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BIG DATA VISIONARIES

2013 IOUG DATA SCIENCE SKILLS SURVEY

By Joseph McKendrick, Research Analyst
Produced by Unisphere Research,
a Division of Information Today, Inc.
February 2013

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EXECUTIVE SUMMARY

Thomas Davenport, co-author of the watershed book *Competing on Analytics* and visiting professor at Harvard University, has famously referred to the role of the data scientist to be the "sexiest job of the 21st century." And it's no wonder—data scientists are being cast as the visionaries who will help guide their organizations into the future, by scooping up information from all corners of the enterprise and beyond, and figuring out ways to make that data tell compelling stories.

However, many of the managers and professionals who will be tasked with this exciting new role—or, in some cases, already performing such magic with data—aren't necessarily going to have the title of "data scientist" in their job descriptions. Rather, these individuals—whose backgrounds include IT and programming; math and statistics; and a willingness to look at things differently—already work within today's organizations, as database administrators, analysts, managers and consultants. Increasingly, the jobs of all these professionals encompass data scientist-style activities—taking raw data sets, and finding ways to extract the nuggets of information of value to the business.

This is the finding of a new survey of 199 data managers and professionals who are part of the Independent Oracle Users Group. The survey was conducted by Unisphere Research, a division of Information Today, Inc. Interestingly, while the survey finds 12% of respondents already consider themselves to be data scientists, only one respondent actually had the formal title. It's also notable that the vast majority of respondents cannot be solely categorized in one type of occupation or another. Most employ database administration skills in their daily jobs, but they are also are involved in various aspects of data architecture, application development and integration, building analytics capabilities, and business consulting.

Key highlights and findings from the survey, which explores the various roles data managers and professionals are assuming, include the following:

- Most data professionals are already assuming skills and day-to-day responsibilities that tend to be associated with data scientists' or analysts' roles—such as the ability to identify and surface data that is important to the business. Database administrators are less likely than other technology professionals or managers to be adopting data scientist roles. Still, up to a third indicate there either already is someone with the title data scientist within their organization, or that there soon will be.
- While today's data professionals spend most of their time managing and securing databases, a large segment expect to be concentrating on business intelligence and data modeling in the near future.
- Database administration is an essential task that will not disappear any time soon. Almost all survey respondents indicate they have at least some basic database administration tasks as part of their jobs.
- A majority of today's data professionals are engaged in actively working with the business and IT to develop data strategies and policies.
- A majority of respondents report that their jobs increasingly call for the ability to employ data to help in business decision-making, and even to "tell a story" with the data.
- Most data managers and professionals report they are directly involved in business consulting—providing advice and guidance to the business. This may consist of tactical, operational advice, or more strategic planning.

Respondents in the survey have a range of job titles, including that of database administrator (37%), CIO or vice president of IT (19%), data, business intelligence, or data warehouse architects (7%), and IT consultants or systems integrators (7%). (See Figure 3 in the next section for a detailed breakout.) Respondents also represent a range of company sizes and types, including IT services (33%), financial services (11%), education (7%), and healthcare (7%). (See Figures 27 and 28.) On the following pages are the results of this latest exploration of the emerging world of the data scientist.

DATA SCIENTIST/ANALYST SKILLS SOUGHT

Most data professionals are already assuming skills and day-to-day responsibilities that tend to be associated with data scientists' or analysts' roles—such as the ability to identify and surface data that is important to the business. Database administrators are less likely than other technology professionals or managers to be adopting data scientist roles. Still, up to a third indicate there either already is someone with the title data scientist within their organization, or that there soon will be.

The emerging role of the data scientist has created industry buzz. The accepted description of the job duties encompasses a range of skills and activities, from analyzing information from all sources, to gleaning a few precious diamonds of vital information from towering mountains of data. Data scientists need to be able to bring disparate datasets together, as well as apply sophisticated data models to real-world business situations. Such professionals usually require some mix of programming skills and statistics, as well as experience with data warehousing. Perhaps most importantly, they need to be able to communicate their hypotheses and findings clearly to the business.

While many data scientist skills are associated with "big data companies" such as Google or Yahoo, survey respondents—many of whom represent smaller or more mainstream organizations, such as manufacturers or hospitals—also see these requirements emerging within their enterprises.

When asked which skills respondents would seek from a data scientist role, the top-ranked skill cited by respondents was the ability to develop analytic models. Mining data for patterns followed, along with the ability to bridge the gap between IT and business processes, as well as to create and apply analytical algorithms to organizational data. The role of communicating and "telling a story" with the data to the business also is considered a top-ranking skill for the emerging data scientist role. (See Figure 1.)

The developing roles of data scientists closely map to the increasing roles data professionals in all categories play. When asked which skills they see increasing in their own jobs, respondents overwhelmingly said they are increasingly being tasked with communicating or telling a story with the data they present. A majority also indicate they are increasingly working with end users to determine their information requirements. Translating business needs into analytic and reporting requirements is also becoming a greater part of respondents' jobs.

While virtually none of the respondents would go as far as saying that they are have the actual title of data scientist (see Figure 3), they are, for all intents and purposes, fulfilling that role. Only one respondent in the survey referred to his/her job title as that of data scientist. It's, notable, however, that 12% of respondents already consider themselves to be data scientists. In addition, 13% say their jobs will be moving in this direction over the next one to two years, while 25% say they eventually will be taking on data scientist roles. (See Figure 4.)

Respondents in DBA roles are far less likely than other data professionals to see themselves as moving into data scientist capacities. Only 9% of DBAs see being a data scientist on their immediate horizon, the survey shows. By contrast, 39% of respondents in other technical positions (programmers, developers, systems analysts, systems administrator, IT consultants) see themselves as moving into data scientist roles. In addition, 35% of IT managers also see themselves as data scientists now or in the immediate future. (See Figure 5.)

Likewise, close to half, 46%, agree that their job roles—as well as those of their team—are evolving closer to the skills associated with those of data scientists. (See Figure 6.) Again, DBAs are far less likely to see this change happening in their own situations. Only 31% of DBAs see their roles and departments evolving in this direction, compared to 57% of other technical professionals and 60% of managers. (See Figure 7.)

Not surprisingly, a majority say current BI and analytics professionals are best suited to the data scientist role. A substantial percentage (38%), however, also urge organizations to look to their current databases staffs. (See Figure 8.)

