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Foote Research Group

FOR IMMEDIATE RELEASE

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Average market value for 554 non-certified tech skills remained unchanged from January to April while pay for 472 tech certifications <u>declined</u> for the third consecutive calendar quarter.

Still, 229 tech skills and certifications changed value in the period, with 123 losing cash value against gains for 106

The struggle to reshape company workforces to capitalize on disruptive technologies continues but progress is being made

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NOTE: This news release is a summary extract of content in the latest quarterly update of Foote Partners' *Tech Skills Demand and Pay Trends Report*, a market intelligence trend report updated every 3 months from data contributed by 3,318 U.S. and Canadian employers. It contains tech jobs and skills compensation published in the firm's *IT Professional Salary Survey* and *IT Skills and Certifications Pay Index™* and deep-dive supply/demand benchmark research from Foote Partners field interviews.

Vero Beach, FL – June 15, 2019 - Extra pay awarded by employers to talented tech professionals for **554 non-certified tech skills** ---also known as skills pay premiums---remained unchanged in the first quarter of 2019 despite 152 skills changing market value during this period. Currently averaging the equivalent of **9.4 percent of base salary on average for a single non-certified skill,** this pay is now near its 19-year high. Conversely, average market values for **479 tech certifications** decreased, down 1.2 percent overall, currently earning the equivalent of **7.4 percent of base salary on average for a single certification.** That's close to the lowest average pay premium in 5 years.

This according to the latest quarterly update of Foote Partners' *IT Skills and Certifications Pay Index™* (ITSCPI) based on compensation data provided by 3,318 private and public-sector employers in 83 U.S. and Canadian cities who partner with the firm to report pay for their 300,618 technology professionals in the U.S. and Canada.

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Since its launch in 1999, the *IT Skills and Certifications Pay Index*^{TM} has continuously tracked cash pay premiums paid to tech professionals by their employers for an ever-increasing number of popular tech skills and certifications. Rigorously validated data and detailed market analyses are updated and published by Foote Partners every 90 days. Currently, premiums are reported for 1,033 certifications and non-certified skills.

**Pay Performance, 3/12/24/24/36 months
Certified vs. Non-certified Tech Skills**
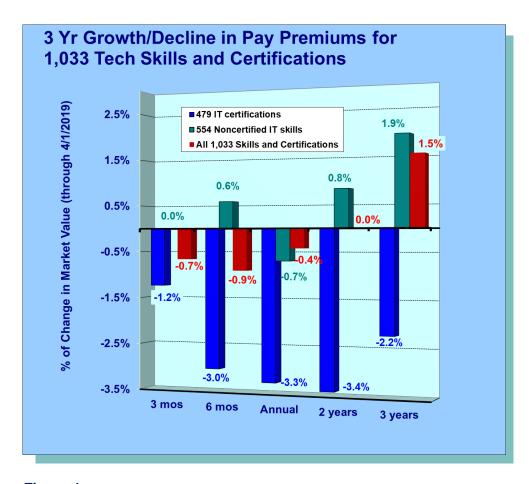
(77,915 IT professionals, data through 4/1/2019)

3 Yr Growth/Decline in Pay Premiums for 1,033 Tech Skills and Certifications

Legend:
- 479 IT certifications
- 554 Noncertified IT skills
- All 1,033 Skills and Certifications

Y-axis: % of Change in Market Value (through 4/1/2019)

X-axis categories: 3 mos, 6 mos, Annual, 2 years, 3 years

Data values:
- 3 mos: -1.2%, 0.0%, -0.7%
- 6 mos: -3.0%, 0.6%, -0.9%
- Annual: -3.3%, -0.7%, -0.4%
- 2 years: -3.4%, 0.8%, 0.0%
- 3 years: -2.2%, 1.9%, 1.5%

Figure 1

Source: Foote Partners, *IT Skills and Certifications Pay Index*^{TM} (1Q2016 – 1Q2019 editions)

SUMMARY: Quarterly and Annual Results – Through April 1, 2019

A. TECH SKILLS AND CERTIFICATIONS PAY PERFORMANCE: BY CATEGORY

NON-CERTIFIED TECH SKILLS

Though 152 surveyed non-certified tech skills changed market value in the first quarter of 2019, average **c**ash pay premiums for **554 non-certified skills** **actually** remained unchanged overall in the same period. Pay performance in the first quarter of 2019 was higher for three non-certified tech skills categories reported: *Data/Database; Applications Development; and Operating Systems* skills. For the twelve-month period ending April 1 pay was higher across the same categories plus non-certified *Management/ Methodology/Process* skills.

Noncertified Tech Skills - % Growth/Decline
3 months & 12 months

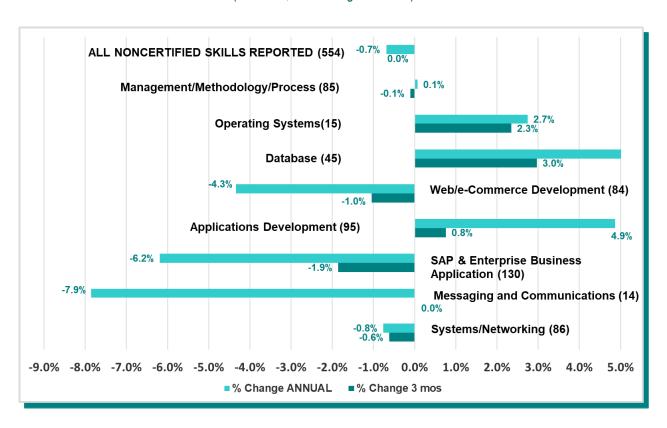### (554 skills, data through 4/1/2019)

Figure 2   Source: Foote Partners *IT Skills & Certifications Pay Index*[TM], 1st Quarter 2019 data

NONCERTIFIED TECH SKILLS TREND HIGHLIGHTS: Largest Market Value Gainers That are Also Highest Paying

These noncertified tech skills *gained 10% or more in market value* in the three months ending April 1, 2019 vs. prior quarter (seen below grouped by segment). Listed in *descending order of amount of % gain and cash pay premium* (including ties). Highest paying skills listed on right **in alphabetical order**. They are averaging pay in a range 15% to 17% equivalent of base salary.

