Trends in Emerging Tech for EHS&S

What's Really Happening Inside Companies

MARCH 2020

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Letter from the Executive Director

Thank you for downloading NAEM's *Trends in Emerging Tech for EHS&S.* Our objective is to examine the adoption and prevalence of emerging technologies being implemented in corporate environment, health, safety and sustainability (EHS&S) management. This report represents the first results of a wider research initiative aiming to empower EHS&S leaders to plan for a digital, connected future.

The EHS&S management field is at the cusp of an exciting transformation. Industrial Internet of Things (IIoT) technologies like smart sensors, drones and mobile applications are all contributing to the revolution in data collection, program design and operations in real time.

By combining the data from a quantitative benchmark survey with insights from in-depth interviews with EHS&S practitioners, this report charts which emerging technologies are really being adopted and why. It also addresses how companies are budgeting for emerging tech and software. It is our hope that this knowledge provides a directional arrow for EHS&S professionals to navigate their journey in determining which technologies are worth the investment of precious time and resources.

It's an exciting time to be in this field and to discuss how emerging technologies can facilitate more effective and efficient environmental compliance, promote healthy and safe workplaces, and accelerate sustainability.

Sincerely,

Carol Singer Neuvelt
Executive Director
NAEM

Contents

Publisher

The National Association for environmental, health, safety and sustainability (EHS&S) Management (NAEM) empowers corporate leaders to advance environmental stewardship, create safe and healthy workplaces, and promote global sustainability. As the leading business community for EHS&S decision-makers, we provide engaging forums, a curated network, peer benchmarking, research insights and tools for solving today's corporate EHS&S management challenges. Visit us online at naem.org.

I. Key Takeaways

This report documents the state of emerging software, technology and analytic tools, as well as budgets and drivers for adopting emerging technologies. The majority of survey respondents are large U.S.-based manufacturers with global operations and a medium degree of risk.

Key Takeaways

- **Most Emerging Technologies Are Not Widely Adopted.** Emerging technologies are still in their infancy. The most common emerging technology already in use is mobile applications (62%). However, more advanced forms of technology, such as smart sensors, wearable devices and drones are starting to gain traction.

- **Companies Are Adopting Emerging Technologies to Reduce Business Risk.** The primary driver motivating respondent companies to adopt emerging technologies and software tools is business risks, such as safety and compliance.

- **Budgets for Emerging Technology and Software Tools Are Increasing.** On average, respondent companies with budgets for emerging technology and software are spending over $65 per employee on emerging software tools and technology. Approximately half of surveyed companies fund these innovations through the budget of their EHS department. Most companies' (66%) emerging technology and software budgets increased over the last two years.

II. Introduction

The EHS&S Manager's Digital Journey: From Software to Emerging Technology

There is widespread speculation that the Fourth Industrial Revolution has begun, ushered in by the rapid integration of Internet of Things (IoT) technologies in industrial processes. Digital, connected technologies, like drones, wearable devices, remote sensors, and much more, stand poised to transform industry as we know it today.

For environmental, health, safety and sustainability (EHS&S) professionals, there are numerous reasons to be excited about the potential benefits of these technologies. IoT devices generate a wealth of data that can predict and prevent risks, improve safety and reduce costs. In parallel, forms of Artificial Intelligence (AI) like Machine Learning (ML) and Natural Language Processing (NLP) offer the potential to automate data analysis so that significant amounts of raw data are translated into actionable insights in real time.

Despite the enthusiasm and speculation around the promise of these converging technologies, far less information is available to help EHS&S leaders assess the current state of play. By benchmarking emerging technology adoption rates, data analysis methods, drivers for adoption, and budgets, this report aims to begin to fill that gap. The result is an insider's look at the prevalence and impact of emerging technologies in the EHS&S space. In addition, EHS&S leaders will learn how much their peers are budgeting for software and technology, what drives them to explore new technology, and how to effectively select, pilot and scale emerging technologies.

III. Methodology and Key Terms

Methodology

This report combines quantitative benchmarking survey data with interviews with seven EHS&S technology leaders to contextualize quantitative findings.

The survey benchmarked:

- The drivers pushing EHS&S functions to adopt emerging technologies
- Which emerging technologies companies are currently using or are planning to use in the next 18 months
- How companies are analyzing the data generated by emerging technologies
- Companies' budgets for emerging technologies and the factors that impact those budgets

From December 2019 through January 2020, NAEM fielded the survey to members and past attendees of NAEM's Software, Innovation, and Technology Conference. There were 73 qualified responses. Only in-house EHS and Sustainability or IT leaders were qualified to respond.

Key Terms

Emerging Technologies

Mobile Applications: Mobile applications (or mobile apps) are programs developed for mobile devices such as smartphones and tablets.

Because mobile applications offer greater portability than computers, they can collect, access and transmit data in places where computers would be cumbersome and inconvenient.

(Industrial) Internet of Things: The Internet of Things (IoT), a term coined by Kevin Ashton in 1999, refers to all of the internet-connected devices embedded in everyday objects and clothing. These technologies transmit and receive data without requiring human-to-human or human-to-computer interaction. The Industrial Internet of Things (IIoT) is the application of IoT technologies to industrial production processes.

Drones: A drone (or unmanned aerial vehicle) is an aircraft without a human pilot on board.

Drones have a wide variety of industrial applications, such as product delivery, aerial photography and infrastructure inspection. Because they can be equipped with sensors, cameras and even artificial intelligence, they can help access hazardous conditions, conduct inspections and perform maintenance tasks.

Virtual Reality: Virtual reality (VR) is an artificial environment experienced through sensory stimuli (usually sight and sound) generated by a computer in which the user's actions interact with and influence outcomes in the artificial environment. VR environments are used to train employees in life-like situations, assist in the maintenance of complex systems, improve product design and monitor transportation networks.

Smart Sensors: Smart sensors generally refer to a sensor that is capable of sensing conditions such as air quality, water quality, temperature or pH, and then digitally converting and communicating this input data to a host system. An algorithm then alerts the user as to whether the parameter is normal or abnormal. Smart sensors may also be programmed to take a pre-defined action when it senses that an abnormal threshold has been surpassed. The following smart sensors are specifically addressed in this report because they pose unique challenges and advantages.

Vehicle Data Trackers: Vehicle data trackers are smart sensors embedded in vehicles.

By embedding smart sensors in vehicle systems, vehicle data trackers help monitor and manage fleets by tracking fuel usage, temperature and driver behavior.

Wearable Devices: Wearable devices are smart sensors incorporated into clothing or worn on the body. Wearable devices enable objects to exchange data through the internet with a manufacturer, operator and/or other connected devices without requiring human intervention. Examples of wearable devices include: smart helmets, chest and torso wearables that track heart rate and breathing rates, wristband electric voltage sensors, and ergonomic devices that assess posture and routine movements.

Wearable devices are commonly used to alert employees to nearby hazards and assess health, activity and movement.

Real-Time GPS Trackers: Real-time GPS trackers (or active trackers) allow users to monitor people or objects in real time. While real-time GPS trackers frequently exist within mobile apps and vehicle data trackers, we consider them as an independent technology in this report because they can be separate devices. Common IIoT GPS trackers include Bluetooth Low Energy Tags, Asset Trackers, and IoT Shipping Container and Trailer Monitoring devices.

GPS technology is ubiquitous in industrial production processes, helping to manage vehicle fleets, monitor supply chains, and track and coordinate shipping.

Emerging Software Tools

Artificial Intelligence: Artificial Intelligence (AI) is a field of computer science devoted to creating computing systems that perform operations analogous to human learning and decision-making. AI makes it possible for machines to learn from past experience and perform human-like tasks.

AI is used in numerous industrial processes including generative design, predictive and preventative maintenance, supply chain optimization, operations and inventory management and employee training.

Natural Language Processing: Natural Language Processing is a subfield of AI that gives machines the ability to understand human languages.

Natural Language Processing is used in language translation applications, word processors to check grammatical accuracy of texts and speech-to-text applications.

Machine Learning: Machine Learning is an application of AI that provides systems the ability to automatically learn and improve from experience by exposure to data — without being explicitly programmed.

Machine Learning is used to facilitate preventative maintenance activities and subvert potential mechanical failures in manufacturing facilities.