How essential would the position of data scientist (or data analyst with comparable skills) be to respondents' organizations? A majority of respondents, 61%, say such skills are "somewhat" to "very" essential. (See Figure 9.) This varies by job role, however. About 44% of DBAs agree that data scientist skills are somewhat to very important to their organizations, contrasted with 69% of other technical professionals, and 72% of IT managers. (See Figure 10)

About a third, 32%, report there is already someone with the title of "data scientist" (or data analyst with comparable skills) within their organization, or will be before the year is out. (See Figure 11.)

Among companies planning to hire data scientists, 5% say they will have four or more within the year, a percentage that will expand to 10% within five years. For the most part, a majority are unsure of their organizations' future plans for data scientist hiring, which may reflect the emergence of many of these skills in-house. (See Figure 12.)

Figure 1: Top Skills Sought for Data Scientist Roles

(As selected by respondents)

1. *Develop analytic models*
2. *Mine data for patterns*
3. *Bridge the gap between IT and business processes*
4. *Create and apply analytical algorithms*
5. *Communicate/"tell a story" with data*
6. *Filter and organize data*

Figure 2: Top Activities Increasing as Part of Respondents' Jobs

(Figures based on responses from multiple questions.)

1. *Communicate/"tell a story" with data*
2. *Work with end users to determine information requirements in new or modified systems*
3. *Translate business needs into analytic and reporting requirements*
4. *Maintain or participate in cross-functional teams or data center of excellence*
5. *Oversee or guide enterprise application integration*
6. *Filter and organize data*
7. *Manage data storage/retrieval*
8. *Design procedures for the solutions of business problems*
9. *Enable forecasting and prediction*
10. *Oversee or advise on systems design and analysis*
11. *Mine data for patterns*
12. *Capacity planning*
13. *Develop analytic models*
14. *Run and analyze test applications or algorithms*
15. *Apply or create advanced algorithms*

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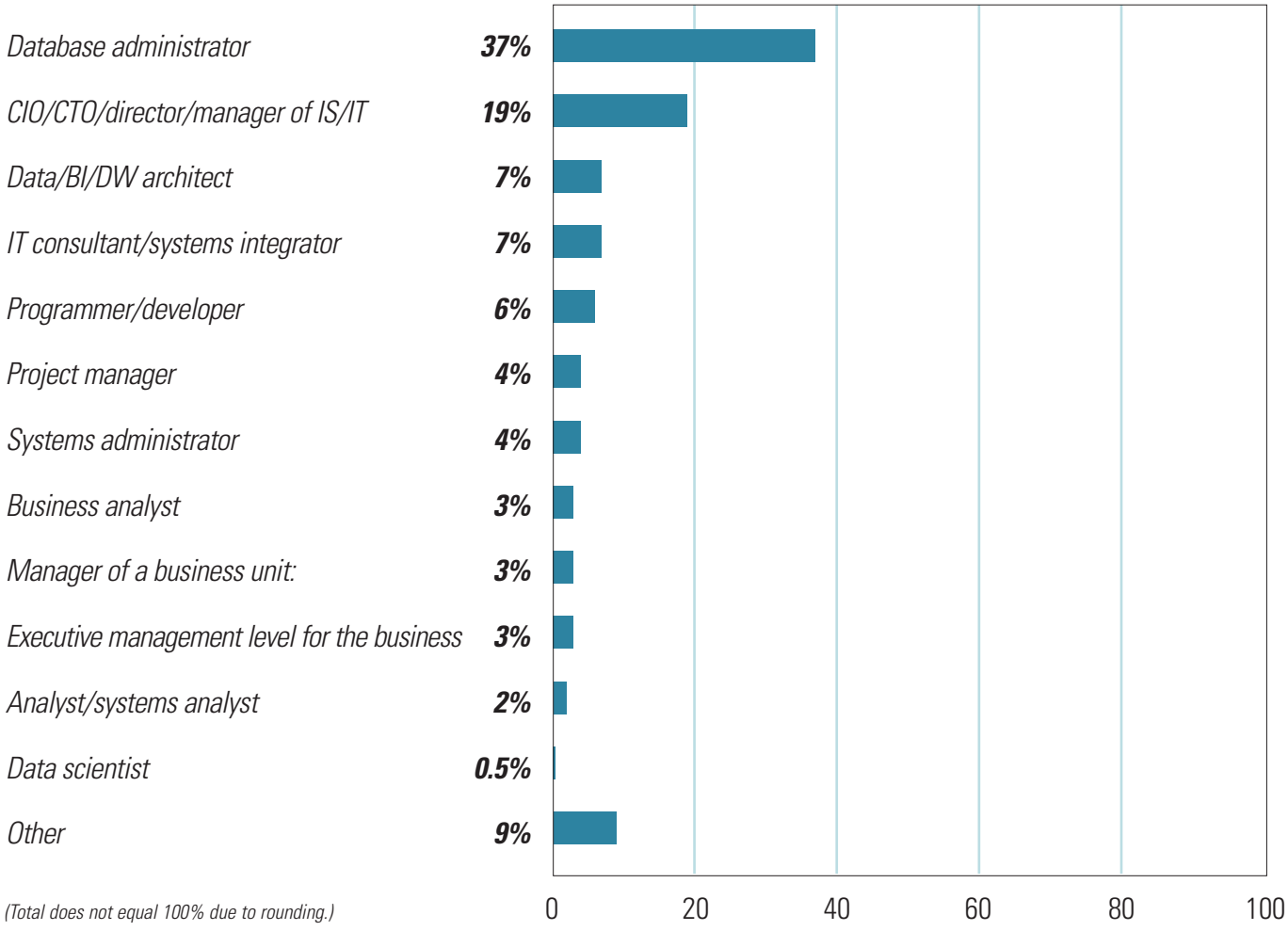
Figure 3: Respondents' Primary Job Titles



(Total does not equal 100% due to rounding.)

Figure 4: Do You Aspire To Be A Data Scientist/Analyst in Your Career?