TECH SKILLS (noncertified)			Highest Paying – Cash Premiums(A-Z)
Applications Development skills	**Systems/Networking skills**	**SAP/ERP – cont'd.**	- Amazon RedShift
NetWeaver	Wireless security	SAP Hybris	- Apache Cassandra
MapReduce	CA Endevor	SAP MDM (Master Data Management)	- Apache CouchDB
Scala	HTTPS	SAP HCM (SAP HR)	- Apache Hive
Apache Pig	Cisco UCCX	SAP PSCD (Collection and Disbursement)	- Apache Pig
Progress 4GL/Development tools	Cisco Prime	PeopleSoft (CRM/Financials/HCM)	- Apache Spark
Visual C++		SAP TM (Transportation Management)	- Artificial Intelligence
C++ /CLI	**Web/SOA/E-Commerce skills**	NetWeaver Portal (SAP EP)	- Big Data analytics
Cobol	SailPoint	Siebel/Siebel Analytics	- Blockchain
SQL	Active Server Pages	SAP PS (Project Systems)	- Cloudera Impala
WebSphere MQ (MQSeries)	XAML/XACML	Baan	- Cloudera software
Apache Struts/Struts2	Backbone.js	Oracle Payroll	- Cryptography (encryption, VPN, SSL/TLS, Hybrids)
JIRA	JSON	SAP Fiori	- Cyber Threat Intelligence
PL/SQL	Microsoft Identity Integration Server (MIIS)	SAP LES (Logistics Execution System)	- Data Acquisition and Control Systems
	RESTful	SAP Security	- Data Analytics
	Microsoft Internet Security and Acceleration Server	SAP Smart Forms	- Data Architecture
Database Skills		SAP GTS (Global Trade Services)	- Data Modelling
TIBCO Spotfire		SAP Hybris	- Data Science
Couchbase Server	**SAP/ERP skills**		- DevOps
Oracle Coherence	SAP MDM (Master Data Management)		- Ethereum
Oracle Enterprise Manager	SAP HCM (SAP HR)		- Hbase
Oracle Reports	SAP PSCD (Collection and Disbursement)		- Machine Learning
	PeopleSoft (CRM/Financials/HCM)		- MapReduce
	SAP TM (Transportation Management)		- Master data management
Management, Process &	NetWeaver Portal (SAP EP)		- Metadata design and development
Methodology skills	Siebel/Siebel Analytics		- Microservices
Data Acquisition and Control Systems	SAP PS (Project Systems)		- Oracle Coherence
eDiscovery	Baan		- Oracle Exadata
	Oracle Payroll		- Predictive Analytics and Modeling
	SAP Fiori		- Risk analytics/assessment
OS / Systems Software Skills	SAP LES (Logistics Execution System)		- Risk management
SUSE	SAP Security		- Scala
Solaris	SAP Smart Forms		- Security architecture and models
	SAP GTS (Global Trade Services)	Source: Foote Partners *IT Skills & Certifications Pay Index*™, 1st Quarter 2019 data	- Smart Contract
			- Splunk
			- Sqoop
			- Zachman Framework

NONCERTIFIED TECH SKILLS TREND HIGHLIGHTS: Market Value Losers

These noncertified IT skills *declined 10% or more in market value* in the three months ending April 1, 2019 (grouped by segment).
Listed in *descending order of amount of % decline*, including ties.

TECH SKILLS (Noncertified) Losers

Applications Development skills
Clojure
Epic Systems applications
Java SE/Java EE
Microsoft SQL Server Management Studio (SSMS

Web/E-commerce Development skills
Apache Wicket
Front End Development
Google App Engine
UDDI (Universal Description, Discovery and Integration
ColdFusion/ColdFusion MX
jQuery
PHP (all)
Microsoft Sharepoint/Sharepoint Server
Scalable Vector Graphics (SVG)
Documentum
WebSphere

Management, Process & Methodology
Quantitative Analysis/Regression Analysis
Data Visualization
Prescriptive Analytics
Game Development
Quality management/TQM
TOGAF (Enterprise Architecture)

SAP & Enterprise Business Applications skills
SAP EHS (Environment, Health & Safety)
SAP NetWeaver Visual Composer
SAP Forecasting and Replenishment (SAP F&R)
SAP BOXI (Business Objects XI)
IBM Sterling
SAP Auto-ID Infrastructure (SAP RF)
Software AG WebMethods
Oracle BPM
SAP WM - EWM (Extended Warehouse Management)
Lawson
Pega
Web Dynapro
Oracle Retail
Microsoft Dynamics/Dynamics 365
SAP MM (Materials Management)
Oracle Eloqua
SAP ERP Operations (multi-skills)
SAP GRC (Governance, Risk, and Compliance)
SAP WEBI (BusinessObjects Web Intelligence)
SAP FI - FSCM (Financial Supply Chain Management)
SAP SRM (Supplier Relationship Management)
Salesforce
SAP SD (Sales & Distribution)
Oracle SOA Suite
SAP S/4HANA)

Systems/Networking skills
Storage virtualization/administration
Rackspace Cloud
Mobile device management
Novell Netware
Wireless sensors/RFID
SolarWinds
vCloud
VMware NSX
Network access control/Identity mgt sys.

Data/Database
Oracle Application Server

Source: Foote Partners *IT Skills & Certifications Pay Index™*, 1st Quarter 2019 data

SUMMARY – cont'd.

TECH CERTIFICATIONS

Cash pay for tech certifications is currently near its five-year low. In January/February/March, **479 tech certifications lost even more value**, **down an average of 1.2 percent in the quarter.** Pay performance in the first quarter of 2019 was lower for six certification segments: *Architecture/Project Management/Process; Info/Cyber Security; Systems Admin/Engineering; Networking & Communications; Data/Database; and Applications Development/Programming Languages*. For the twelve-month period ending April 1 pay was also lower in the same categories mentioned above but gained in two: *Web Development* and *Foundation level & Training.*

Tech Certifications - % Growth/Decline
3 months & 12 months

(479 certifications, data through 4/1/2019)

