business processes to work within this environment. When it comes to decentralization, transparency, autonomy and what data you are/are not going to enter into blockchain, you need to look at how it's going to interoperate with your Oracle, SAP or other ERP system.

And because blockchain is actually a trustless environment, organizations also have to consider who they are (or aren't) going to trust to use blockchain. This is critical because blockchain was designed to take trust out of the process. This presents some interesting transparency issues that still need to be worked through.

Right now, IEEE is in the middle of a conformity assessment project on blockchain for food, so we're working closely with a number of food processing plant manufacturers in Europe. Traceability is a big issue for agriculture and for the food supply chain. It's about tracing the supply chain from the source (the farm), through processing, onto the distributor, out to the retail outlet and right to the consumer. Much goes into that supply chain.

Most of the food producers we speak with want to use blockchain, but don't want the complication of relying on blockchain engineers to understand the appropriate platform and consensus algorithm for their circumstances. They want the IEEE to provide a certified system that warranties that a blockchain system is going to work for their specific applications. Thus, remove the uncertainty out of the process.

Could we trace from the point of the farm all the way to the consumer? This is especially important in the organic food world, where the end product costs more and consumers want to know if that apple, carrot or head of lettuce was really grown organically. The same approach can be used for products like romaine lettuce, whose supply chain wasn't digitized (as proven in the recent E. Coli outbreak). The problem is that if you don't have a digital record of where the lettuce came from, what good is the blockchain?

These are the types of questions and concerns that we're working through as we continue to develop standards for blockchain. Some of the standards are already in place, but there are more to come as organizations continue to embrace and use this immutable ledger. We're educating on both the good and bad of these advanced technologies, whether it's blockchain, artificial intelligence or machine learning. EIR

And because blockchain is actually a trustless environment, organizations also have to consider who they are (or aren't) going to trust to use blockchain. This is critical because blockchain was designed to take trust out of the process.

ABOUT THE AUTHOR

MARIA PALOMBINI is Director, Communities and Opportunities Development for Life Sciences, GBSI, IEEE-Standards Association.

ESDU: EXCELLENCE IN ENGINEERING METHODS & DATA ANALYSIS PRODUCES ASTEROID

New Data Item could lead to dramatic effects in aircraft aerodynamics.

Maybe not as dramatic as John F. Kennedy's declaration "… time for this nation to take a clearly leading role in space achievement," but what if…? What if we could improve the air flow across aerostructures such that the performance of aircraft and airplanes could be increased substantially more than the cost to manufacture tighter tolerances? I*mproved fuel efficiency? Reduced pollution? Cheaper flights to Hawaii?*

How would you go about identifying, measuring and approaching those design changes? What systems, processes or methods need to be developed to support such an endeavour?

When these questions transcend companies, technologies, industries, organizations need a proven approach to producing the authoritative works required – an ESDU 'Data Item' that can be leveraged to drive innovation, implement safety enhancements, and realize cost savings … *and maybe open up the world through cheaper flights with less emissions.*

ESDU (the Engineering Sciences Data Unit, formerly the Technical Department of the UK Royal Aeronautical Society) has just achieved another major milestone in its nearly 80 years of developing validated 'Data Items' for a wide range of engineering applications. The latest major ESDU

ESDU MILESTONES THROUGH THE DECADES

1980
ESDU assumed the task of publishing Defence Standard 00-932 on the properties of Aerospace Metallic Materials. And, within 3 years ESDU took over responsibility for Panel M leading to MMDH.

1992
ESDU programs were made available to users on disk.

1995
ESDU began work on converting all the Data Items to electronic format.

1997
MMDH ceases to be a Defence Standard and becomes another ESDU Series, ESDU 00932. ESDU is acquired by IHS.

1998
The first version of ESDUscope, a PC application for the navigation and use of the ESDU Data Items and programs, was released.

2000
The first electronic version of the Metallic Materials Data Handbook (MMDH) was released. It was a PC application based on an MS Access database and enabled comprehensive searching across all material properties and characteristics, from composition, through strength and toughness, to weldability.

—

Data Items and software were delivered over the internet via www.esdu.com for the first time.

2006
Active graphs were introduced. They allowed users to click on the graphs and obtain digitally-read values. An interpolation facility was included for carpet plots and families of curves.

2010
The Zephyr 7 sets the official endurance record for an unrefuelled, unmanned aerial vehicle with its flight of just over 14 days. ESDU provided consultancy support for the design and continues to be involved in the design of subsequent versions of the aircraft.

2011
The first ESDU-created MATLAB codes were made available to users. 'ESDUpacs online' (EPOL) were introduced to enable users to run ESDU programs directly on the ESDU website.