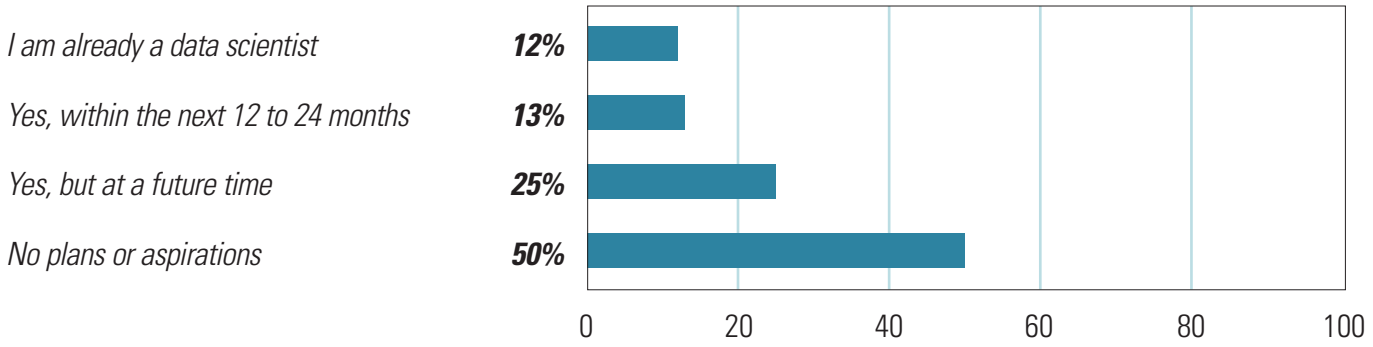


Figure 5: Data Scientist/Analyst Aspirations—By Job Roles

	DBAs	Managers	Other technical*
I am already a data scientist	2%	25%	13%
Yes, within the next 12 to 24 months	7%	10%	26%
Yes, but at a future time	37%	15%	19%
No plans or aspirations	54%	50%	42%

*Programmers, developers, systems analysts, systems administrator, IT consultants

Figure 6: See Job Role (or Team Members' Job Roles) Evolving to Data Scientist Roles?

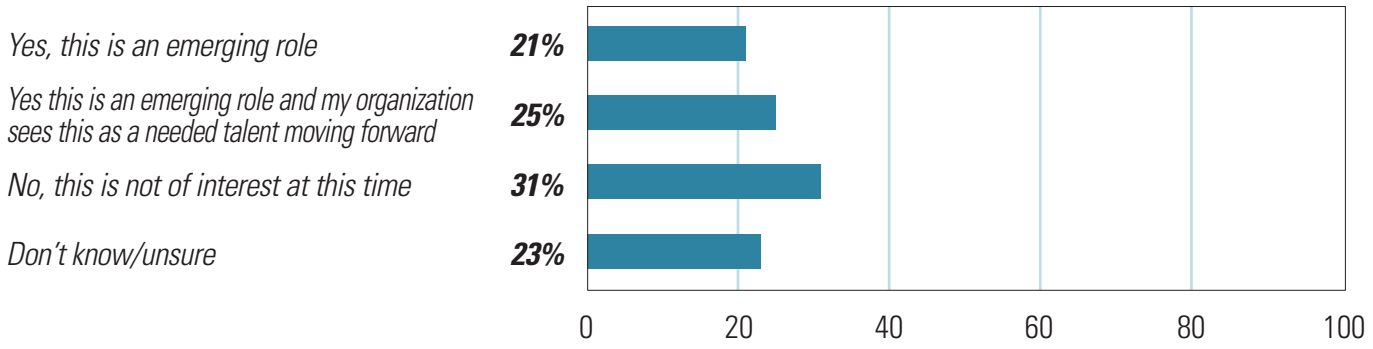
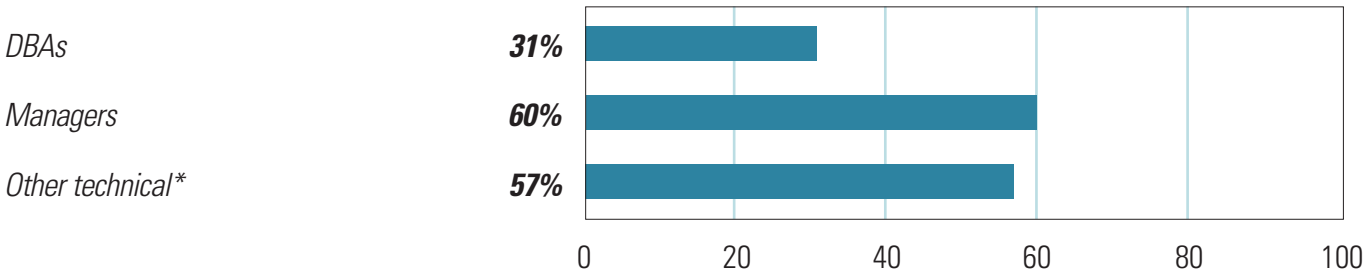
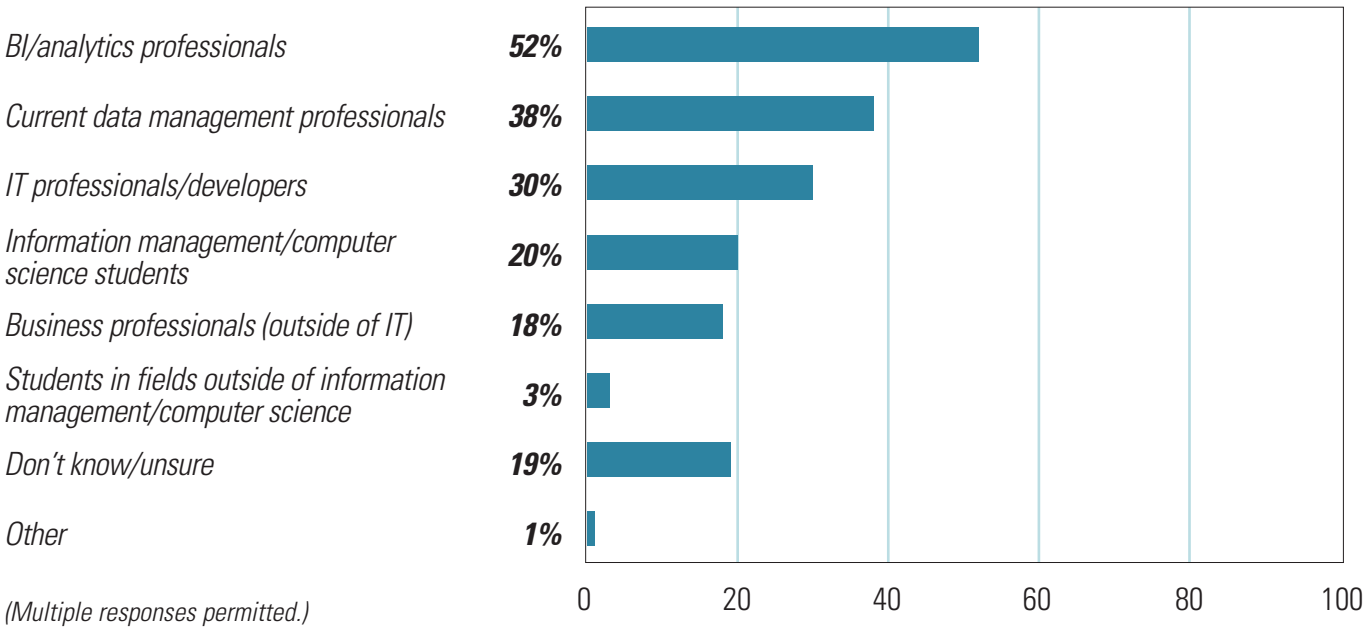