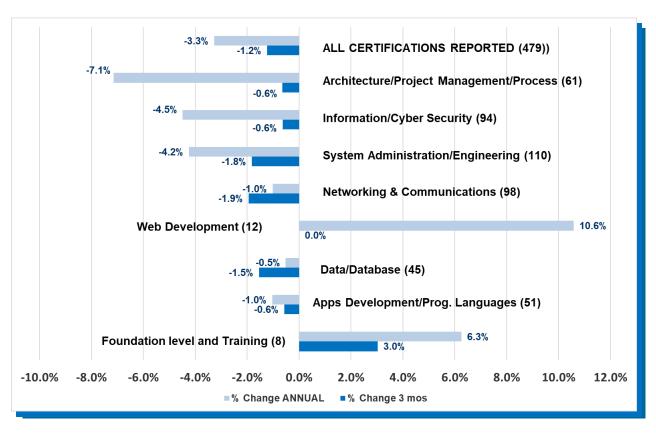|	% Change ANNUAL	% Change 3 mos
ALL CERTIFICATIONS REPORTED (479))	-3.3%	-1.2%
Architecture/Project Management/Process (61)	-7.1%	-0.6%
Information/Cyber Security (94)	-4.5%	-0.6%
System Administration/Engineering (110)	-4.2%	-1.8%
Networking & Communications (98)	-1.0%	-1.9%
Web Development (12)	10.6%	0.0%
Data/Database (45)	-0.5%	-1.5%
Apps Development/Prog. Languages (51)	-1.0%	-0.6%
Foundation level and Training (8)	6.3%	3.0%

Figure 3

Source: Foote Partners *IT Skills & Certifications Pay Index™*, 1st Quarter 2019 data

TECH CERTIFICATION PAY TREND HIGHLIGHTS: Largest Market Value Gainers That are Also Highest Paying

These tech certifications *gained 10% or more in market value* in the three months ending April 1, 2019 (seen below grouped by segment). Listed in ***descending order of amount of % gain in cash pay premium*** (including ties). Highest paying skills listed on right **in alphabetical order.** They are averaging pay in a range 13% to 17% equivalent of base salary.

TECH CERTIFICATION Gainers		Highest Paying – Cash Premiums(A – Z)
Info/Cyber Security certifications GIAC Certified Intrusion Analyst (GCIA) GIAC Certified Forensics Analyst (GCFA) InfoSys Security Management Professional (ISSMP/CISSP) Certified Secure Software Lifecycle Professional (CSSLP) GIAC Information Security Professional (GISP) GIAC Exploit Researcher and Advanced Penetration Tester (GXPN) EC-Council Certified Incident Handler (ECIH) GIAC Enterprise Defender (GCED) GIAC Certified Forensics Examiner (GCFE) CompTIA Advanced Security Practitioner (CASP) **Database certifications** EMC Data Science Associate Teradata 14 Certified Associate Teradata 14 Certified Database Administrator Teradata 14 Certified Professional Teradata 14 Certified Solutions Developer	**Networking and Communications certifications** Cisco Certified Design Associate (CCDA) Cisco Certified Design Expert (CCDE) Cisco Certified Network Associate (CCNA) Cisco Certified Network Professional (CCNP) Juniper Networks Certified Internet Specialist (JNCIS) **Systems Administration certifications** VMware Certified Design Expert (all) **Architecture, Project Management and Process certifications** Certified Business Analysis Professional (CBAP) PMI Program Management Professional (PgMP) SAS® Certified Advanced Analytics Professional Using SAS®9	- Certified Cyber Forensics Professional - Certified Forensic Computer Examiner (CFCE) - Certified in Risk and Information Systems Control (CRISC) - Certified in the Governance of Enterprise IT (CGEIT) - Certified Scrum Master - Certified Secure Software Lifecycle Professional (CSSLP) - Cisco Certified Architect - CyberSecurity Forensic Analyst (CSFA) - EC-Council Certified Incident Handler (ECIH) - GIAC Reverse Engineering Malware (GREM) - GIAC Security Expert (GSE) - GIAC Web Application Penetration Tester (GWAPT) - Information Systems Security Engineering Professional (ISSEP/CISSP) - Information Systems Security Management Professional (ISSMP/CISSP) - PMI Portfolio Management Professional (PfMP) - PMI Professional in Business Analysis (PMI-PBA) - PMI Program Management Professional (PgMP) - PMI Risk Management Professional (PMI-RMP)
Source: Foote Partners *IT Skills & Certifications Pay Index*™, 1st Quarter 2019 data		

TECH CERTIFICATION PAY TREND HIGHLIGHTS: Market Value Losers

These tech IT certifications *declined 10% or more in market value* in the three months ending April 1, 2019 vs. prior quarter (grouped by segment).
Listed in *descending order of amount of % decline*, including ties.

TECH CERTIFICATIONS Losers

Application Development/Programming Languages
Oracle Certified Associate - Java SE Programmer
Oracle SOA 12c Infrastructure Implementation Certified
    Expert

**Architecture, Project Management, and Process
    Certifications**
Six Sigma Master Black Belt
ITIL Foundation Certification
Certified Associate in Project Management (CAPM)
TOGAF 9 Certified

Data/Database
HP ASE Vertica Big Data Solutions Administrator V1
HP ATP Big Data Vertica Solutions V1
MongoDB Certified Developer Associate

Info/Cyber Security certifications
Certified Fraud Examiner
Cisco Certified Network Associate - CyberOps
Certified Information Privacy Technologist- all countries
GIAC Certified Windows Security Administrator (GCWN)
Cisco Certified Network Professional - Security
Certified Cyber Forensics Professional
Certified Healthcare Information Security and Privacy
    Practitioner (ISC2)
Systems Security Certified Practitioner (SSCP)

Networking & Communication certifications
EMC Information Storage Associate (EMCISA)
SolarWinds Certified Professional (SCP)
VMware Certified Advanced Professional – Network
    Virtualization
CWNP/Certified Wireless Network Administrator
    (CWNA)
EMC Technology Architect - Specialist (EMCTA)
EMC Storage Administrator - Associate (EMCSA-A)
EMC Cloud Engineer (EMCCE)
EMC Storage Administrator - Specialist (EMCSA-S)
NetScout/nGenius Certified Master (nCM)
VMware Certified Professional - Network Virtualization
CWNP/Certified Wireless Network Expert (CWNE)
EMC Technology Architect - Expert (EMCTA)
EMC Storage Administrator - Expert (EMCSA-E)
Cisco Certified Network Professional - Cloud
AWS Certified Solutions Architect - Professional (Cloud)

Systems Administration certifications
HP ATP - Cloud Administrator V1
Novell Certified Instructor (CNI)
VMware Certified Advanced Professional 6/7 - Cloud Mgt and
    Automation Deployment
Novell Certified Engineer (CNE)
Novell Certified Administrator (CNA)
Novell Certified Linux Professional
VMware Certified Professional 6.5 - Data Center Virtualization
    (VCP6.5-DCV)
Novell Certified Linux Engineer (CLE)
Novell Identity Manager Administrator
VMware Certified Advanced Professional (all)
VMware Certified Advanced Professional 6/7 - Cloud Mgt and
Automation Design

Source: Foote Partners *IT Skills & Certifications Pay Index*[TM], 1st Quarter 2019 data

SUMMARY - cont'd.