2015
The first simple ESDU Toolbox apps were developed and released, allowing users to perform relatively simple calculations via an online user interface.

2018
The second generation of the ESDU Toolbox apps were made available. These enabled users to run more complex ESDU programs via an online user interface.

1980 | 1985 | 1990 | 1995 | 2000 | 2005 | 2010 | 2015

project is called ASTEROID and consists of a suite of 'Data Items' and software. The scope: a research project concerning the aerodynamic effects of small changes of aircraft shape and developing methods for use by the aircraft design industry for the optimisation of aerodynamic cleanliness in manufacture, maintenance and repair.

THE RESEARCH OBJECTIVE: develop improved computational methods to determine the aerodynamic effects of small local changes in external shape and airflow – (i.e. excrescences, surface deviations and airflow leakage). The project developed methods to quantify the effects on aeroplane performance of: steps and gaps between adjacent panels, small protuberances, holes and indentations, external repair patches; and also of airflow leakage arising from ineffective sealing between components. Outcomes from this project could significantly improve air, land, marine and space travel.

RESEARCH CONTEXT: All structures, including airframes, are manufactured and assembled to specified tolerances. In general, the smaller (tighter) the tolerances, the higher will be the cost of manufacture. It is not possible to build an aircraft (including all joints, fairings, cowlings and doors) to exactly the shape set out in the design - i.e. the optimised shape for highest performance and minimum fuel burn. This project has delivered improved tools that design and manufacturing organisations could use to quantify the performance penalties arising from deviations from the design and so enable the trade-off between manufacturing tolerances and aircraft performance to be quantified.

Once in-service the external 'cleanliness' of an aircraft will decrease due to the general ageing of paint and seals and the deterioration in the alignment of cowlings, doors and other moveable components. In addition, if an aircraft suffers damage in service, choices have to be made about the nature of the repair – whether it will restore the original shape (usually the most expensive option) or whether it is acceptable to change the external profile by adding an external plate to cover the damaged area. This project has delivered a design tool that can be used to quantify the drag reductions (and therefore fuel and emissions savings) that may be achieved by optimising repairs and the fit of components in service.

"We set sail on this new sea because there is new knowledge to be gained, and new rights to be won, and they must be won and used for the progress of all people" stated John F. Kennedy during the Man on the Moon speech. ESDU's long history of creating 'Data Items' in many ways delivers on that promise. ESDU from IHS Markit, which is based in London, consists of a team of engineers who, with the essential assistance of Technical Committees, develop, validate and publish 'Data Items'. Data Items (known as 'Data Sheets' in the early days when they were literally a single sheet) present authoritative and validated methods and/or data on specific engineering problems for use by practising engineers. Two fundamental components remain essential to the philosophy of ESDU:

1. an independent Committee to arrive at a consensual view of the results of research and
2. a qualified staff to do the necessary technical work. EI

Saturday, August 17, 1940
ESDU is said to have had its inception with the first meeting of the Stressed Skin Data Sheet Committee (subsequently renamed the Structures Committee). Committee members were appointed for their personal expertise and were not representatives of their employers; thus, technical decisions could be made without any political interference from a company or institution.

1942
Aerodynamics Committee and Fuels and Oils (renamed Fuels and Lubricants) Committee were added.

1955
Fatigue Committee was added.

1960
Transonic Aerodynamics Committee was added.

1962
Dynamics Committee was added.

1964
Bearings and Lubrication; Fluid Mechanics, Thermodynamics and Physical Data; Gearing and Mechanisms; and Stress Analysis and Strength of Components (SASC) Committees were formed with the involvement of the UK Institution of Mechanical Engineers.

1965
Heat Transfer, and Physical Data and Reaction Kinetics (PDRK) Committees were formed at the instigation of the UK Institution of Chemical Engineers.

1966
The Acoustic Fatigue Committee was formed and added.

1971
The Aircraft Noise Committee was formed and added.

1973: ESDU issued its first computer program. Data Item No. 73003, on the buckling of orthotropic and isotropic rectangular plates including sandwich panels, was issued and users were offered the option of being supplied with a pack of cards or of typing the listing provided in the Data Item.

1940 | 1945 | 1950 | 1955 | 1960 | 1965 | 1970 | 1975

As enduring as the B52 Stratofortress, the philosophy of the work produced by ESDU and the method of doing that work remains: ESDU's fundamental role is to develop rigorously validated methods and collations of data for use by practising design engineers, mainly, but not exclusively, working in the aerospace industry. Currently, there are 18 ESDU Series and 16 Committees consisting of ~220 Committee Members. By serving the needs of many, ESDU accomplishes the task at much lower cost and with a higher reliability than could the individual. The technical work is carried out by the ESDU engineering staff and that is monitored and validated and gains its consensual authority through the involvement of independent Committee Members, all of whom are experts in their fields. Committee Members continue to be drawn from industry, academia and technical institutions (e.g. research laboratories) from around the world and committee members can contribute in person or virtually.