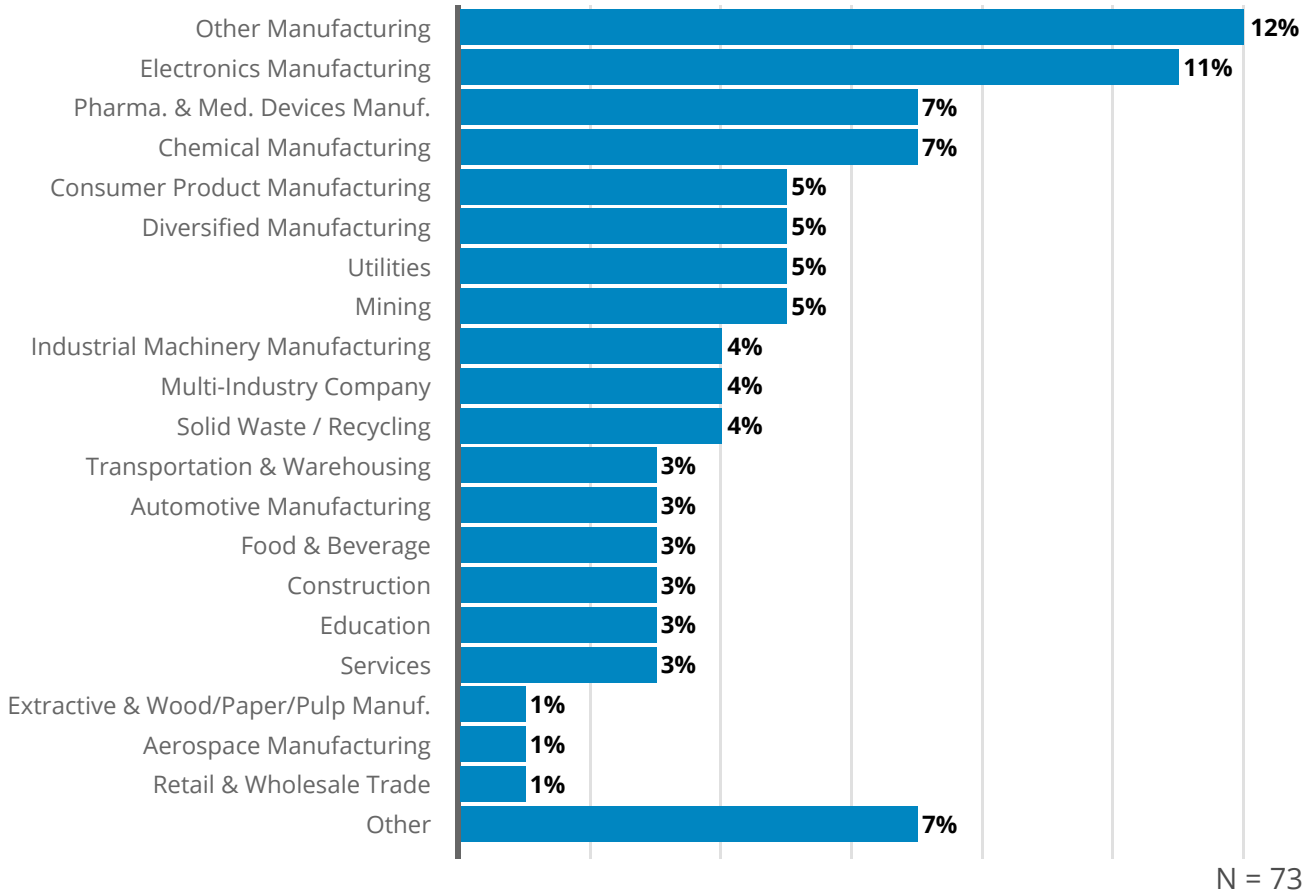
IV. Demographics

The majority of survey respondents are large (78% over $1 billion in revenue), U.S.-based manufacturers (58% manufacturing) with global operations and a medium degree of risk (70%). Electronic Manufacturing, Chemical Manufacturing and Pharmaceutical Manufacturing are the most prevalent within the manufacturing industry. Over a third of respondents have a department with high program maturity.

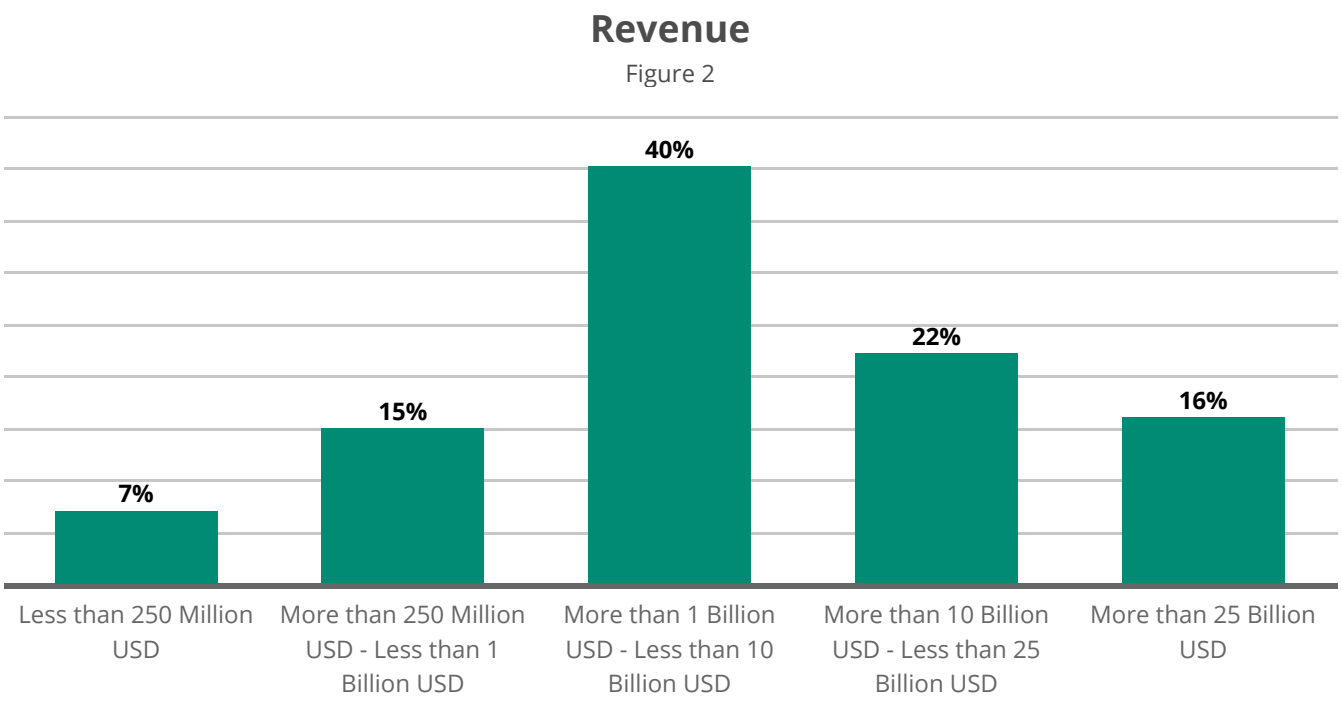
Most Respondents Work Within the Manufacturing Sector

Primary Industry

Figure 1

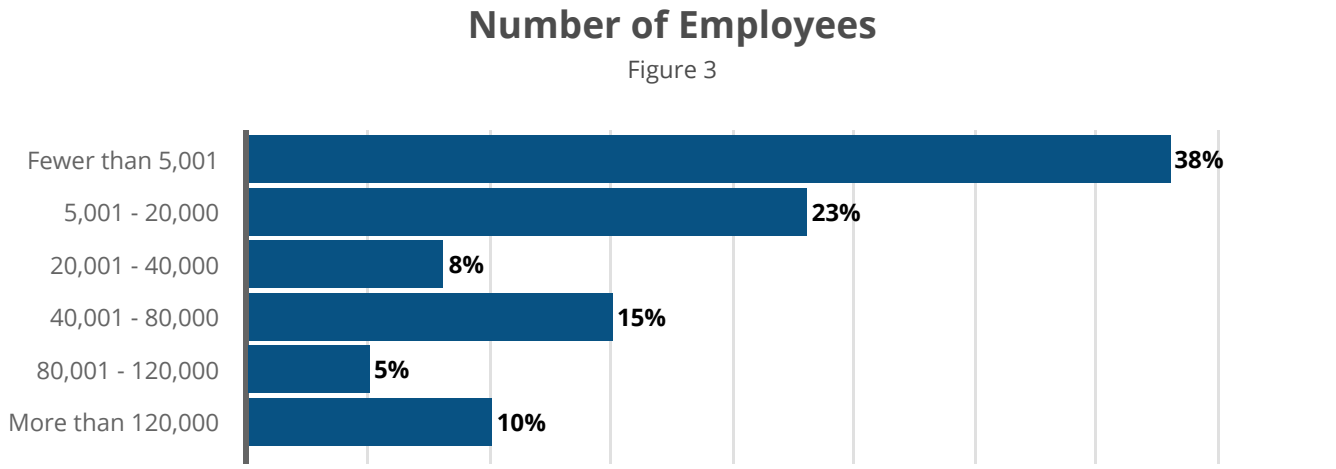


Most Respondents Have Revenue Over $1 Billion



N = 73

15% of Respondents Come From Companies With Greater Than 80,000 Employees

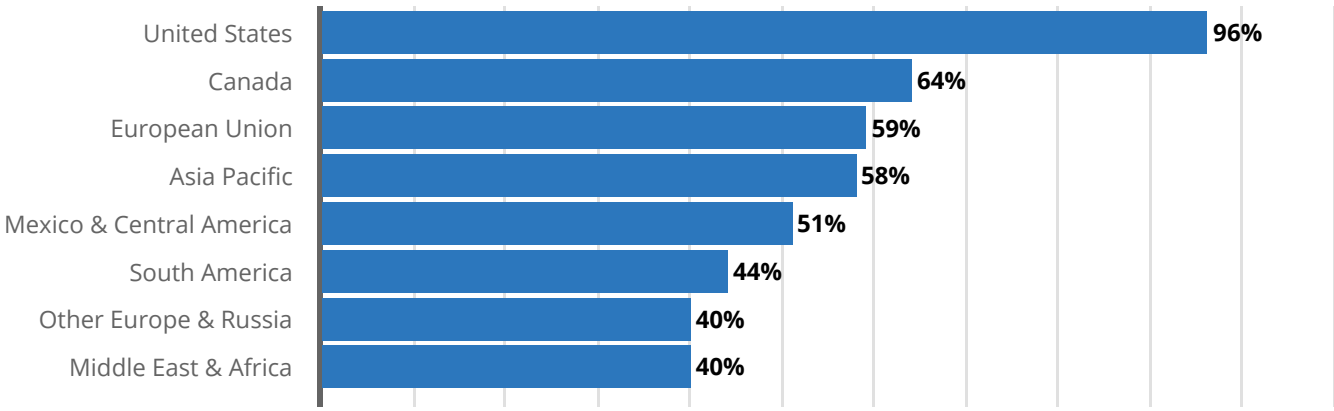


N = 73

Respondents Have Global Operations

Geographic Regions

Figure 4



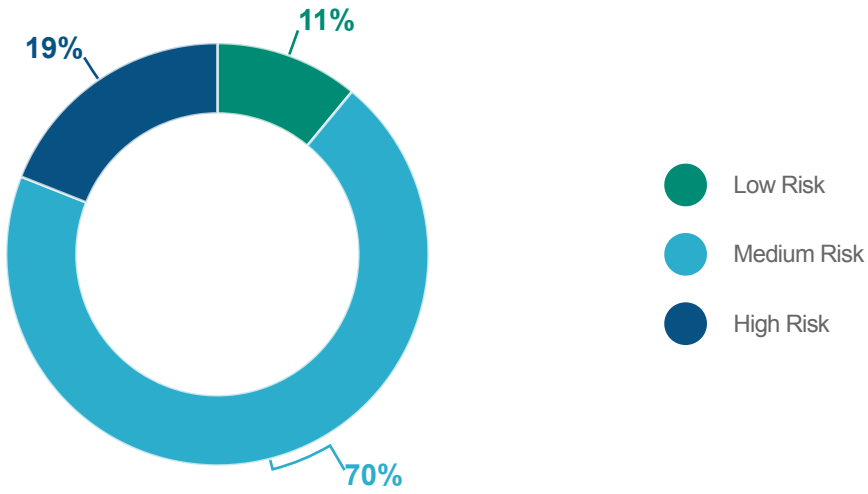
* Respondents were allowed to choose multiple geographic regions