B.   FAST GROWING NON-CERTIFIED TECH SKILLS THAT ARE ALSO EARNING HIGHEST PAY

The following non-certified tech skills meet two prerequisites: they recorded steep gains in cash market value in the six months ending April 1, 2019 in our *IT Skills and Certifications Pay Index*^{TM} and they are also earned workers cash pay premiums well above the average of all 554 skills reported. **No skill below is earning less than the equivalent of 16 percent of base salary—significant considering the average for all skills reported is 9.4 percent equivalent of base salary**—and are listed in descending ranked order of cash premium and market value increases (including ties).

1. **Big Data Analytics**
    Apache Pig
    > *Market Value Increase:* 21.4 percent (in the six months through April 1, 2019)
    > *Average Pay Premium:* 17 percent of base salary equivalent

    Big Data Analytics related skills and certifications have grown in market value every quarter in the past two years. Cash premiums for 103 Big Data related non-certified skills have as a group increased 3.5 percent in market value in the past six months, averaging the equivalent of 12.2 per cent of base salary. For all the interest in the use of advanced data analytics to enable companies to understand, package, and visualize data for enhanced decision making, the truth is that the marketplace for so-called Big Data skills has been surprisingly volatile: 38 (or 37 percent) of Big Data skills tracked in our benchmark research changed market value in the first quarter of 2019.

    Apache Pig is a high-level platform for analyzing large data sets that consists of a high-level language—Pig Latin--for expressing data analysis programs, coupled with infrastructure for evaluating these programs. The salient property of Pig programs is that their structure is amenable to substantial parallelization, which in turns enables them to handle very large data sets. Pig can execute its Hadoop jobs in MapReduce, Apache Tez, or Apache Spark. Pig Latin abstracts the programming from the Java MapReduce idiom into a notation which makes MapReduce programming high level, similar to that of SQL for relational database management systems. Pig Latin can be extended using user-defined functions which the user can write in Java, Python, JavaScript, Ruby or Groovy and then call directly from the language.

2. **MapReduce**
    Scala
    > *Market Value Increase:* 13.3 percent (in the six months through April 1)
    > *Average Pay Premium:* 17 percent of base salary equivalent

    MapReduce is a programming model for processing and generating large data sets with a parallel, distributed algorithm on a cluster. A MapReduce program is composed of a *map* procedure (or method), which performs filtering and sorting and a *reduce* method, which performs a summary operation. The "MapReduce System" (also called "infrastructure" or "framework") orchestrates the processing by marshalling the distributed servers, running the various tasks in parallel, managing all communications and data transfers between the various parts of the system, and providing for redundancy and fault tolerance.

    The ***Scala*** programming language—short for 'scalable'--makes up for a lot of deficiencies in Java, integrating with Java while optimizing code to work with concurrency. It appeals most to enterprises that have already invested in Java and don't want to have to support anything new in their production environments.

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SUMMARY - cont'd.

Fast growing/highest paying non-certified tech skills – cont'd.

3. Metadata design and development
Market Value Increase: **6.3** percent (in the six months through April 1, 2019)
Average Pay Premium: 17 percent of base salary equivalent

Metadata design and development. Data can be replicated and delivered anywhere in the world instantaneously--it is the fundamental resource in the new economy. The business rocket ship known as digital innovation depends on data, metadata, and A.I. working in concert to create systems that gets smarter over time. But while data is used to drive decision-making and insights, it's the *metadata* that stores what is learned—what works, when to use it, what is still uncertain—and this the key to "smarter". Digital transformation is driving a new wave of interest in metadata design and development skills in 2019.

4. Security architecture and models
Market Value Increase: 6.3 percent (in the three months through April 1, 2019)
Average Pay Premium: 17 percent of base salary equivalent

Two fundamental concepts in computer and information security are the security model, which outlines how security is to be implemented—in other words, providing a "blueprint"—and the architecture of a computer system, which fulfills this blueprint. Security architecture is a view of the overall system architecture from a security point and how the system is put together to satisfy the security requirements. It describes the components of the logical hardware, operating system, and software security components, and how to implement those components to architect, build and evaluate the security of computer systems.

With cybersecurity related skills gaining nearly 4 percent in cash market value in the past year and the threat landscape continuing to be a core business issue, we expect security models and architecting skills to continue to be strong going forward.

5. Amazon RedShift
*Market Value Increase***:** 14.3 percent (in the six months through April 1, 2019)
Average Pay Premium: 16 percent of base salary equivalent

Amazon Redshift is the Internet hosting service and data warehouse product which forms part of the larger cloud-computing platform Amazon Web Services. It is built on top of technology from the massive parallel processing data warehouse company ParAccel, to handle large scale data sets and database migrations. It is a fast, scalable data warehouse that makes it simple and cost-effective to analyze data across data warehouses and data lakes, delivering aster performance by using machine learning, massively parallel query execution, and columnar storage on high-performance disk. Driving demand for this skill is the push for organizations to consider new approaches for their data warehousing environments in the face of exploding data volumes and business imperatives to leverage data to generate additional value in the form of more productive and efficient business operations.

SUMMARY - cont'd.

Fast growing/highest paying non-certified tech skills – cont'd.

6. Master Data Management
Market Value Increase: 14.3 percent (in the six months through April 1, 2019)
Average Pay Premium: 16 percent of base salary equivalent

Master data management (MDM) arose out of the necessity for businesses to improve the consistency and quality of their key data assets, such as product data, asset data, customer data, location data, etc. Many businesses today, especially global enterprises have hundreds of separate applications and systems (i.e. ERP, CRM) where data that crosses organizational departments or divisions can easily become fragmented, duplicated and most commonly out of date. When this occurs, answering even the most basic, but critical questions about any type of performance metric or KPI for a business accurately becomes hard. The basic need for accurate, timely information is acute and as sources of data increase, managing it consistently and keeping data definitions up to date so all parts of a business use the same information is a never-ending challenge. That's what has and will continue to drive a premium on MDM skills.