Figure 7: Roles Evolving to Data Scientist—By Current Job Roles



*Programmers, developers, systems analysts, systems administrator, IT consultants

Figure 8: Best Sources for Data Scientist Skills



(Multiple responses permitted.)

Figure 9: Importance of Data Scientist/Analyst Roles to Organizations

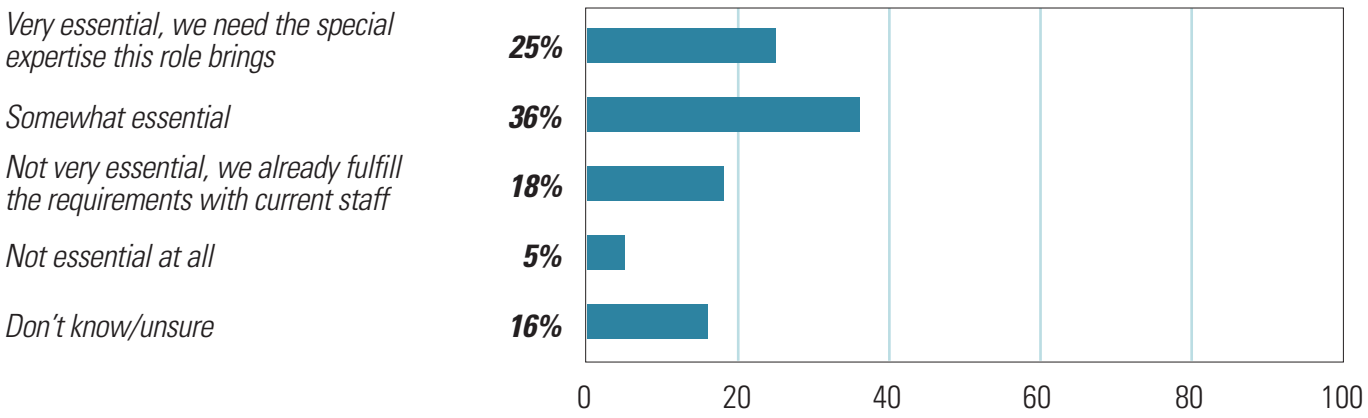
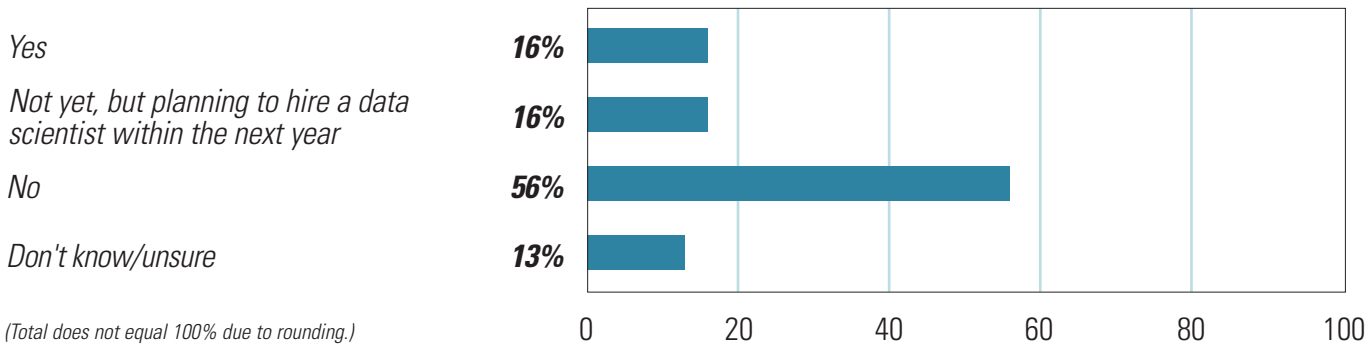


Figure 10: Importance of Data Scientist/Analyst Roles to Organizations—By Job Roles

	DBAs	Managers	Other technical*
Very essential, we need the special expertise this role brings	**14%**	**29%**	**28%**
Somewhat essential	**31%**	**43%**	**41%**
Not very essential, we already fulfill the requirements with current staff	**21%**	**19%**	**19%**
Not essential at all	**7%**	**5%**	**6%**
Don't know/unsure	**26%**	**5%**	**6%**

**Programmers, developers, systems analysts, systems administrator, IT consultants*

Figure 11: Anyone With the Title "Data Scientist" (or Data Analyst with Comparable Skills) on Staff?



(Total does not equal 100% due to rounding.)

Figure 12: Planned Number of Data Scientists on Staff

(Among organizations that have or are planning to soon hire data scientists.)

	Within 1 year	Next 3-5 years
1	15%	5%
2	10%	12%
3	6%	13%
4	0%	2%
5 or more	5%	8%
Don't know/unsure	63%	60%

(Total does not equal 100% due to rounding.)

SHIFTING PRIORITIES

While today's data professionals spend most of their time managing and securing databases, a large segment expect to be concentrating on business intelligence and data modeling in the near future.