N = 73

Respondents Were Mostly From Medium-Risk Industries

EHS Risk

Figure 5

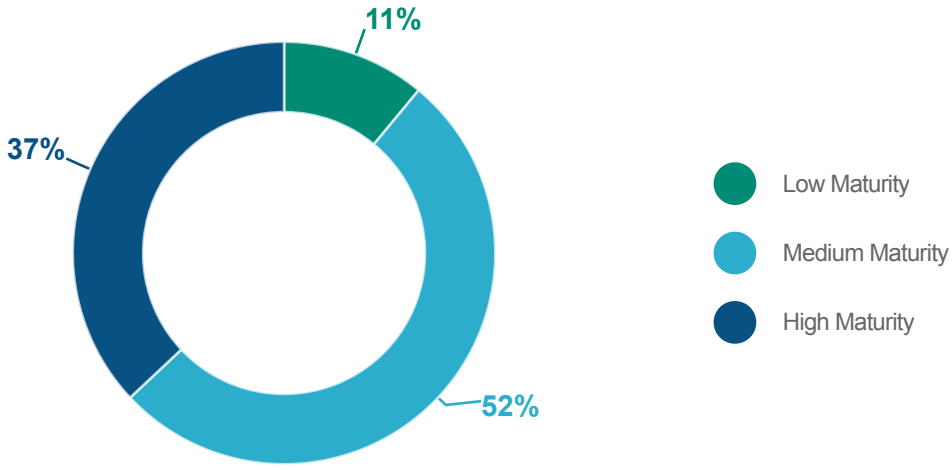


N = 73

Over a Third of Respondents Have a High-Maturity EHS&S Program

Program Maturity

Figure 6



N = 73

V. The State of Emerging Software and Technology

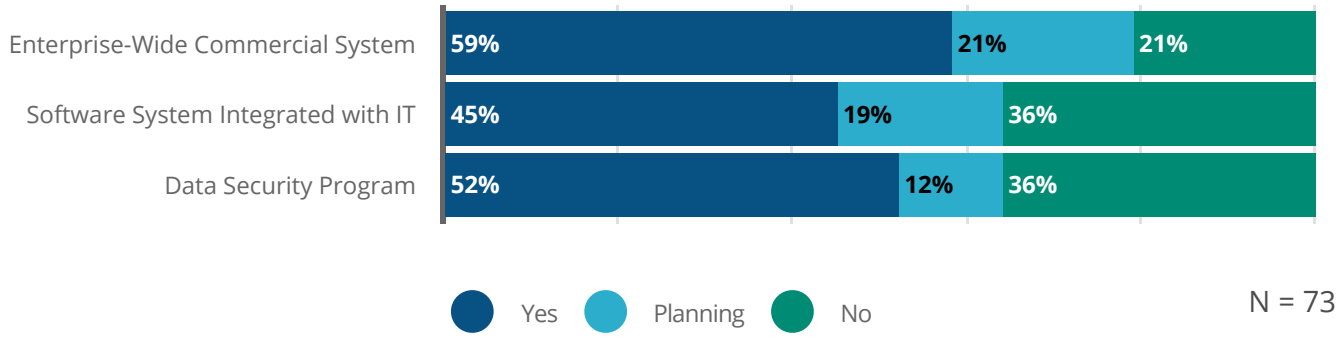
Management Information System Adoption

Among survey respondents, enterprise-wide management information EHS&S systems (EHS-MIS) are increasingly common. Figure 7 shows that 80% of respondents have an enterprise-wide EHS&S system or are planning to adopt one within the next 18 months. In addition, 64% of respondents have integrated their EHS&S systems with other IT systems. Finally, 52% of respondents have a data security program to protect their data and 12% more are planning to adopt one in the next 18 months. On the whole, these statistics indicate that companies have fairly advanced data management processes and systems.

Data security programs and clear internal guidelines governing how data will be used inside companies are becoming more important as companies collect more personal data about their workers. These results indicate that companies are moving to take the initial steps to take advantage of emerging EHS&S technologies.

EHS&S Systems Adoption

Figure 7



EHS&S Management Systems Are a Prerequisite to Adopting Emerging Technologies

Among the EHS&S leaders we interviewed, there was clear consensus that enterprise-wide EHS&S management systems are a key prerequisite to experimenting with and deploying emerging technologies. However, more than 20% of companies surveyed do not have and do not plan to acquire an enterprise-wide EHS&S management system in the near future. One expert described the maturity required to adopt emerging technologies in these terms:

"The first step is to get a data strategy together and that typically requires implementing one of the software solutions... I would not recommend someone still operating on spreadsheets to go start playing with wearables... And then once you've got data analysis, emerging technologies are the perfect thing to put on your to-do list."

Two interviewees echoed those comments, highlighting how existing data should be standardized and accessible across all business units before investing in emerging technologies. As an EHS&S leader at a Fortune 500 chemical manufacturer put it:

"If you have a company that has multiple businesses and they all want to do their own thing, you really start to lose some of the benefits of bringing everybody into the same system or tools. And while you need to build flexibility in there so that they can operate with what restrictions they have for their businesses, you really want everybody using the same tool."

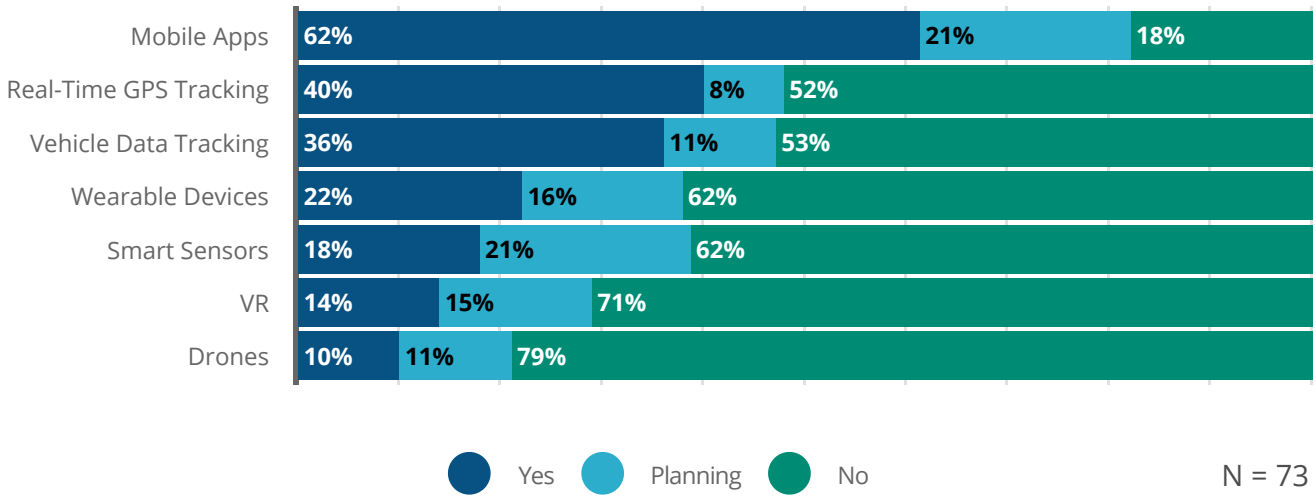
The absence of EHS&S management systems and their importance in improving data accessibility and standardization indicates that many companies still have prerequisites to meet before experimenting with emerging technologies.

Emerging Technology Adoption

Two-thirds of respondents have adopted one or two emerging technologies. The most common technology adopted is mobile applications (62%). Nearly two-thirds of respondents are already using mobile apps for EHS&S purposes and a further 21% are planning to implement them in the next 18 months. The next two technologies with the greatest rate of adoption are Real-Time GPS Tracking and Vehicle Data Tracking, with just under half of respondents using or planning to use in the next 18 months. Adoption rates are considerably lower for more advanced technologies like drones (10%), VR (14%) and smart sensors (18%). This indicates that more advanced emerging technology remains relatively new to the EHS&S field.

Emerging Technology Adoption

Figure 8



VI. The State of Data Analysis

Data Analysis

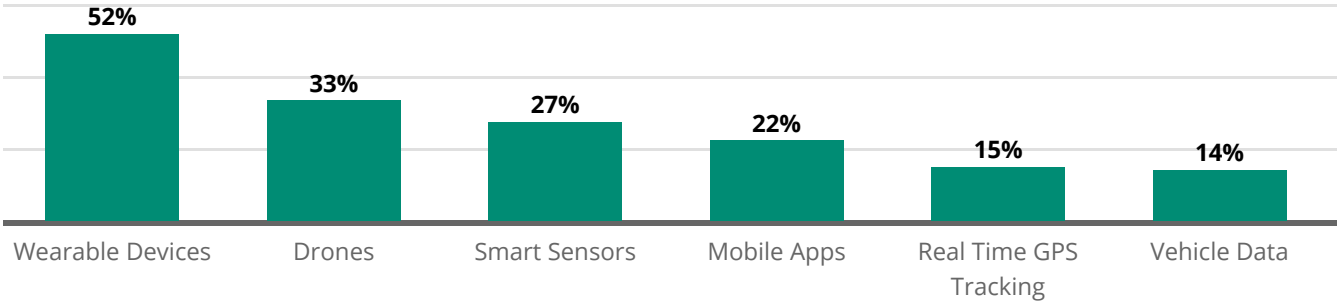
Emerging technologies generate a wealth of data, but data on its own does not automatically translate to actionable insights for EHS&S leaders. Instead, all this emerging data must be managed, organized and analyzed in order to provide value. As one interviewee put it, "data is the backbone" of this transformation, and data analysis is the key to unlocking value.

Data Collected Is Not Always Data Analyzed

Some respondents reported that they are not currently analyzing data they collect from emerging technologies. Wearable devices top the list, with just over half of survey respondents not analyzing wearable device data.

Percent of Technology Users Not Analyzing Data

Figure 9



N = 65

The Beginning of AI

Respondents are primarily using non-AI tools for data analysis. Smart sensors had the highest rate of AI use, but only 15% of respondents are analyzing smart sensor data with AI.