7. Smart Contract
Blockchain
Cloudera Impala
Apache Hive
Market Value Increase: 6.7 percent (in the six months through April 1, 2019)
Average Pay Premium: 16 percent of base salary equivalent

Smart contracts help you exchange money, property, shares, or anything of value in a transparent, conflict-free way while avoiding the services of a middleman. They're the product of the decentralized ledger systems that run the blockchain and so skills in smart contracts are be catapulted along with Ethereum and others for an almost unlimited number of uses ranging from financial derivatives to insurance premiums, breach contracts, property law, credit enforcement, financial services, legal processes and crowdfunding agreements.

Research analyst firm IDC forecasts that by 2021 at least 25 percent of the Global 2000 will use *blockchain services* as a foundation for digital trust at scale. Large vendors IBM, Microsoft, Hewlett Packard Enterprise, Amazon Web Services, Baidu, and SAP have made sizable investments and have begun rolling out blockchain-as-a-service solutions in their partner accounts. Aside from North America, we see big blockchain technology investments in the Middle East, Asia, and in Europe where blockchain centers in Berlin, Zurich, Singapore, London, and South Korea are creating buzz. There are hundreds of DLT (distributed ledger technology) start-ups around the world, employing thousands. At a high level, *blockchain technology* is a way of securely managing access and information. What makes DLT so interesting to businesses and some governments is how it is positioned to make vast improvements in an almost endless array of transactional activities. Skills shortages will continue for blockchain developers but especially for the architects, project managers, and quality engineers who can design, build, and test Blockchain operating models. Understanding how Blockchain integrates with IoT, Artificial Intelligence, Machine Learning, Robotics, and other technologies is a plus now for architects but will be a requirement in the future as these other technologies mature and adoption rates increase.

SUMMARY - cont'd.

Fast growing/highest paying non-certified tech skills – cont'd.

Cloudera Impala is an open source Massively Parallel Processing (MPP) query engine that provides high-performance, low-latency SQL queries on data stored in popular Apache Hadoop file formats. The fast response for queries enables interactive exploration and fine-tuning of analytic queries rather than long batch jobs traditionally associated with SQL-on-Hadoop technologies, meaning that data can be stored, shared, and accessed using various solutions that avoids data silos and minimizes expensive data movement. Impala returns results typically within seconds or a few minutes, rather than the many minutes or hours that are often required for Hive queries to complete. We cannot understate the value of this to advanced data analytics platforms and the work of data scientists and analysts engaged in Big Data initiatives and the impact this has on skills acquisition demand going forward

Apache Hive is a data warehouse system built on top of Apache Hadoop that facilitates easy data summarization, ad-hoc queries, and the analysis of large datasets stored in various databases and file systems that integrate with Hadoop, including the MapR Data Platform with MapR XD and MapR Database. Hive offers a simple way to apply structure to large amounts of unstructured data and then perform batch SQL-like queries on that data. Hive easily integrates with traditional data center technologies using the familiar JDBC/ODBC interface.

8. **Risk analytics/assessment**
     Market Value Increase: 6.7 percent (in the three months through April 1, 2019)
     Average Pay Premium: 16 percent of base salary equivalent

Evaluating risk is an obsession for most businesses; for others it is something to ignore at great peril to their future success. The field of risk analytics has entered its prime: recent projections put the global fraud detection and prevention market at $41.59 billion by 2022, up from $16.62 billion in 2017. The spike in interest for non-certified skills to prevent misappropriation of assets, bribery and corruption, fraud, data theft or money laundering in financial services, government or public utilities is in full force in our latest findings. Most employers are rewarding people who can incorporate data and insights from many sources to better identify, measure, and mitigate risk. McKinsey & Company recently published an excellent paper describing what this is all about.

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SUMMARY - cont'd

C. TECH CERTIFICATIONS CURRENTLY EARNING WELL ABOVE-AVERAGE PAY BUT DECLINING THE MOST IN CASH MARKET VALUE – Second Half, 2018

Average market values for 479 tech certifications decreased in the first quarter of 2019, down 1.2 percent overall, and lost 3.3 percent of their value in the last twelve months. Pay premiums for single certifications are averaging the equivalent of 7.4% of base salary now after 50 certifications recorded pay premium losses against 27 gaining value in the first three months of 2019.

Why are more certifications losing value than gaining value? Certifications decline in market value for a number of obvious and not so obvious reasons. Pay premiums may diminish as a certification expires, is retired, or is replaced with more appropriate certifications as technology evolves. Also, there remains a lingering bias that taking a proctored exam does not confer expertise in a subject on the test taker, especially when the pass rate is 70 percent correct answers. The certification industry has fought back against this bias by adding laboratory requirements and even peer review panels that decide if the candidate has qualified to receive designation.

But just as often it's their popularity that drives down pay premiums for a certification: as interest in a certification escalates and more people attain the certification the gap between supply and demand for the certification narrows, driving down its market value as the laws of scarcity would dictate. This has been documented in the case of dozens of certifications over the 18 years Foote Partners has been tracking and reporting their market values in the ***IT Skills and Certifications Pay Index***.

Which ones are bucking the trend---highest paying and still growing in value? The following tech certifications recorded impressive gains in cash market value in the **six months ending April 1, 2019** and they are also earning cash pay premiums significantly above the **7.4 percent average equivalent of base salary of all 479 skills reported** .

PROJECT/PROGRAM MANAGEMENT

PMI Program Management Professional (PgMP)
Average Pay Premium: 16 percent of base salary equivalent
Market Value Decrease: **33.3** percent (in the six months through April 1, 2019)

(Detail on current trending for this certification appears in the **Tech Skills Demand and Pay Trends Report.- 2Q 2019 edition**)

APPLICATIONS DEVELOPMENT

Certified Secure Software Lifecycle Professional (CSSLP)
Average Pay Premium: 15 percent of base salary equivalent
Market Value Decrease: **25** percent (in the six months through April 1, 2019)

(Detail on current trending for these certifications appear in the **Tech Skills Demand and Pay Trends Report.- 2Q 2019 edition**)

Certifications declining in value but still paying above-average – cont'd.