By Jappe van der Zwan

USING GAMES TO CULTIVATE STANDARDS AMBASSADORS

Gamification is helping more people understand and engage with standardization in today's business environment.

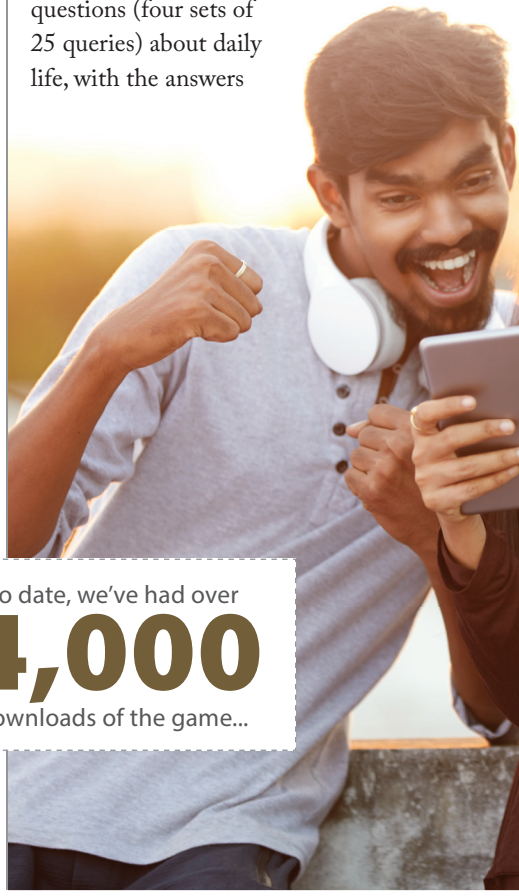
This year, more than 2.4 billion people around the globe will pick up their phones or tablets to play mobile video games, according to Activision Blizzard Media. The PC gaming industry is expected to reach $33.6 billion by 2020 (up from an estimated $28 billion in 2017) and the global gaming market was estimated to be worth $28.5 billion in 2018 (a 4.9 percent increase over 2016).

Many of the people driving those numbers belong to either the millennial or post-millennial (Gen Z) generation, the latter of which is now aged 4-24. We're at a point where we need these "customers of the future" to help explain the value of standards to their peers, co-workers and managers.

To engage these disruptors and standards ambassadors of the future, we created The Big Hack and The Wow Game. From a marketing point of view, we're looking at it from the vantage point of a 14-year-old child who enjoys playing games, wonders about the world and enjoys taking on challenges.

THE BIG HACK

Using this as a baseline, we've created an app meant to raise the awareness about standards in a fun and educational way. The Big Hack, for example, opens with a storyline about how cybercriminals have hacked into a computer system and left everything from computers to mobile phones to road traffic in a quandary. The head of state pleads for help in saving the country, and the gamer takes over from there. The game walks players through 100 questions (four sets of 25 queries) about daily life, with the answers



To date, we've had over **4,000** downloads of the game...

ABOUT THE AUTHOR

JAPPE VAN DER ZWAN is the Business Unit Manager Standards Products & Services at NEN. He has worked for over 18 years in Standards, with a broad experience in the field of Standards Development as Publishing. This background supports a strong belief in connecting standards experts and standards users as one of the drivers for our future, with the use more and more as the starting point.

all relating to standards. They play the game, get points, receive direct feedback on correct answers and get a chance to rank on the leaderboard.

The goal of The Big Hack was to raise awareness about standards in a fun and educational way, focusing on youngsters (from 12 – 17), but the game can be fun for everyone.

To date, we've had over 4,000 downloads of the game and witnessed varied usage depending on the marketing effort behind it (it's not Fortnight, where kids play on their own without any additional marketing). We received substantial publicity for the game when we introduced it, and a good side effect is that it has led to a lot of positive engagement with high-level stakeholders.

THE GOAL OF THE BIG HACK WAS TO RAISE AWARENESS ABOUT STANDARDS IN A FUN AND EDUCATIONAL WAY…

It's important to put a cross-department effort into the creation and marketing of the game itself. Games work particularly well in enforcing the value of standardization, but you have to work to constantly develop, redevelop and add new things to the games to keep users engaged—a reality that also applies to standards. You also need to have the right marketing in place to keep it going.