Use of AI to Analyze Data From Emerging Technology

Figure 10

Common Forms of AI in EHS		
Technology	AI Analysis	Non-AI Analysis
Smart Sensors	15%	65%
Vehicle Data	9%	80%
Wearable Devices	7%	48%
Drones	7%	67%
Real-Time GPS Tracking	6%	82%
Mobile Apps	5%	76%

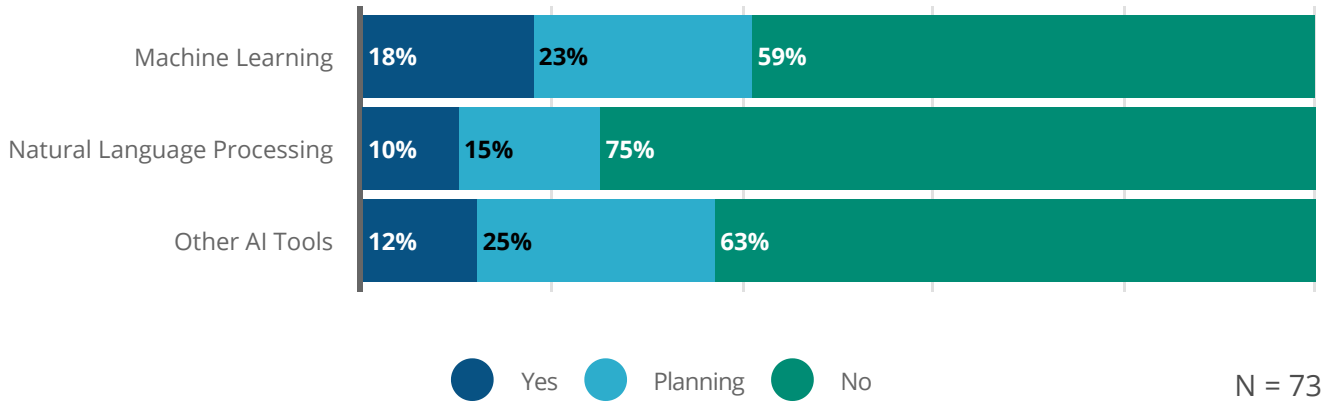
N = 65

Machine Learning Is the Most Adopted Form of AI

Machine Learning was the most adopted form of AI, with 41% of respondents using Machine Learning or planning to adopt it in the next 18 months. One quarter of respondents said that they use Natural Language Processing in their EHS&S departments or are planning to adopt it in the next 18 months. Over a third of respondents have already adopted or plan to adopt an AI tool to analyze data for their EHS&S department.

Artificial Intelligence Tools Adoption

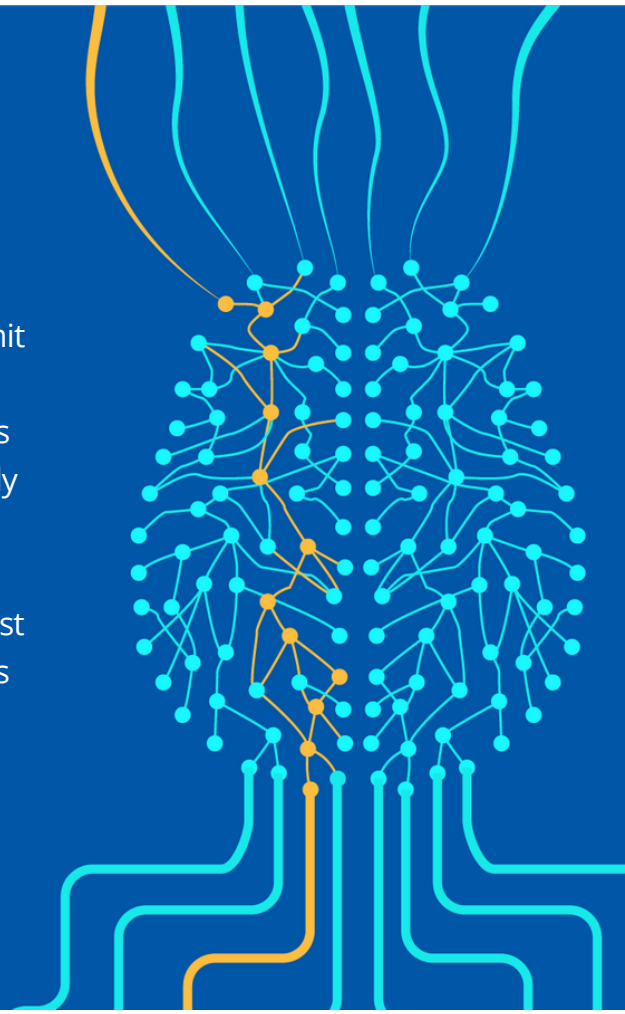
Figure 11



Using AI for Analysis in High-Risk Manufacturing

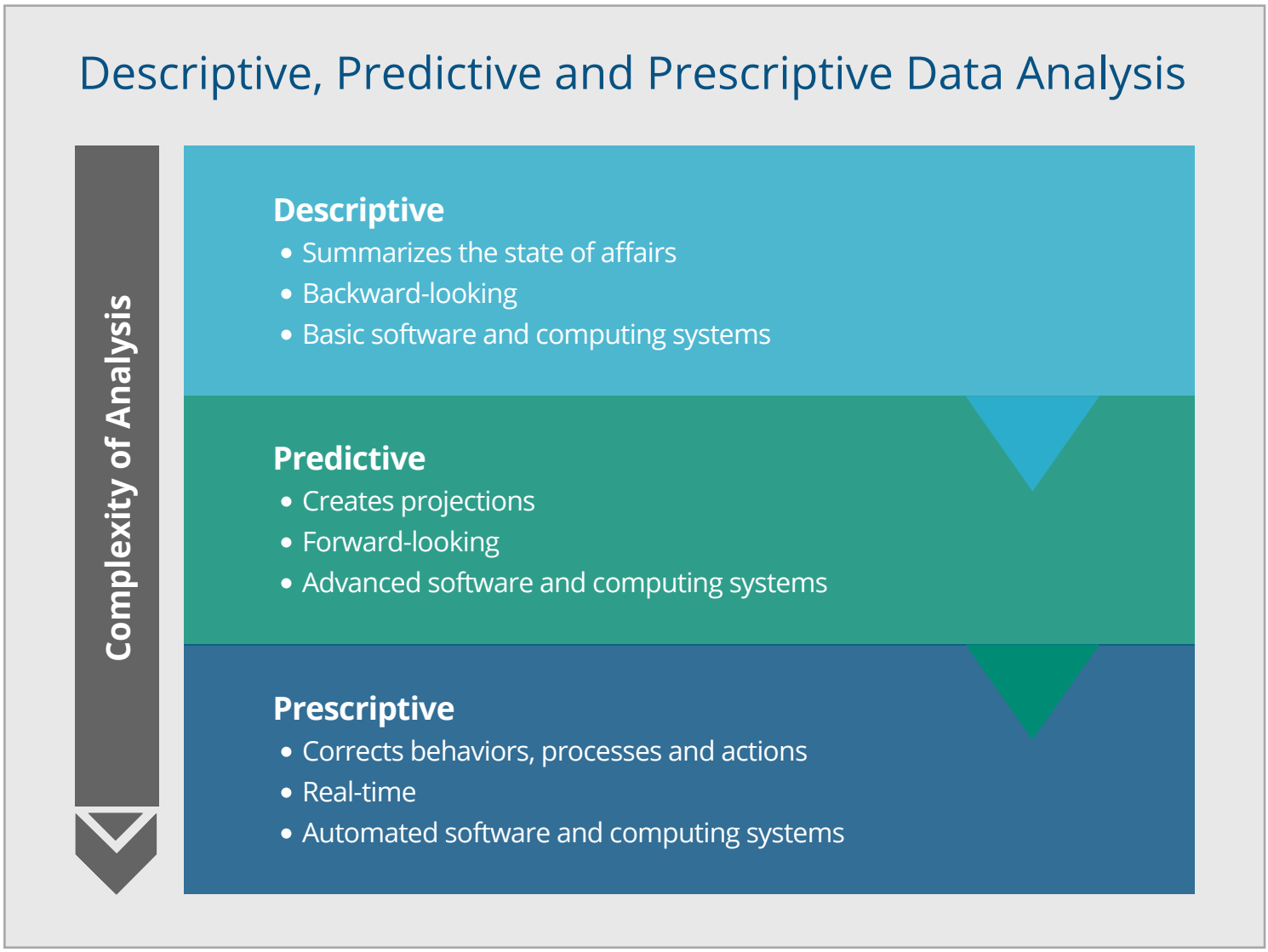
For an EHS&S leader working in a high-risk manufacturing industry, the benefits of AI, specifically Machine Learning, allowed them to reduce their "number of deviations to permit violations by over 95%... from hundreds of deviations in a month to one." Machine learning processes also allowed this EHS&S leader to significantly cut energy usage and drastically improve the efficiency of scrubbers.

But implementing AI first required this EHS&S leader to invest in their staff's analytic capabilities, as multiple staff members received in-depth training on how to extract, transform and load data from an enterprise-wide data lake. The upfront costs of investing in personnel were worth it, as this team is now able to devote more time to analyzing data, building customizable data dashboards and making decisions.



The Data Analytics Journey: From Descriptive to Prescriptive Goals

Companies can pursue data analysis for Descriptive, Predictive or Prescriptive purposes. As technologies and analytic tools advance, data analysis will progress from describing past incidents and scenarios to predicting future risk and incidents. Eventually, many companies aspire to use data analysis to prescribe preventative measures and actions in real time, as the gap between data collection and analysis is closed.



Companies Are Primarily Using Data for Descriptive Purposes

Companies are primarily collecting data for descriptive purposes. Drones are commonly used for descriptive purposes (92%), while Smart Sensors are the least frequently used for descriptive purposes (58%). Smart Sensors and Drones had the highest rates of use for Predictive purposes with 58% and 54%, respectively. Vehicle data had the highest proportion of respondents who used the data for prescriptive purposes.

Goal of Analysis of Data From Emerging Technology*

Figure 12

Technology	N	Descriptive	Predictive	Prescriptive
Mobile Apps	52	83%	33%	35%
Vehicle Data	30	73%	23%	47%
Real-Time GPS Tracking	30	70%	23%	37%
Smart Sensors	24	58%	58%	42%
Wearable Devices	22	45%	41%	41%
Drones	13	92%	54%	23%

* Percentages may add up to more than 100% because respondents could choose multiple goals for analysis.

Contracting Out Data Analysis

Data from Wearable Devices was most frequently contracted out for analysis with 38% of respondents who use wearable devices contracting out at least a portion of the analysis. Smart sensors were the most commonly analyzed in-house, with only 17% of respondents contracting out analysis. Most respondents using these emerging technologies are analyzing data exclusively in-house.