Applications Development – cont'd

AWS Certified DevOps Engineer - Professional
Average Pay Premium: 11 percent of base salary equivalent
Market Value Decrease: **10** percent (in the six months through April 1, 2019)

(Detail on current trending for this certification appears in the **Tech Skills Demand and Pay Trends Report.- 2Q 2019 edition**)

INFO / CYBERSECURITY

Information Systems Security Engineering Professional (ISSEP/CISSP)
Information Systems Security Management Professional (ISSMP/CISSP)
Average Pay Premium: 15 percent of base salary equivalent
Market Value Decrease: **25** percent (in the six months through April 1, 2019)

(Detail on current trending for these certifications appears in the **Tech Skills Demand and Pay Trends Report.- 2Q 2019 edition**)

EC-Council Certified Incident Handler (ECIH)
Average Pay Premium: 14 percent of base salary equivalent
Market Value Decrease: **16.7** percent (in the three months through April 1, 2019)

(Detail on current trending for this certification appears in the **Tech Skills Demand and Pay Trends Report.- 2Q 2019 edition**)

Certified Forensic Computer Examiner (CFCE)
Average Pay Premium: 15 percent of base salary equivalent
Market Value Decrease: **25** percent (in the six months through April 1, 2019)

(Detail on current trending for this certification appears in the **Tech Skills Demand and Pay Trends Report.- 2Q 2019 edition**)

GIAC Certified Intrusion Analyst (GCIA)
Average Pay Premium: 12 percent of base salary equivalent
Market Value Decrease: **20** percent (in the six months through April 1, 2019)

(Detail on current trending for this certification appears in the **Tech Skills Demand and Pay Trends Report.- 2Q 2019 edition**)

SUMMARY - cont'd.

Certifications declining in value but still paying above-average – cont'd.

Info/Cybersecurity – cont'd.

GIAC Exploit Researcher and Advanced Penetration Tester (GXPN)
Average Pay Premium: 12 percent of base salary equivalent
Market Value Decrease: **9.1** percent (in the six months through April 1, 2019

(Detail on current trending for this certification appears in the **Tech Skills Demand and Pay Trends Report.- 2Q 2019 edition**)

Business Analysis

Certified Business Analysis Professional (CBAP)
Average Pay Premium: 12 percent of base salary equivalent
Market Value Decrease: **20** percent (in the six months through April 1, 2019)

(Detail on current trending for this certification appears in the **Tech Skills Demand and Pay Trends Report.- 2Q 2019 edition**)

SUMMARY - cont'd.

D.   Tech Certifications declining the most in cash market value

In the table below (Figure 4) are tech certifications currently recording the largest market value losses in the six months ending April 1, 2019 and are currently pay average-to-below average cash pay premiums. In many cases these declines can be attributed to a narrowing of the gap between supply and demand as more candidates achieve certification. However as stated earlier in this report, not all employers recognize certification to be an adequate measure of talent in a technology discipline, preferring alternative forms of accreditation to fit their needs.

CERTIFICATION	Average Pay Premium (% of base salary equivalent)	Market Value Decrease (October 2018 to March 2019)
HP ATP - Cloud Administrator V1	4 %	-42.9 %
HP ASE - Vertica Big Data Solutions Administrator V1 HP ATP - Big Data Vertica Solutions V1 EMC Information Storage Associate	5 %	-37.5 %
CWNP/Certified Wireless Network Administrator	4 %	-33.3 %
CSX Cybersecurity Practitioner	8 %	-33.3 %
Open Group Certified Architect EC-Council Certified Security Analyst	9 %	-30.8 %
Oracle Certified Associate - Java SE Programmer EMC Technology Architect - Specialist HDI Customer Service Representative NetApp Certified Data Administrator, ONTAP SAS Certified Base Programmer for SAS 9	5 %	-28.6 %
Certified Healthcare Information Security and Privacy Practitioner (ISC2)	8 %	-27.3 %
SolarWinds Certified Professional VMware Certified Advanced Professional – Network VMware Certified Professional 6.5 - Data Center Virtualization	6 %	-25.0 %
Cisco Certified Network Associate – CyberOps EMC Technology Architect - Expert SAS Certified Advanced Programmer for SAS 9	7 %	-22.5 %

Figure 4

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Tech Labor Trends Discussion & Analysis

IT Skills and Certifications Pay Index™

Data collected through April 1, 2019

LABOR TRENDS DISCUSSION & ANALYSIS

INTRODUCTION. It's difficult to find an employer that isn't struggling to come up with its own unique tech staffing model that balances three things: the urgencies of digital transformation and cybersecurity threats, combating ever deepening security threats, and keeping increasingly complex systems and networks running smoothly and efficiently.

The staffing challenge has moved well beyond simply having to choose between contingent workers, full-time tech professionals, and a variety of third-party services options. Over the next few years managers will continue to be tasked with leading a massive transformation of the technology and tech-business hybrid workforce to focus on delivering a wide variety of operational solution and revenue-generating opportunities including:

- Next-gen Internet of Things/M2M
- Artificial Intelligence/Machine Learning
- Blockchain
- Mobility
- Big Data//Information Integration/ BI analytics
- Cybersecurity
- Automation
- Robotics

- Edge computing
- Quantum computing
- Cloud computing
- Healthcare tech/IoMT/Telemedicine
- Carbon-reducing technology/exponential energy
- Autonomous vehicles
- Web 3.0

All of these depend on solving the puzzle of getting the mix of critical technology and business skills and experience *just right* when shortages of skills and talent have never been more profound or more constraining in effecting business transformation.

These changes don't happen overnight. Practically speaking, it takes a few fiscal cycles to get budgets in line and recruiting and training efforts in place to build any new foundation for an optimally restructured workforce. To be sure, 'clean sheeting' your organizational systems and practices isn't realistic: you need to build a new human resource foundation under what you're already doing, incrementally strengthening that foundation over time. This takes a well-thought out job role architecture plus carefully crafted agile compensation models to get people paid to true competitive market levels and incented to perform at high levels.

Dramatic changes in the corporate tech workforce, pushed by digital disruptions, continues to define 2019 tech labor supply and demand

Employers have been facing conspicuously harder tech labor challenges in 2019 than any year in recent history. And their people problems are about to get exponentially worse unless they start laying the groundwork *right now* for a new staffing paradigm that will soon be thrust upon each and every one of them.