The bulk of respondents' job duties are in the database administration areas, with 41% indicating more than half of their work weeks are in this area. About one out of 10 says they spend most of their time in application development and administration. (See Figure 13)

Looking out over the next five years, about half say they expect to increase the amount of time they spend in database administration activities. Two-fifths say they will be devoting more of their time to business intelligence and analytics, and a similar number expect to be doing more in data modeling and architecture. (See Figure 14.)

Overall, 38% report they work directly with executive management "much" or "all of the time" in their organizations. This varies by job title, and not surprisingly is lower for database administrators—20% of whom report frequent contact with management. About 37% of other technical respondents have frequent interaction with their executive managers, and—perhaps not surprisingly—53% of IT managers have regular contact with their organizations' leaders. (See Figure 15.)

Overall, 45% expect to see greater interaction with their organizations' executive management over the next five years. About one-third of DBAs also expect to be spending more time with management. A majority of other technical professionals, as well as IT managers, anticipate more frequent interaction with business leaders. (See Figure 16.)

On the following pages are detailed findings on the various activities and skills within each of these five major categories.

Figure 13: Percentage of Time Per Week Spent on Key Data Management Areas

	None	1%-10%	11%-25%	26%-50%	>50%	Unknown
Database administration	4%	15%	17%	19%	41%	4%
App development/integration	21%	35%	21%	10%	9%	4%
Business consulting	26%	38%	18%	7%	7%	5%
BI/analytics	32%	33%	17%	7%	6%	5%
Data modeling/architecture	15%	43%	21%	13%	5%	3%

(Figures based on responses from multiple questions.)

Figure 14: Change in Amount of Time Spent in Key Data Management Areas Over Next Five Years

	Increase	Remain same	Decrease	NA	Unknown
Database administration	51%	24%	7%	3%	15%
BI/analytics	39%	31%	2%	1%	28%
Data modeling/architecture	38%	36%	5%	6%	15%
Business consulting	37%	32%	2%	1%	29%
App development/integration	28%	39%	5%	11%	17%

(Figures based on responses from multiple questions.)

Figure 15: Frequency of Working Directly with Executive Management

	ALL	DBAs	Managers	Other technical*
All the time	15%	10%	29%	9%
Much of the time	23%	10%	24%	28%
Occasionally	46%	57%	43%	41%
Not at all	15%	24%	5%	22%

*Programmers, developers, systems analysts, systems administrator, IT consultants

(Totals do not equal 100% due to rounding.)

Figure 16: How Direct Interaction With Executive Management Will Change Over Next Five Years

	ALL	DBAs	Managers	Other technical*
Increase	45%	31%	52%	53%
Remain about the same	34%	40%	33%	22%
Decrease	3%	0%	5%	3%
Don't know/unsure	18%	29%	10%	22%

*Programmers, developers, systems analysts, systems administrator, IT consultants

SKILL AREAS

DATABASE ADMINISTRATION

Database administration is an essential task that will not disappear any time soon. Almost all survey respondents indicate they have at least some basic database administration tasks as part of their jobs.

Database administration is an area that encompasses all the necessary functions for creating and maintaining databases. As defined in the U.S. Department of Labor Bureau of labor Statistics' Occupational Outlook Handbook, DBAs "use software to store and organize data, such as financial information and customer shipping records. They make sure that data are available to users and are secure from unauthorized access." Duties include identifying user needs to create and administer databases; ensure that the database operates efficiently and without error; making and testing modifications to the database structure when needed; maintaining the database and update permissions; and backing and restoring data to prevent data loss.

In this survey, a total of 92% indicated that at least one of the skills listed here are part of their day-to-day routines. The following charts show the database administration skills—advanced (Figure 17) and basic activities (Figure 18)—that are now part of respondents' jobs, and the extent to whether those activities are increasing, are on the wane, or are remaining steady. Respondents say they are getting more involved with managing data storage and retrieval; developing database utilities and automated reporting; monitoring systems and platform availability; overseeing backup, clustering, mirroring, replication and failover; and diagnosing performance issues.

There's less activity involving the creation of management of data management languages; and designing and delivering ETL processes.

Among respondents identifying themselves as DBAs in their formal job titles, systems monitoring, performance diagnosis, and backup and mirroring are the daily activities most on the rise. (See Figure 19.)

Figure 17: Changes in Advanced Database Administration Activities

	Increasing	Decreasing	Remaining the same
Develop database utilities and automated reporting	58%	12%	30%
Monitor system and platform availability	58%	9%	33%
Oversee backup, clustering, mirroring, replication and failover	57%	11%	33%
Build database schema, tables, procedures and permissions	51%	8%	40%
Design data warehousing and business intelligence platform	49%	10%	41%
Set up data sharing and disk partitioning	48%	15%	37%
Oversee data fraud, abuse, risk and security	48%	11%	41%
Create, test and execute data management languages	24%	21%	54%
Select and provision cloud resources	39%	16%	45%
Build and deploy Hadoop/MapReduce or other Big Data frameworks	32%	20%	49%
Other	24%	14%	61%