Use of Contractors for Data Analysis

Figure 13

Technology	Contracted Out	Only In-House
Wearable Devices	38%	62%
Drones	33%	67%
Vehicle Data	27%	73%
Real Time GPS Tracking	26%	74%
Mobile Apps	18%	82%
Smart Sensors	17%	83%

VII. Drivers of Emerging Technology Adoption

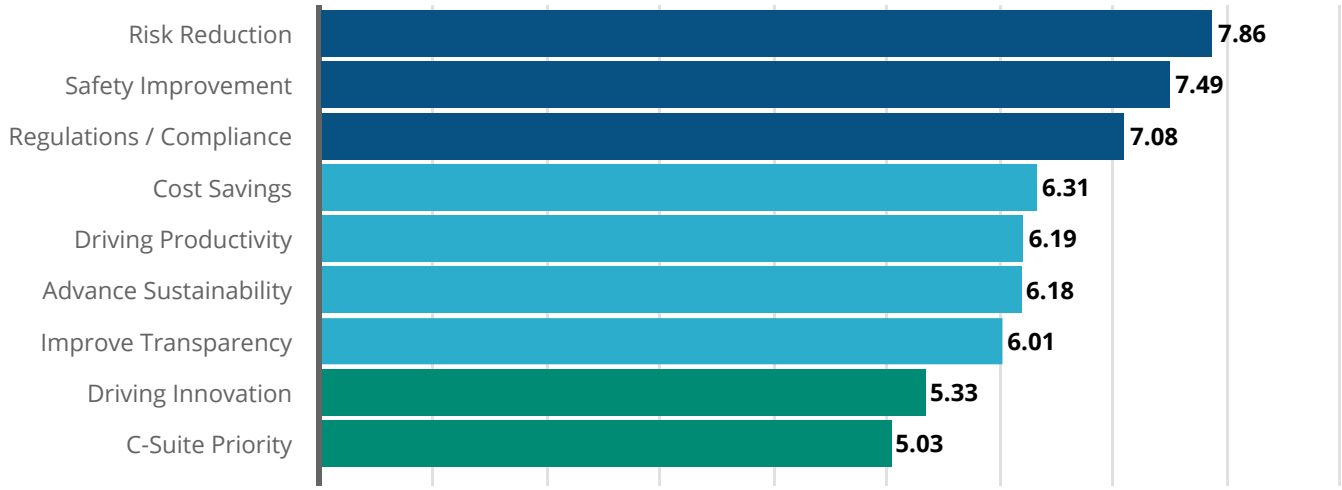
Understanding the Drivers

Risk Reduction is the leading driver motivating EHS&S leaders to adopt emerging technologies. But as we analyze the drivers for emerging technology and software in more detail, there are clearly three distinct tiers of drivers, indicated in color from dark to light in Figure 14. The top tier, including Risk Reduction, Safety Improvement and Regulations/Compliance, all essentially deal with reducing business risk. The second tier of drivers consists of Cost Savings, Driving Productivity, Advancing Sustainability and Improving Transparency. The third tier consists of Driving Innovation and C-Suite Priority. While some companies may be motivated to implement emerging technologies for these second- and third-tier reasons, the majority of emerging technology projects focus squarely on reducing risk.

As an experienced EHS&S technology leader put it: ***"What helps us with prioritizing our efforts is that we're very focused in on reducing overall risk. We're not really looking at lagging indicators like injury and illness rates... We're focused on what we can do to be predictive and to eliminate prioritized risk in our facilities. Thermal stress is a good example where we recognize that heatstroke can kill a person, so that is considered a first-tier risk in the health arena."***

Drivers for Adopting Emerging Technology

Figure 14



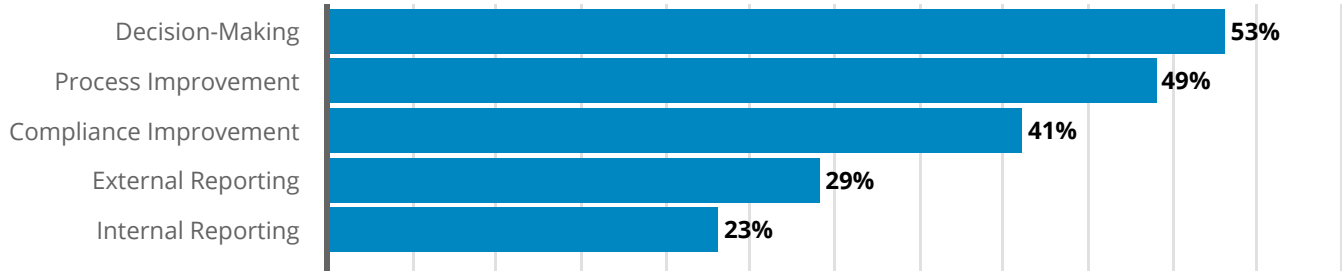
* We asked respondents to rate each category on a scale from 1 - 10, 10 being the highest and 1 the lowest. Figure 14 reports these results as the average value for each category.

N = 73

Technology Is Expected to Impact Decision-Making and Process-Improvement

While risk is a clear driver for the adoption of emerging technologies, there is a wide variety of effects that EHS&S leaders expect to see as they implement emerging technologies. Respondents are expecting emerging technology to have the biggest impact on Decision-Making (53%) and Process-Improvement (49%). Reporting is at the bottom of the list with External and Internal Reporting chosen by less than 30% of respondents.

Expected Impact of Emerging Technology



N = 73

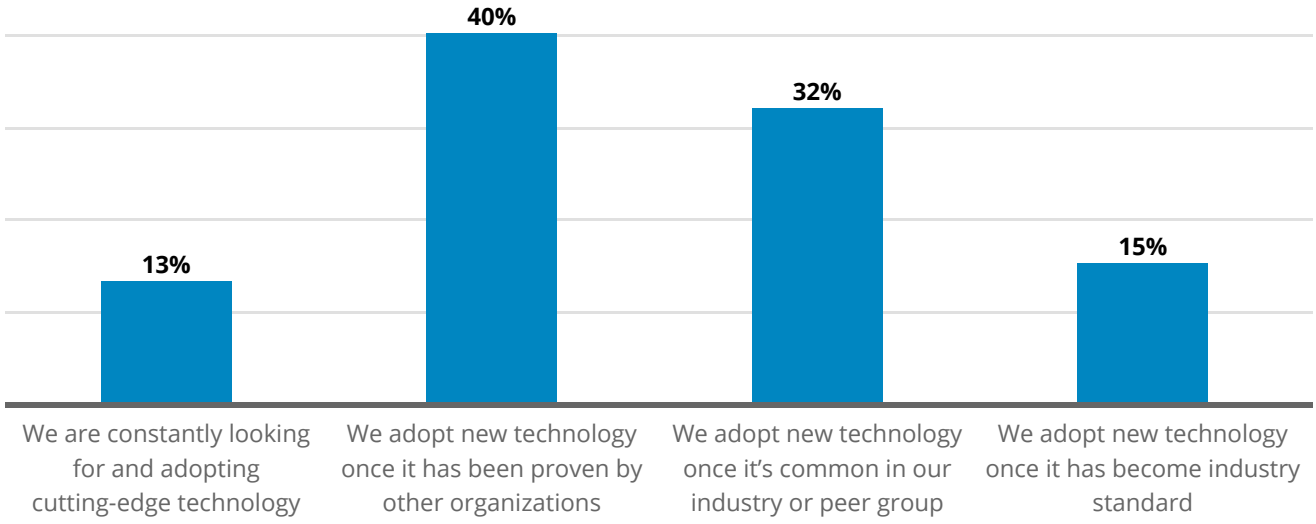
Approach to Technology Is Impacted by Program Maturity and Risk

Currently, a small minority of respondents (13%) are looking for and adopting cutting-edge technology. This minority of companies have high-maturity programs and high exposure to risk. In contrast, EHS&S leaders with less mature programs in industries less exposed to risk face different pressures, and thus approach technology differently. An EHS&S leader in a company with low exposure to risk highlighted how they:

"must implement technologies that are proven and will absolutely provide the stated savings. There is no room for experimental or emerging technologies."

Approach to Technology

Figure 16



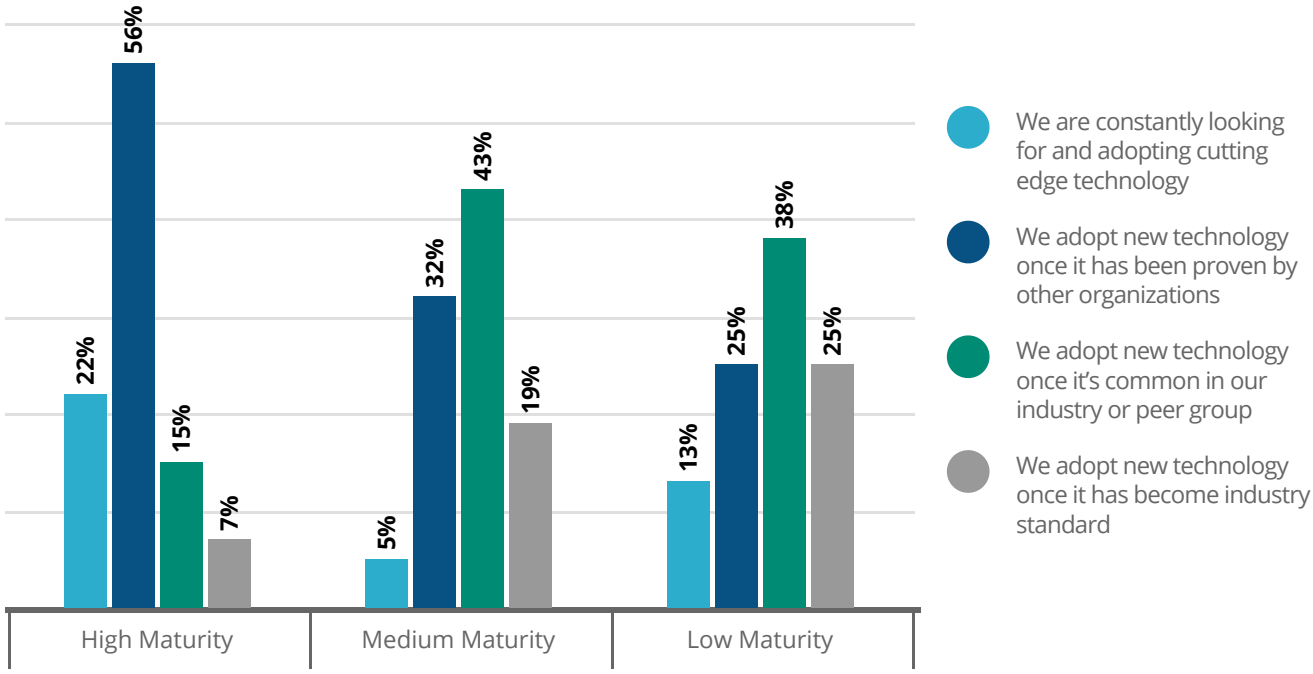
N = 73

Program Maturity

Approach to technology is driven primarily by program maturity. High-maturity respondents had a small proportion of companies who are late adopters (7%). Most (78%) high-maturity respondents reported that they try to stay ahead of the curve.