We've conducted interviews since late 2018 with 500+ senior tech execs. Our findings? Most not only realize this threat but are conspicuously stressed out about it. Two long time labor trends have shifted recently that will help them in the short term.

LABOR TRENDS DISCUSSION, cont'd.

First, market value volatility in pay for tech skills is the lowest it's been the past decade. The 1,033 certified and non-certified tech skills tracked in Foote Partners' **Tech Skills and Certifications Volatility Index** are averaging market value fluctuations of 23% in the last twelve months (quarter-to-quarter percent of skills changing value) compared to 27% to 31% four years ago (see page 41 - 45).

Second, the constant frenzy surrounding short term skills gaps and unfilled jobs targeted at point solutions has quieted down according to our recent quarterly labor market benchmark research. There are many indicators for this including the fact that growth in pay for the 1,033 skills and certifications in our quantitative research was negative for the year 2018. In other words*, the gap between supply and demand for tech skills narrowed broadly last year across all certified and non-certified skills surveyed.*

What's overtaking these two trends is something more urgent and potentially catastrophic when it comes to managing tech professionals: several game-changing emerging technologies that are altering the landscape of not just businesses but the private lives of billions of people. Among them are Artificial Intelligence, Blockchain, the next generation of IoT (Internet of Things), Automation, and countless digital innovations. Layered into all of these is continuing efforts in to building deeper cybersecurity capabilities for constantly escalating threat levels.

The upshot is 2019 will continue the trend that began this year in which employers have finally taken stock in how poorly prepared they are from a talent perspective for consuming these revolutionary (though in many cases, nascent) technologies. And trust us, they will all be enthusiastically deepening their commitment to them within the next three years.

The hardest truth and most difficult barrier are that the human resource management function supporting technology professionals at most companies has for years been unable to get in front of the unique demands of the technology workforce. They've been barely getting by for years with short-term fixes. Here's what it looks like from the perspective of HR leaders:

- **People management systems and practices to tech professionals that have become frighteningly ineffective**. Even ad hoc work-around solutions are failing

- **Persistent fallout**
  - Too many tech job titles
  - High tech staff churn in key roles, especially the most experienced tech workers.
  - Skills gaps. Difficulty finding *and hiring* tech professionals
  - Overreliance on consultants, contractors, temps

- **Confusion about pay.** Constant uncertainty about how much to pay tech professionals, especially new jobs and the "Swiss Army knife" hybrid positions.

- **Job Definition/Design Chaos.** Managing independently created tech jobs that don't fit in very well with established tech roles…*that are themselves ill-defined*

- **Job Path Uncertainty:** tech workers have trouble navigating their careers and employers aren't helping them very much

LABOR TRENDS DISCUSSION, cont'd.

If these new blockbuster technologies existed independent of one another it would not be nearly as frightening from a labor demand perspective. But they don't: they're all part of one gigantic dynamic mesh. This mesh will demand an unprecedented level of talent that will place a stunning labor strain on employers regardless of whether they are developing, supporting, or consuming these pervasive groundbreaking technologies.

And here's the rub: employers cannot aspire to capitalize on these transformation technologies without first climbing out of the deep hole they've been digging for years. That means replacing HR management systems and practices that lack the power, agility and flexibility necessary to do competitive combat in a labor environment substantially different than what has existed heretofore. The next few years will test employers' people management capabilities will like never before.

There is a window of opportunity right now while these new technologies are maturing. More employers are commencing the serious work of repairing broken or underperforming people management systems and practices.

Architecture to the rescue—but this time for managing people

Foote Partners has worked with countless employers over more than 25 years in rethinking how they define the work of their tech professionals and how they can shape an enterprise tech workforce to deliver on business goals. But even more important, how they need to think about and build capabilities for the future, executing on business strategies that are not yet fully formed but which we, as experienced forecasters and analysts, have helped them understand capabilities which most likely need to be operational in their future.

Our observation across more than 3,000 employers is that the only approach to this particular work that has ever achieved *consistent* success—much less any proven success---has been one based on a strong architectural foundation. Not business architecture or technical architecture but rather *people architecture*.

By this we mean applying traditional architecture principles and practices to human capital management. Adopting a framework for tech people and pay that properly defines, classifies, and aligns job roles, levels, skills and competencies across the enterprise and allows for accurate matching of people and jobs to a constantly evolving marketplace. And perhaps most importantly, one that that is flexible in principle and agile enough in practice to enable job and pay scalability, meet forecasted labor needs, and accommodate growth and change with minimal pressure while also not creating new problems as a by-product.

Architecturally driven tech people management practices have been commonplace for years at consulting industry employers and virtually nowhere else. The business models and competitive focus of these employers relies on people performing services and as such their chief assets "walk out the door every night". They operate within business models that have specialized people practices and budgets that simply are not easily replicated in other industries.

LABOR TRENDS DISCUSSION, cont'd.

This shouldn't be a novel idea but it is. It's similar to how architecture thinking and practices were applied to technology inventorying and acquisition in the early 1990s and to businesses since the day they began. Enterprise architecture later became its own discipline as technology and business converged over the last two decades.

Tech People Architecture is similar in principle to traditional IT architecture initiatives but applied instead to workforce management and tech human capital. There are strategy and capability roadmaps, phase gate blueprints, benchmarks, performance metrics, and stakeholder management is critical. Governance issues need careful attention and business strategy drives it all. *Agile Compensation* is the answer to the chaos created by the proliferation of technology related job titles and lack of consistency in job definition and pay programs across the enterprise for the same work performed.

But with Agile Compensation and Tech People Architecture it's about how key human capital management (HCM) elements such as job definition and design, skills demand and acquisition, compensation, incentives and recognition, professional development, and work/life balance plug into an overall optimized operational model. The model is tuned to new technologies, business strategy, organizational goals, and culture and performance philosophies, and it promotes flexibility and scalability, like any disciplined architecture approach.

People architecture approaches correct lack of job title standardization in the marketplace and too many job titles floating around IT departments, corporate departments, and business lines. With so many dimensions and variability in tech jobs, employers are unable to cope with the complexity of defining, determining pay, and laying out career paths for all these jobs. For many, serious retention and hiring problems are showing up for the first time. Recruiters are picking off your best people and candidates are suddenly rejecting offers.