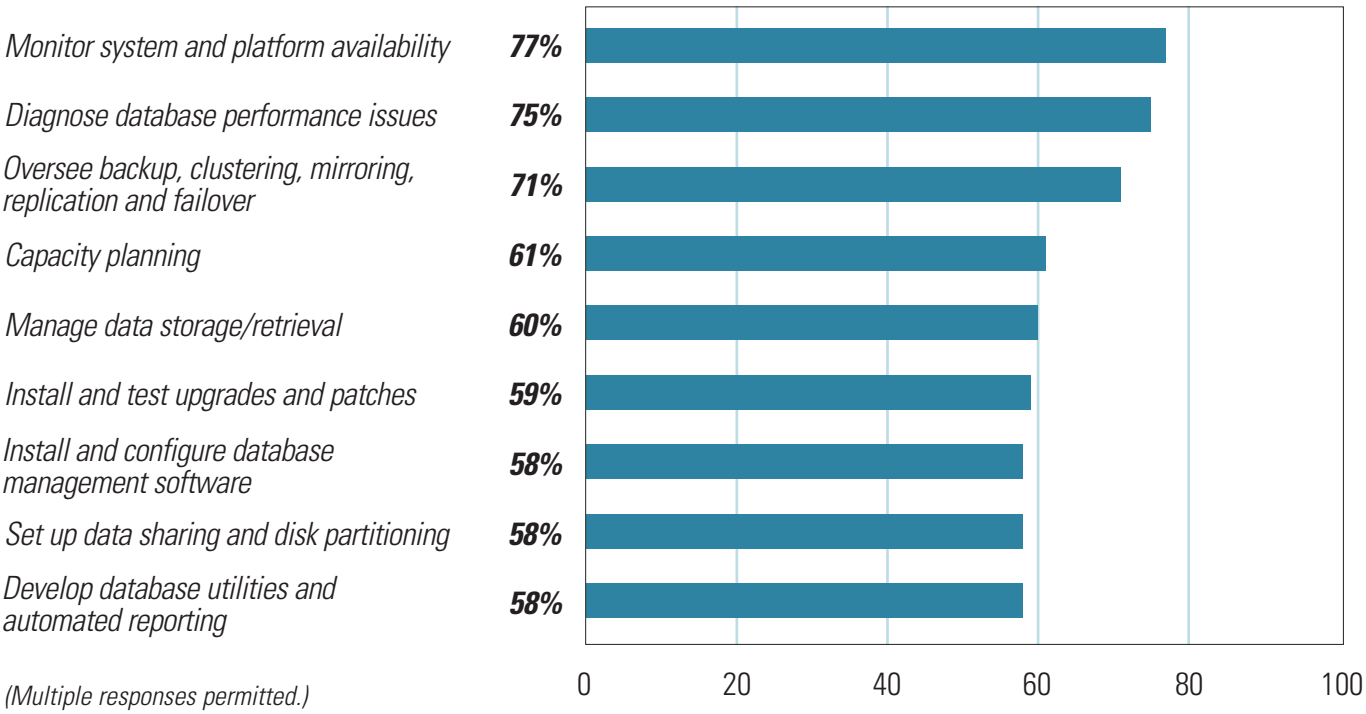
(Multiple responses permitted.)

Figure 18: Changes in Basic Database Administration Activities

	Increasing	Decreasing	Remaining the same
Manage data storage/retrieval	59%	5%	37%
Diagnose database performance issues	57%	9%	34%
Capacity planning	55%	9%	35%
Manage data collection	55%	4%	42%
Oversee data manipulation/exploration/cleaning	52%	7%	42%
Create and implement reporting applications	44%	15%	42%
Install and test upgrades and patches	44%	14%	43%
Install and configure database management software	40%	15%	45%
Design and implement data loading (ETL) processes	40%	17%	43%
Manage user access and privileges	39%	12%	48%
Other	23%	9%	68%

(Multiple responses permitted.)

Figure 19: Rising Activities—DBA Only



(Multiple responses permitted.)

DATA MODELING AND ARCHITECTURE

A majority of today's data professionals are engaged in actively working with the business and IT to develop data strategies and policies.

A data architect (or data modeler) is responsible for designing and promoting a data model and architecture that helps the organization fulfill its strategic goals. The data architecture encompasses databases, data integration and data access. Data architects identify standards, set policies, and develop and maintain a formal description of data and data structures, including metadata—data definitions, data models, and data flow diagrams. Data architects also oversee Master Data Management solutions.

A total of 80% respondents indicate that at least one of the data architecture and modeling skills listed here are part of their day-to-day routines. The following chart shows the data modeling and architecture skills that are now part of respondents' jobs. Respondents were asked to indicate whether the listed activities are increasing, are on the wane, or are remaining steady.(See Figure 20.)

Skills more in demand include translating business needs into analytic and reporting requirements; maintaining or participating in cross-functional teams or data center of excellence; supporting business process enablement; designing and documenting database architecture; and working with end users and clients to plan and design systems.

Figure 20: Changes in Data Modeling and Architecture Activities

	Increasing	Decreasing	Remaining the same
Translate business needs into analytic and reporting requirements	63%	10%	27%
Maintain or participate in cross-functional teams or data center of excellence	61%	5%	33%
Support business process enablement	61%	5%	35%
Design and document database architecture	58%	6%	36%
Work with end users and clients to plan and design systems	59%	7%	33%
Filter and organize data	53%	12%	35%
Develop analytic models	47%	12%	41%
Parse datasets	39%	14%	47%
Identifying and specifying cloud resources	42%	16%	42%
Design and build data models	43%	16%	41%
Data modeling and architecture not part of my job at this time	29%	15%	56%
Other	24%	12%	64%

(Multiple responses permitted.)

DATA APPLICATION DEVELOPMENT AND INTEGRATION

Today's data professionals are actively engaged in building the applications that will run on top of the databases they oversee.

Application developers are tasked with designing, creating and testing the programs that make organizations run. The U.S. Department of Labor's Bureau of Labor Statistics Occupational Outlook Handbook describes a developer's duties as "analyzing users' needs, then design, test, and develop software to meet those needs; recommending software upgrades for customers' existing programs and systems; designing each piece of the application or system and plan how the pieces will work together; and creating flowcharts and other models that instruct programmers how to write the software's code."

A total of 75% of respondents indicated that at least one of the application development and integration skills listed is part of their day-to-day routines. The following charts show the data application development and integration skills—advanced (Figure 21) and basic activities (Figure 22)—that are either increasing, decreasing, or remaining the same as part of respondents' jobs.

Areas seeing increases in respondents' jobs are activities that require close engagement with business users, including working with end users to determine information requirements in new or modified systems, overseeing or guiding enterprise application integration, designing procedures for the solutions of business problems, and helping to design enterprise architecture.

Figure 21: Changes in Advanced Data Application Development and Integration Activities

	Increasing	Decreasing	Remaining the same
Work with end users to determine information requirements in new or modified systems	65%	4%	31%
Oversee or guide enterprise application integration	60%	8%	31%
Design procedures for the solutions of business problems	58%	6%	36%
Help design enterprise architecture	57%	9%	34%
Formulate statements of business problems	54%	8%	37%
Select vendors	52%	11%	37%
Select and provision cloud resources	46%	8%	46%
Application development and integration are not part of my job at this time	28%	14%	58%
Other	17%	14%	69%

(Multiple responses permitted.)