Approach to Technology by Program Maturity

Figure 17



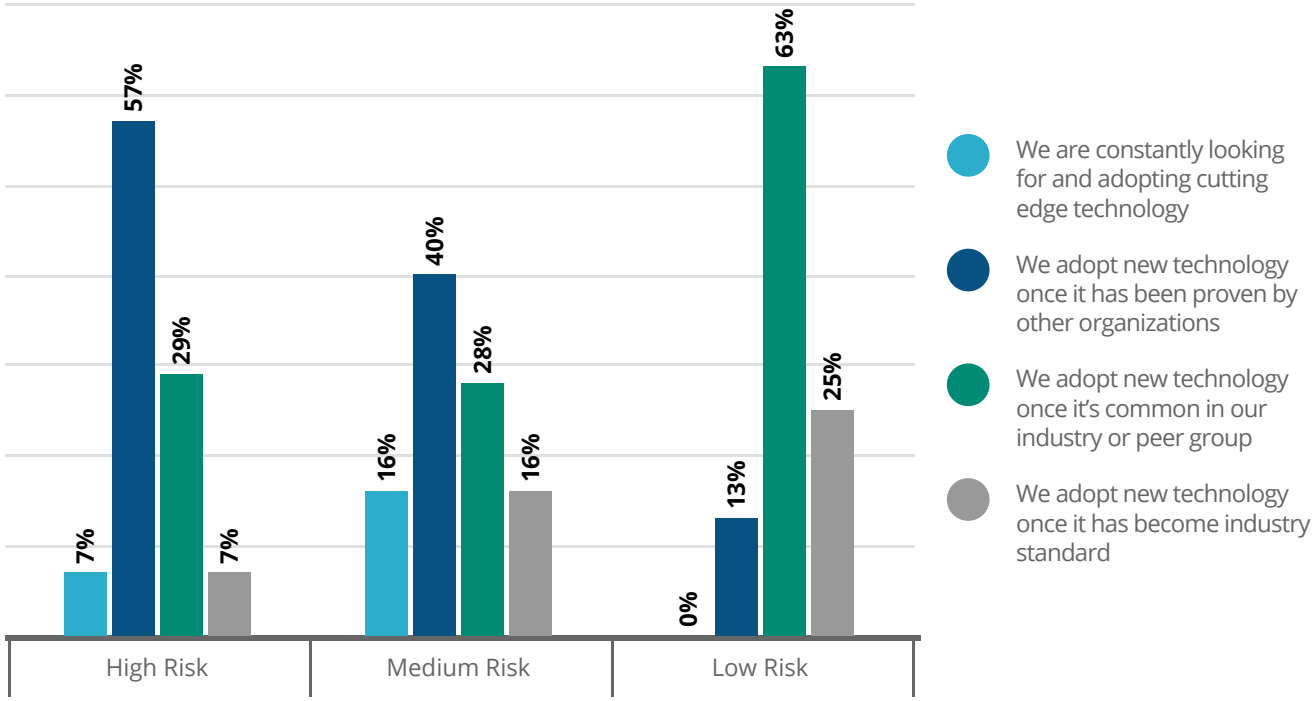
N = 73

Risk

In addition to program maturity, risk is an important determinant in how companies approach technology. High-risk and medium-risk companies are much more likely to be early adopters of technology (64% and 56%) than low-risk companies (13%).

Approach to Technology by Risk

Figure 18



N = 73

Perspectives From the NAEM Community

Data Privacy Considerations

An EHS leader for a Fortune 500 company addressed the need to establish clear data privacy policies before piloting a wearable sensor designed to collect biometric data. "We were placing biometric sensors on Field Service employees that were going to monitor their hydration, their sleep, their core temperature. That scares some people, so we had to be very thoughtful and we had an extremely rigorous process up front with our data privacy teams, HR, and employee relations teams to put some guidelines in place before we did a pilot. Then we had... very transparent communications with the employees around what was being tracked and how it was being used."

Data Ethics

To frame the importance of getting data security and privacy right, this expert highlighted the concept of "digital humanism — the notion of how you integrate people with technology in an ethical and responsible way. There are clear risks to getting this wrong. We've seen a large online retailer and others in the news for saying they are going to use sensor data for one thing and then employees accusing them of using it for other things. We were very clear that all of our sensors were related to health and safety and not productivity."

A New Definition of Success

An EHS&S leader at a Fortune 500 Chemical Manufacturer summed up this change: "I think in the past, we would consider taking a project from cradle to grave and implementing it fully — that was a win. And now we had to change our definition of a win: we looked at this and we figured out whether it moves forward or not, now that's the win. So we try to introduce more of the terminology of fail fast, fail often because it happens a lot... but I think for people it's hard to accept that we are deciding not to do something because we are so accustomed in past experiences to take it all the way across the finish line. But we have a new finish line or a new way of looking at it with things that don't work."

Trust the Data

An EHS&S technology leader for another Fortune 500 chemical manufacturer highlighted how it was more difficult to trust the benefits of drones, in comparison with other technologies like VR: "We implemented drones for inspection purposes... on defoliation towers so we don't have to put humans into those places, or build scaffolding to go through all of those places... The biggest thing that I've seen is getting over that mental hurdle of 'different is wrong,' especially for drones. It took a long time for us to say, 'we can use [drones] and it'll satisfy our needs just as well as putting this human up there to actually physically see what we're looking at.' With the VR hoods, it was a lot different just because the benefits were instantaneous... If you put on one of those hoods, right away you can see how lifelike it is and the experience that you get from doing it."

VIII. Emerging Software and Technology Budgets

Emerging Software and Technology Budgets

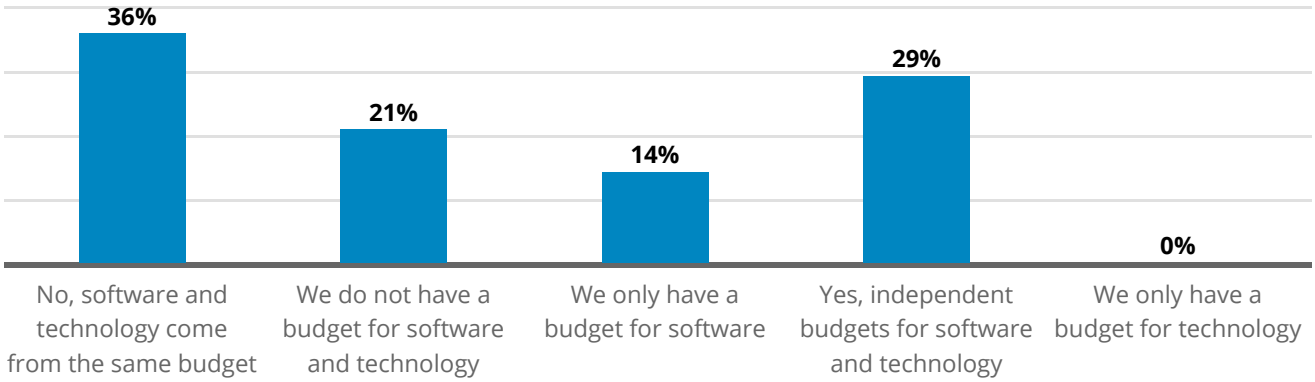
With interest in emerging technologies increasing, companies are starting to make investments into emerging technology and software tools. Budgets are reported on a per-employee basis because the cost of most emerging technologies scales as the number of users increases. Respondents who reported a budget of $0 were not included in the calculations.

Investment in Software Is Needed to Invest in Technology

Figure 19 shows that all respondents who have a budget for emerging technology also have a budget for emerging software, and typically both budgets are combined. A majority of respondents (65%) have started investing in emerging technologies, and only a few (21%) respondents have no budget for emerging software or technology.

Relationship Between Software and Technology Budget

Figure 19



N = 73

Budgets for Emerging Software and Technology Vary Widely

We asked respondents to report their total budget for emerging technology and software from the past year. The amount of capital that companies budgeted for emerging technologies varies widely. The responses varied from no investment (11%) to spending hundreds of dollars per employee on emerging technology.

Emerging Technology and Software Budget Per Employee*

Figure 20

	% With Budget = 0	Average	1st Quartile	2nd Quartile	3rd Quartile	4th Quartile
Budget	**11%**	**$629,300**	**$60,000**	**$145,000**	**$300,000**	**$9,200,000**
Budget/Employee	**11%**	**$68**	**$6**	**$14**	**$46**	**$500**

* Values calculated without respondents who have a budget of $0

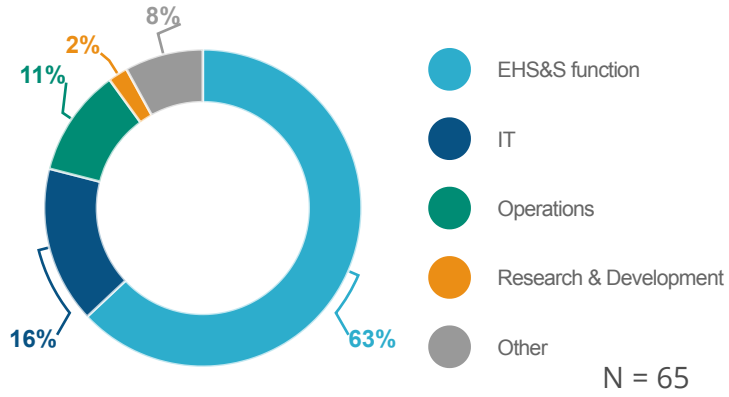
N = 73

Funding for Software Crosses Functional Lines

Budgets for emerging software mostly came from the EHS&S function (63%). IT (16%) and Operations (11%) were also common sources for budgets. A small minority of companies received funding for emerging technology and software budgets from Research & Development, Innovation, or multiple departments pooling resources. The funding source for emerging software nearly matches the funding source for emerging technology, but slightly more of the technology budgets comes from Operations (20%).