THE WOW GAME

With The Wow Game, we wanted to raise awareness about standards, train players, and help them understand the standardization process in a fun and educational way. The game focuses on young professionals, but can be used by anyone.

Compared to The Big Hack, this game is a bit different, but it also starts with the customer. Just like organizations are always looking for new committee members—and especially younger committee members—we're doing the same. We introduced a program to attract new experts to our committees. Now, these individuals are not really into video games, but they do enjoy working with tools and playing old-fashioned board games.

To reach them, The Wow Game is a board game that shows and explains the importance of standardization in their own companies. The game kicks off with a two-minute introductory video explaining the situation and the rules of play. The gameplay itself is pretty easy: All stakeholders are sitting around

IT'S CALLED THE WOW GAME, AND IT'S ESSENTIALLY A BOARD GAME FOCUSED ON TRAINING AND HELPING PLAYERS UNDERSTAND THE STANDARDIZATION PROCESS IN A FUN AND EDUCATIONAL WAY.

a table. The standardizer is there to support the game, lead the process and build a consensus. There are three rounds: an initial proposal; drawing up a standard and receiving comments; and developing a final standard. (Whether the end result is actually a standard depends on the game itself).

I've played The Wow Game several times and found that people get into their roles and play the game as if they want to win. The post-game evaluation process is a particularly important aspect of the game. Also important is the role of the standardizer, who is very visible and leads the evaluation. Thus, the people around the table talk to each other about what has happened during the process. That's a serious part of the game, but obviously it's mostly about having fun together.

END RESULTS COUNT

For The Wow Game, we also developed a sheet where the end results are tallied. The Wow Game, for example, was developed by standardizers and professional game designers.

We've had over 50 game plays with 350 participants so far. The game supports new committee members and helps them understand how standardization works. We use it within our program to renew universities, along with other solutions. We give them the full catalog of standards, but that is not enough to really explain what standards are and how they're used.

This is where the game proves its value. We also use the game to introduce our new colleagues to the field of standardization. These are usually the new consultants that support the committees, or sales and marketing professionals and financial experts who need a better understanding of the environment that they're operating in. We've developed and published training programs for customers, one of which we're now developing a board game for on the topics of safety and security.

As you can see, the value of gamification in standards is widespread. It starts with developing ambassadors—an initiative that can be attempted in various ways, including gamification. The same games can be used to attract new customers and engage younger generations in technical subject matter that they might not otherwise be exposed to.

In addition to the game development itself, organizations also need to use advertisements, events, training and education about standardization programs to help enforce the value of standards. The scale goes from youth to universities to organizations to decision-makers—and everyone in between—with the most important criteria being awareness, understanding and competence/knowledge.

To date, we've had over **50** game plays with **350** participants so far.

It's time to immerse yourself in the world of new customers with games. Even in a world where all customers, employees and solutions are different, the fun factor is binding. People like to have fun, and if you can learn by having fun (or, just have fun learning), it really helps. EI

ABOUT THE AUTHOR

JAPPE VAN DER ZWAN is the Business Unit Manager Standards Products & Services at NEN. He has worked for over 18 years in Standards, with a broad experience in the field of Standards Development as Publishing. This background supports a strong belief in connecting standards experts and standards users as one of the drivers for our future, with the use more and more as the starting point.

IHS Markit®

ESDU Validated Engineering Data for engineers by engineers

Design Engineers, Research Scientists or whatever your field within engineering…

ESDU Data available for Aerospace, Mechanical, Process and Structural topics. We bring the knowledge and experience of hundreds of engineers to your desk.

Engineers and technical professionals need access to different kinds of engineering information to ensure optimal design and performance, safety and compliance.

Whatever your field of concern, you want validated information. You want it quickly. You want it in a form that meets your specific requirements. Above all, you want this information to be reliable.

ESDU is developed in collaboration with hundreds of experts from industry, research organizations and academia.

ESDU Validated engineering methods and data provide users with a unique knowledge base to solve engineering design problems and implement complex analytical techniques. Guided and approved by independent international expert committees, ESDU's methods are a trusted source of engineering insight.

Recognised by CAA, FAA and EASA to name a few.

Check out our Demonstration Video and see how ESDU can save you time and money!
https://ihsmarkit.com/esdu-demo


IHS Markit®
Critical knowledge locked up in shared drives, document management & other enterprise systems?
Unlock value hidden in documents and unstructured data with Goldfire by IHS Markit. Industry leaders leverage Goldfire to:
- Improve service and maintenance
- Accelerate business development
- Seamlessly execute programs
- Speed ideation and time to market
Learn more:
ihsmarkit.com/Goldfire