Figure 22: Changes in Basic Data Application Development and Integration Activities

	Increasing	Decreasing	Remaining the same
Design processes for solving specific business problems	55%	6%	40%
Design and suggest changes in application systems	53%	11%	37%
Write scripts	48%	15%	36%
Recommend specific applications	46%	14%	40%
Develop efficiency in the design and maintenance of database resources	46%	11%	43%
Manage testing/quality assurance	45%	9%	47%
Prepare charts and diagrams and develop documentation	45%	10%	44%
Selecting alternative security technologies	44%	9%	47%
Oversee or conduct programming/application development	41%	13%	46%
Prepare test cases and reviews test results	42%	16%	42%
Develop applications and environments	41%	19%	40%
Prepare logic flow charts, codes and specifications	34%	18%	48%
Select languages and protocols	28%	22%	49%
Other	21%	15%	64%

(Multiple responses permitted.)

BUSINESS INTELLIGENCE AND ANALYTICS

A majority of respondents report that their jobs increasingly call for the ability to employ data to help in business decision-making, and even to "tell a story" with the data.

Professionals involved in business intelligence and analytics are charged with generating financial, market, and operational insights from corporate data. They specialize in integrating and filtering data sources to identify patterns and trends within markets, customer segments, sales channels and internal operations. They collect data not only from internal enterprise data stores, but from outside sources as well.

A total of 63% of respondents say they employ one or more of the BI and analytics activities listed below as part of their day-to-day routines. The following charts show the BI and analytics skills—high-level (Figure 23) and basic (Figure 24)—that are now part of respondents' jobs. Respondents were asked to define the extent to whether the listed activities are increasing, are on the wane, or are remaining steady as part of their routines.

Activities on the rise as part of respondents' jobs include supporting data analysis and helping business users make data-driven business decisions, communicating or telling a story with data, enabling forecasting and prediction, translating business needs into analytic and reporting requirements, and filtering and organizing data, and mining data for patterns.

Figure 23: Changes in High-Level Business Intelligence and Analytics

	Increasing	Decreasing	Remaining the same
Support data analysis/making data-driven business decisions	59%	7%	34%
Communicate/"tell a story" with data	58%	6%	37%
Enable forecasting and prediction	58%	9%	33%
Develop analytic models	54%	9%	38%
Enable data visualization	53%	10%	37%
Identifying and deploying cloud resources	53%	11%	35%
Deliver presentations to senior management	46%	16%	39%
Apply or create advanced algorithms	37%	19%	44%
Other	15%	18%	68%

(Multiple responses permitted.)

Figure 24: Changes in Basic Business Intelligence and Analytics Activities

	Increasing	Decreasing	Remaining the same
Translate business needs into analytic and reporting requirements	62%	12%	26%
Filter and organize data	59%	5%	35%
Mine data for patterns	56%	11%	33%
Design and build data models	56%	14%	31%
Acquire and manage new data sets	54%	6%	40%
Troubleshoot or performance-tune BI tools, systems, and software	50%	7%	43%
Run and analyze test applications or algorithms	49%	15%	36%
Design and implement data loading (ETL) processes	51%	16%	33%
Design and implement reporting applications	49%	14%	36%
Test and document BI systems and applications	44%	12%	44%
Build and deploy Hadoop/MapReduce or other Big Data frameworks	41%	17%	41%
Business intelligence and analytics are not part of my job at this time	26%	16%	59%
Other	26%	21%	53%

(Multiple responses permitted.)

BUSINESS CONSULTING

Most data managers and professionals report they are directly involved in business consulting—providing advice and guidance to the business. This may consist of tactical, operational advice, or more strategic planning.

A total of 69% indicated that at least one of the skills listed here are part of their day-to-day routines. The following charts show the business consulting activities—high-level (Figure 25) and basic (Figure 26)– that are now part of respondents' jobs. Respondents were asked whether these activities are increasing, are on the wane, or are remaining steady.

Leading skills on the increase among respondents in this category include the ability to communicate business value with data, overseeing project scheduling, delivering presentations to senior management, and overseeing systems design and analysis from a business perspective.

Figure 25: Changes in High-Level Business Consulting Activities

	Increasing	Decreasing	Remaining the same
Deliver presentations to senior management	57%	9%	34%
Oversee or advise on systems design and analysis	57%	8%	35%
Enable forecasting and prediction	54%	10%	36%
Create or advise on budgets	46%	10%	44%
Plan or approve IT equipment and software purchases	43%	11%	46%
Hire employees and contractors	42%	13%	45%
Approve or advise on outsourcing arrangements	33%	14%	53%
Other	25%	19%	56%

(Multiple responses permitted.)

Figure 26: Changes in Basic Business Consulting Activities

	Increasing	Decreasing	Remaining the same
Communicate/"tell a story" with data	67%	4%	30%
Support or assist with project scheduling	54%	7%	38%
Capacity planning	51%	15%	34%
Make decisions on standards and protocols	51%	9%	39%
Train and develop end users/IT staff	50%	6%	44%
Select and provision cloud resources	42%	7%	51%
Synthesis and model building	41%	9%	50%
Other	8%	20%	57%

(Multiple responses permitted.)

DEMOGRAPHICS

Figure 27: Respondents' Organization Size—By Number of Employees

(Among organizations that have or are planning to soon hire data scientists.)