Software Budget Source

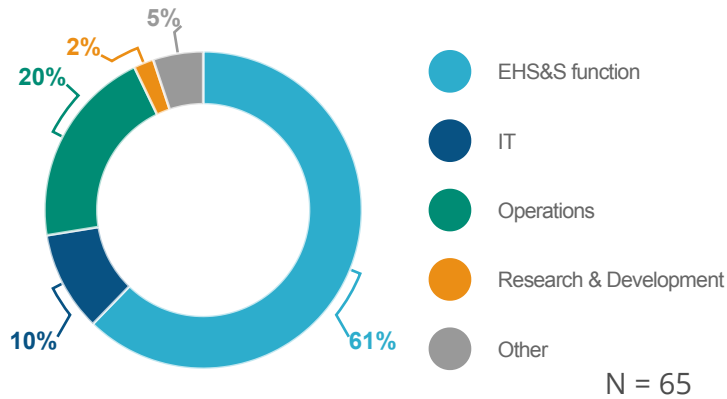
Figure 21



N = 65

Technology Budget Source

Figure 22

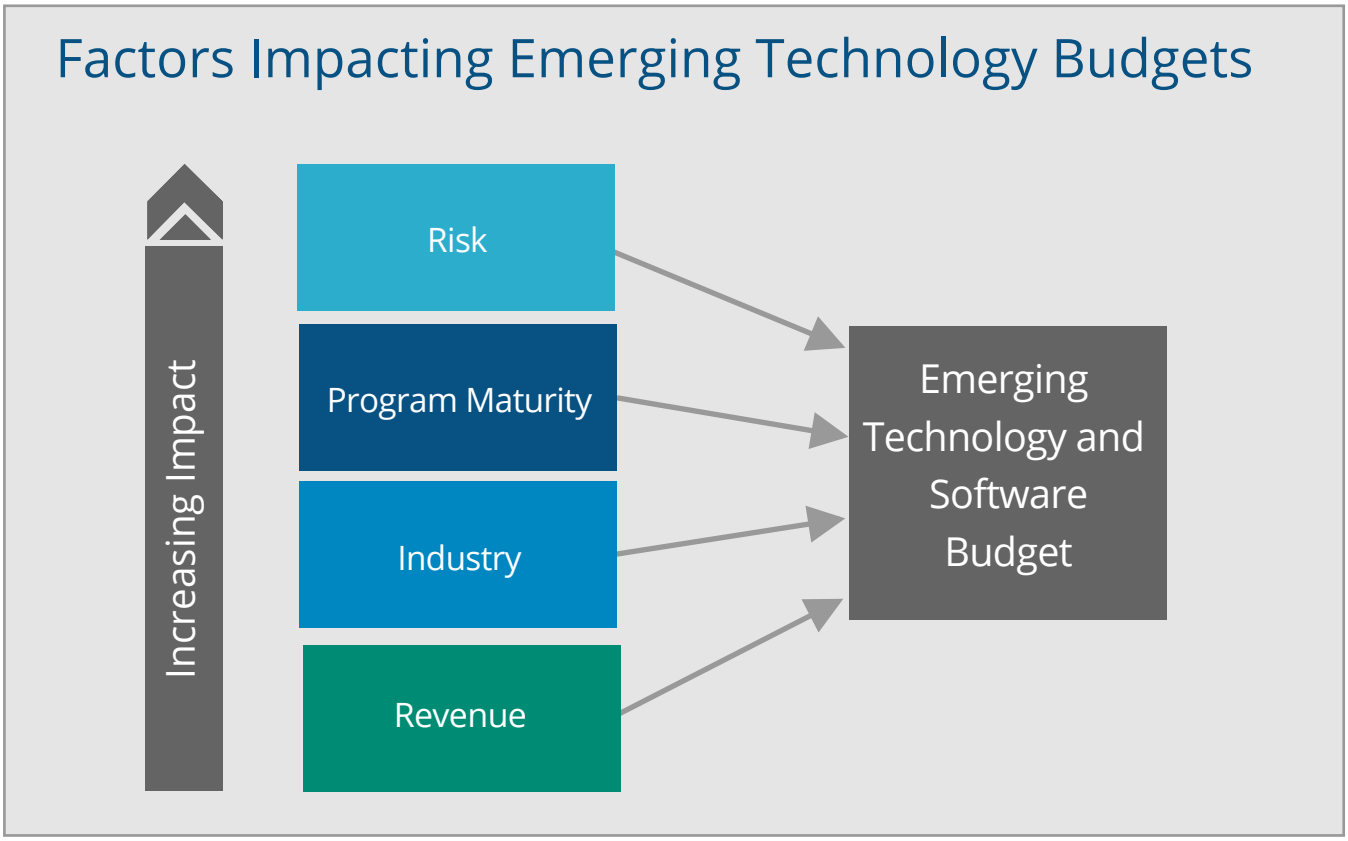


N = 65

Factors Impacting Emerging Technology and Software Budgets

The amount of investment respondents made in emerging technology and software depended on risk, program maturity, industry and revenue. There was a strong correlation between the reported risk and the total budget for emerging technology and software. On average, high-risk respondents spend almost 5 times as much as medium-risk respondents and 15 times as much as low-risk respondents.

The largest driver for high-risk companies was risk reduction. Investing in emerging technologies and software can reduce a large amount of risk and uncertainty, so it is not surprising to see high-risk respondents investing a significantly larger amount than low- and medium-risk respondents. High-risk companies are also much more likely to have a budget for emerging software and technology. Less than 8% of high-risk respondents do not have a budget for emerging software or technology.

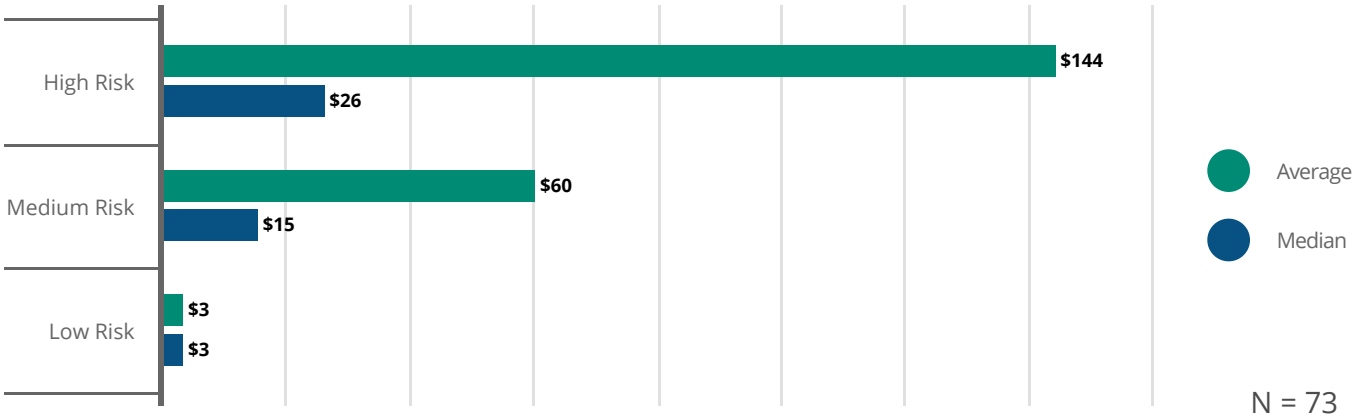


Risk

Risk has a strong correlation with budgets for emerging technology per employee. On average, high-risk industries' budgets are almost two-and-a-half times the size of medium-risk industries.

Emerging Technology Budget by Employee by Risk*

Figure 23

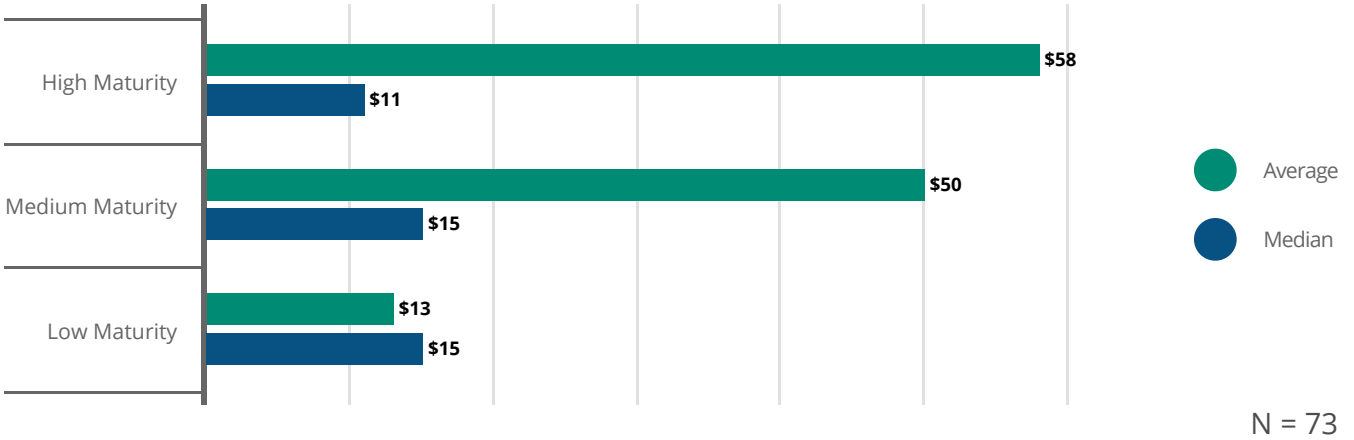


Program Maturity

The correlation between program maturity and emerging technology and software is not as strong as the correlation between total budget and risk, but there is still a strong correlation. While the average budget for high-maturity programs is nearly three times the average budget of medium-maturity programs, they have the same median budget.

Emerging Technology Budget by Maturity*

Figure 24



*Values calculated without respondents who have a budget of $0

Industry

High-risk industries like Chemical Manufacturing, Mining and Utilities are making the largest investments in emerging technology and software. Chemical manufacturers are spending the most on emerging technology per employee.