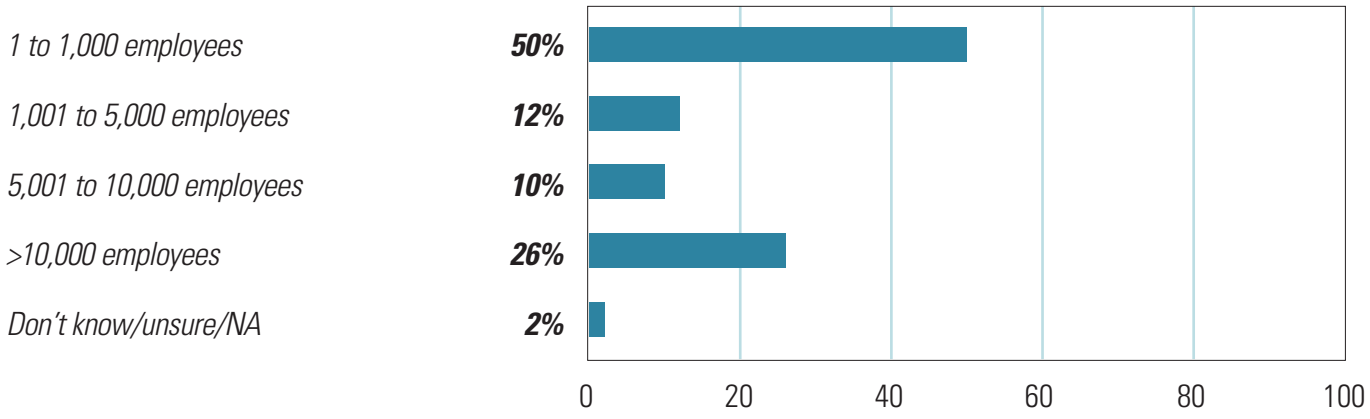
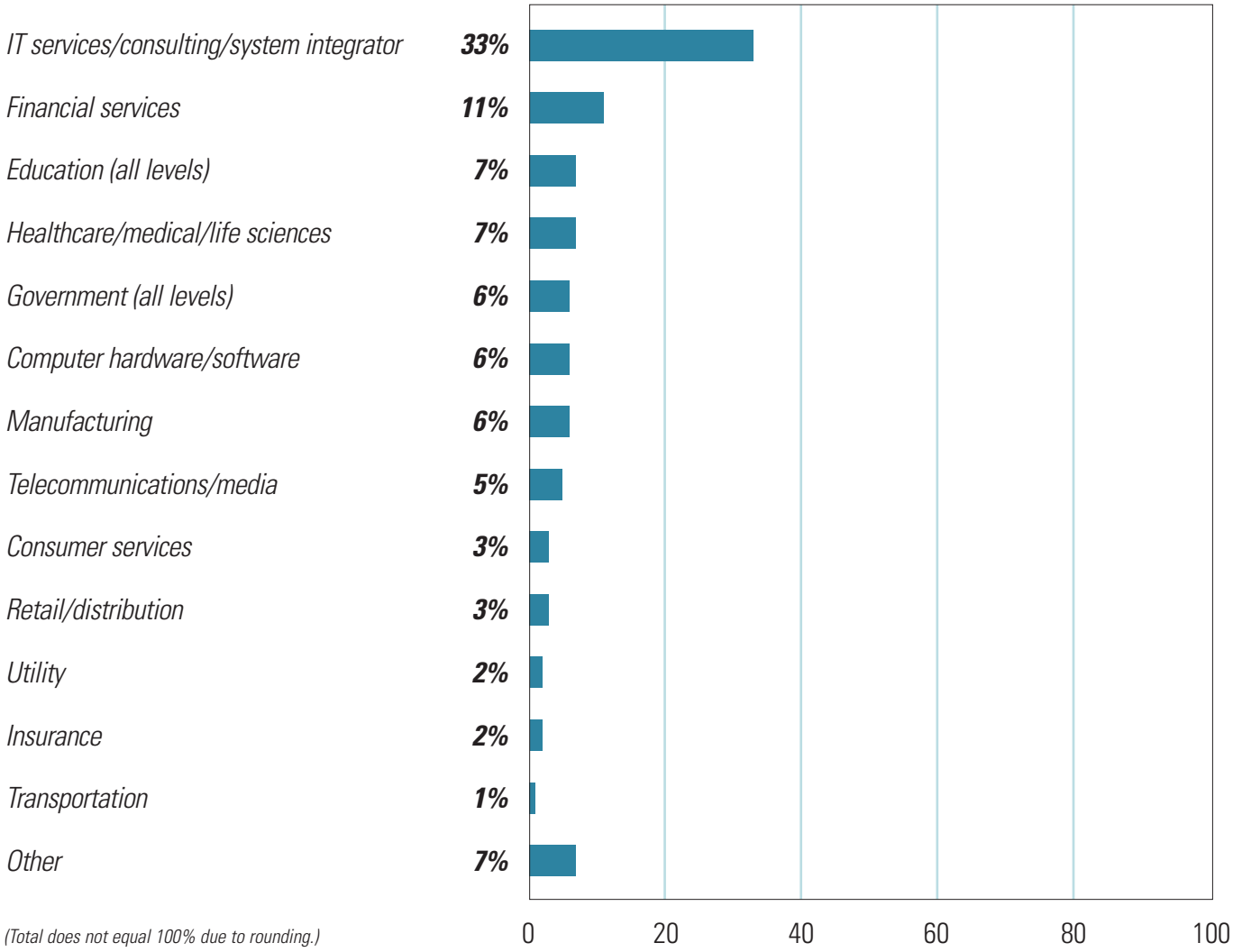


Figure 28: Respondents' Primary Industries



(Total does not equal 100% due to rounding.)

IOUG RECOMMENDS

The results of this survey indicate that many data professionals—including database administrators and IT managers—see their roles evolving closely to that of data scientist. Bringing data scientist skills into organizations doesn't require hiring of individuals under the formal title of data scientists—many of these skills already exist, or are evolving within today's enterprises. Data managers and professionals are increasingly adopting or orienting themselves toward serving in data scientist roles.

Here are measures IOUG recommends that organizations take to foster professional growth:

Build upon the skills base that is already established within data management departments. Most organizations have long had database administrators and analysts on staff, with institutional knowledge and capabilities to tackle emerging Big Data opportunities. Existing staff is often more than capable of extending, enhancing, and augmenting their skills, to manage and mine new data types.

Promote and reward more "scientific" approaches to data management and analysis. Data managers and professionals need to adopt scientific approaches and principles to data analytics, which features randomized testing and experimentation.

Recognize that Big Data is important to the future of the organization, and be willing to fund efforts to mine this abundant new source of information. The growth of structured, semi-structured and unstructured data types both surging into and being stored with organizations offers significant opportunities to expand innovation, customer service, and insightful decision-making. Data managers and professionals need to work closely with business leaders to help them understand how to realize these opportunities.

Design and offer training and continuing education to master Big Data. Educational organizations such as the IOUG offertraining to develop data scientist skills, and will be featuring structured learning opportunities and more than 50 sessions dedicated **Big Data** and **Business Intelligence** at **COLLABORATE 13–IOUG Forum**. Data professionals with experience managing data environments may acquire the data science capabilities organizations are seeking through the networking, peer-to-peer sharing and technical expertise available through user group engagement.

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