Emerging Technology Budget by Employee by Industry*

Figure 25

Industry	Average of Budget/Employee
Chemical Manufacturing (N=4)	$176.11
Mining (oil & gas, minerals, coal, etc.) (N=4)	$149.05
Utilities (N=4)	$93.49
Other Manufacturing (N=8)	$77.56
Consumer Product Manufacturing (N=4)	$60.51
Multi-Industry Company (N=2)	$57.92
Construction (N=2)	$48.63
Pharmaceutical & Medical Devices Manufacturing (N=5)	$30.11
Industrial Machinery Manufacturing (N=2)	$14.02
Diversified Manufacturing (N=3)	$8.09
Automotive Manufacturing (N=2)	$8.00
Electronics Manufacturing (N=5)	$3.64
Other (N=5)	$91.37

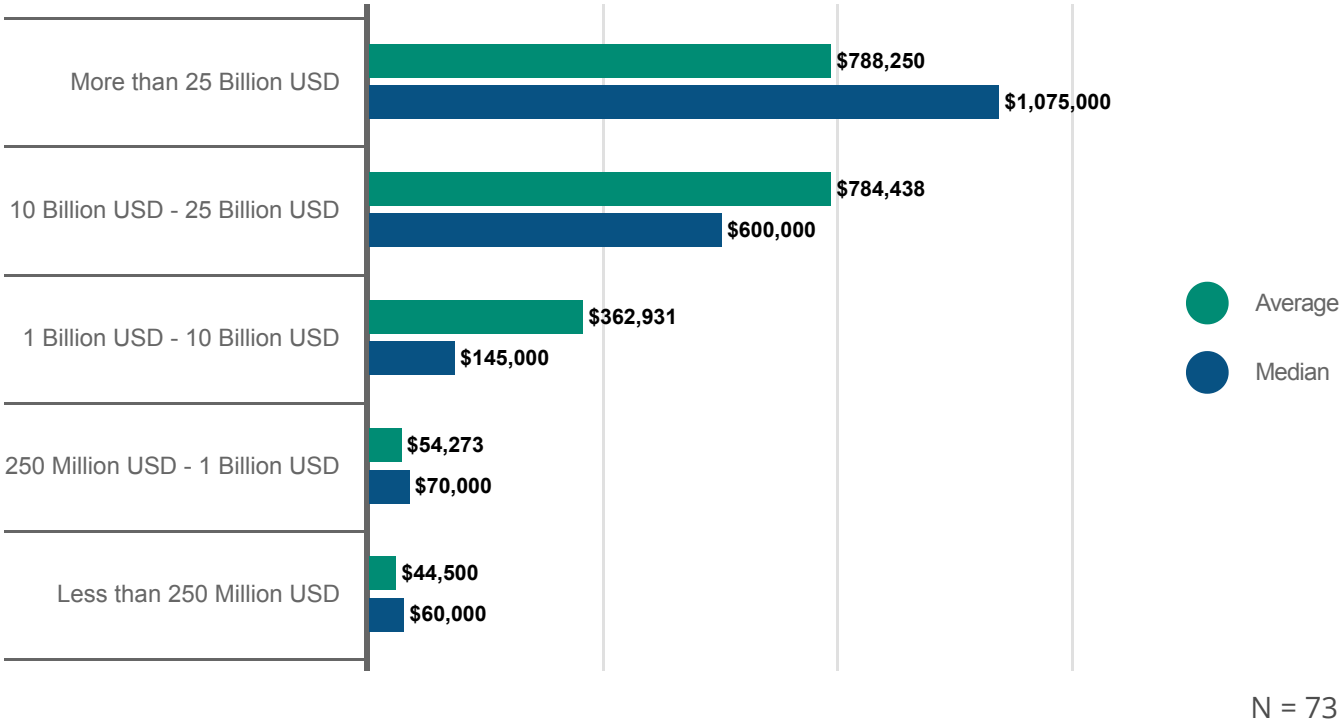
* Values calculated without respondents who have a budget of $0

Revenue

Respondents with high revenues reported spending more on average than those with lower revenues. Smaller companies were twice as likely to not have a budget for emerging software and technology.

Emerging Technology Budget by Revenue*

Figure 26



N = 73

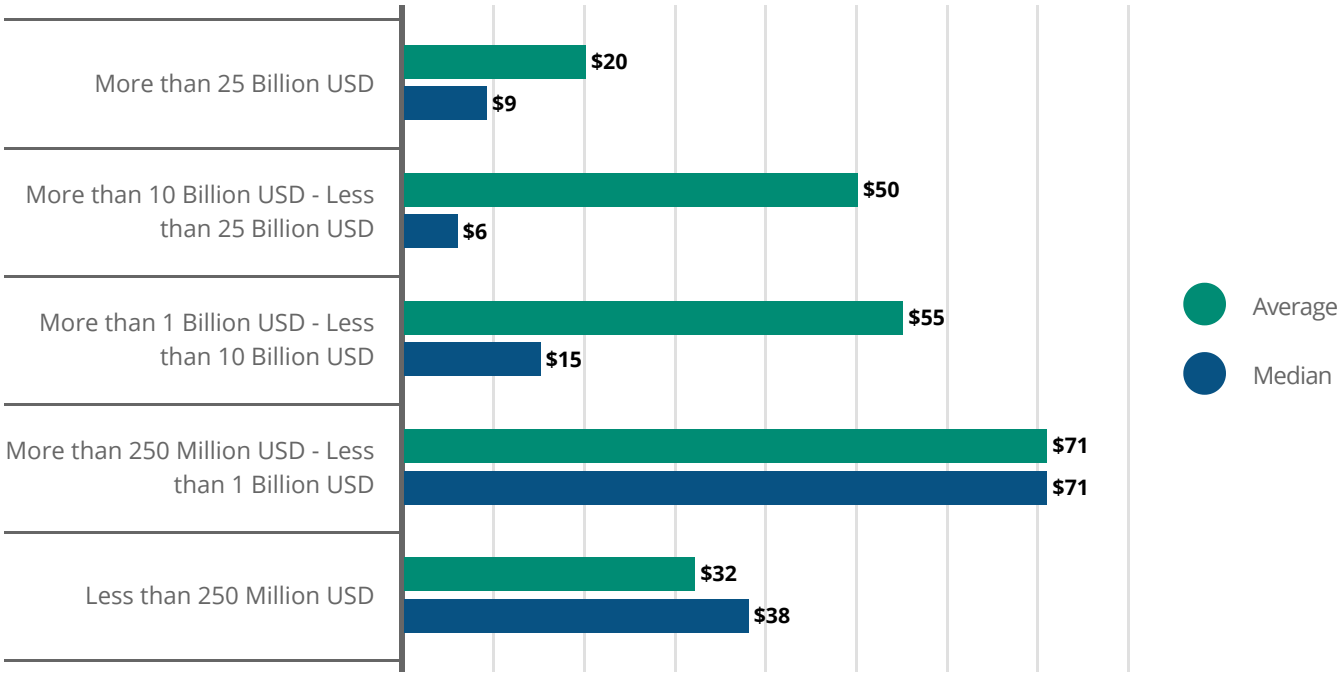
*Values calculated without respondents who have a budget of $0

Larger Companies Spend Less per Employee on Emerging Technologies

When the budget per employee is cross-tabbed by revenue, there are clear efficiencies of scale. While larger companies are spending more overall on emerging technology, they are spending less per employee.

Emerging Technology Budget per Employee by Revenue*

Figure 27



N = 73

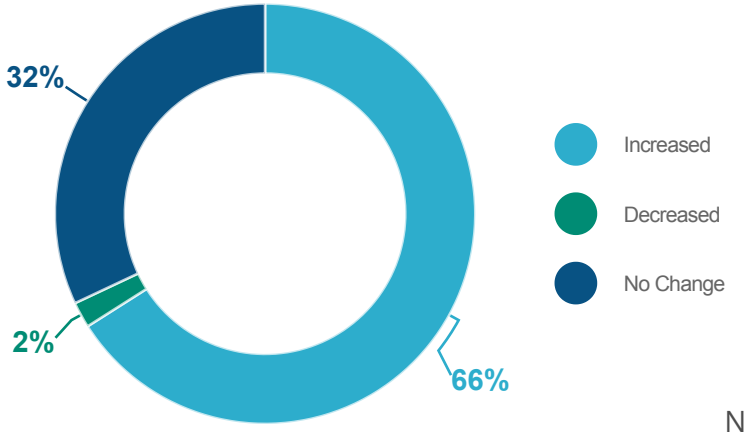
*Values calculated without respondents who have a budget of $0

Budgets for Emerging Software and Technology Are Growing

Nearly two-thirds of respondents reported that their budget for both emerging software and technology is increasing. Only 2% of respondents reported that their budgets for emerging technology had decreased in the past two years. The remaining third of respondents reported that their emerging software and technology budgets had not changed over the past two years.

Software Budget Change in Past 2 Years

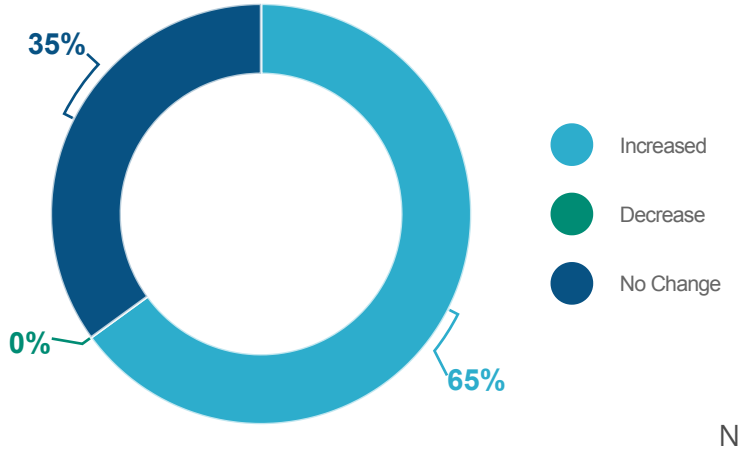
Figure 28



N = 73

Technology Budget Change in Past 2 years

Figure 29



N = 73

IX. Conclusions

Conclusion

- Most emerging technologies are not widely adopted, but Mobile Apps are the most widely adopted. Over four fifths of respondents will be using Mobile Apps within the next 18 months.
- Artificial Intelligence is still in its infancy for EHS&S purposes. Less than one quarter of survey respondents are currently using AI for any purpose.
- Companies who adopt emerging technologies are doing so to reduce their exposure to risk, and to improve decision-making and processes.
- There is no clear consensus on how EHS&S leaders expect emerging technology to impact their departments. In other words, EHS&S leaders are expecting emerging technology to impact their departments in a large variety of ways.
- Investment in software is necessary to begin investing in emerging technology. None of the respondents reported having a budget for emerging technology without a budget for emerging software.
- The amount of capital that companies are investing in emerging technology varies widely, and is influenced by risk, program maturity, industry and revenue.

X. Acknowledgements

Contributors

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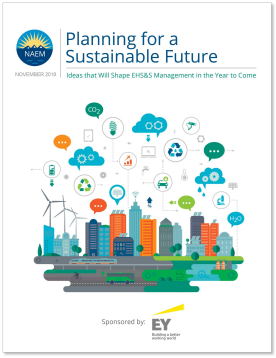

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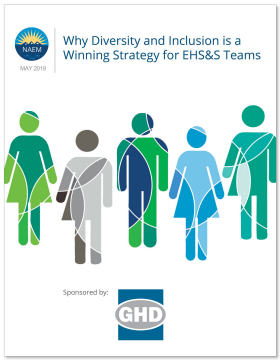

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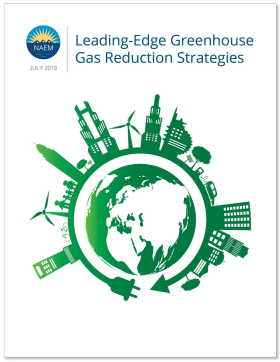

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