Tensions are palpable and that's one of the factors driving Tech People Architecture and Agile Compensation right now. Let's take a deeper dive into two of these emerging technologies to see why they're going to succeed and what skills will be most in demand.

<u>LABOR ANALYSIS</u>: *Skills training and development becomes the critical differentiator*

A 2018 Cyentia Institute study entitled "Unraveling the Cyber Skills Gap & Talent Shortage" found that 80% of respondents do not feel adequately prepared to defend their organizations. 68% of the 3,109 international tech professionals surveyed (81% working in cybersecurity) express doubts about their organization's readiness to thwart advanced threats.

Foote Partner's latest *IT Skills and Certifications Pay Index*[TM] provides evidence of employers' response to the cybersecurity talent retention gap: The **Certified Cyber Forensics Professional** certification is earning the highest certification cash premium among all 458 reported in the *Pay Index*, averaging the equivalent of 17% of base salary. Further, in the most recent October data update of our *IT Professional Salary Survey*, Cybersecurity Specialists with three years of experience are averaging $107,000 in base salary in 65 U.S. cities. Senior level cyber specialists with five years' experience are averaging $137,000.

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LABOR TRENDS DISCUSSION, cont'd.

But with a nagging lack of consistency nationally in cybersecurity career definitions, and a shocking dearth of experienced cyber professionals, employers can expect to experience difficulties in attracting and retaining cybersecurity talent for months or even years to come.

Employers are more aware that they don't have the right people in their security departments. What's missing are enough underlined experienced security professionals who understand:

- Threat Intelligence and Analysis
- Valuing Asset Inventory
- Access/Identity Management
- Visibility

- Cryptography
- Audit log analysis
- Compliance and policy
- Secure Data Management
- Information Risk Management

- Process Optimization and Agile Controls
- Secure and defensive programming
- Network Security
- Business Continuity Management

Chief Security Officers are desperate for qualified talent to determine whether or not there's been an attack, to identify root cause, and to figure out what information has been exposed. They're allocating more financial resources to security challenges according to our data. But the linkage between the business and the information security and cybersecurity organizations is still too weak from a labor perspective.
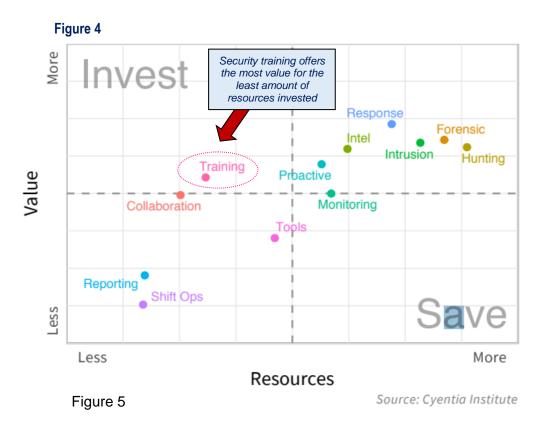
A common refrain in our interviews has been "We're going to need as many people as possible to 'hit the ground running' to meet the demand". That's going to be a tall order not to mention a bit unrealistic in the short term. The fact is it's going to take another three to five years to narrow this particular skills gap. Employers will get there because indications are that the money and incentives are sufficient to get vendors, employers, and training organizations focused on the solution. And of course, it will take that long to get the requisite experience in place, which is typically 4 to 6 years of hands-on experience.

Cybersecurity skill sets are still evolving in training protocols. Hands-on experience in a cyber security environment is more critical to cyber security jobs than just academic learning. Only 7% of the top universities around the world offer a technical cybersecurity degree at the undergraduate level. Cybersecurity curriculum has to dramatically expand and colleges need to aggressively pursue internship opportunities for their students to expose them real-world conditions. There need to be clear channels for attracting people into a profession that do not have the cache of software development.

This Cyentia Institute study concludes that organizations that invest in training show improved preparedness at both the employee and corporate level. The problem is that not enough companies are investing in training cybersecurity skills: half of the respondents pay for their own training and only 15% reported that their employers cover all cybersecurity training expenses. Moreover, 60% reported using personal time for IT and security training. Only 13% of companies conduct training during normal business hours and 35% of respondents report spending at least $1,000 annually in training-related expenses.

LABOR TRENDS DISCUSSION, cont'd.

The chart below (Figure 5) shows where investment intersects with value according to the perceptions, experience, and activities of Security Operations Center (SOC) and Incident Response (IR) staff. In theory, activities in the upper-left would offer good value at comparatively low cost. The only activity squarely in that quadrant? Training.

Figure 4

Figure 5

Source: Cyentia Institute

One of the key findings in our own recent in-depth interviews with more than 90 Chief Security Officers and Chief Information Security Officers is an expanded definition of "security professional" that is being taken more into account in hiring decisions. It's a long list but it can be distilled down to these:

- Ability to translate technology risk to business risk.
- Think business and learn business speak
- Understand your industry
- Be open-minded and think outside the box (be strategic and not just tactical)
- Develop your people skills and work at being trustworthy.
- Be able to write and present high-level concepts coherently and succinctly. Keeping in mind the language of business

LABOR TRENDS DISCUSSION, cont'd.

Cybersecurity leadership and governance issues. In some cases, it's going to become apparent that organizations simply don't have the right security leadership in place," suggests Foote. "Organizations have to ask themselves if security itself is sitting in the right place within the organization, who is accountable for security, and how to hold them accountable. You can't avoid every serious incident, and while many businesses are good at incident management, too few have an established, organized approach for evaluating what went wrong and how to fix it. As a result, they are incurring unnecessary costs and accepting inappropriate risks.

Organizations of all sizes need to take stock now in order to ensure they are fully prepared and engaged to deal with these emerging security challenges and in particular cyber security strategy. By adopting a realistic, broad-based, collaborative approach to cyber security and resilience, government departments, regulators, senior business managers and information security professionals will better understand the true nature of cyber threats and how to respond quickly and appropriately.

Some companies are augmenting their staffing with machine learning technology and probability theory to model patterns of behavior and flag anomalous activity. Machine learning technology is increasingly being adopted as a way to reduce the noise (alerts) that traditional security products produce and to bubble up mid- and high-level concerns to IT staff. The discipline of machine learning finds its way into many large companies through the hiring of data scientists, who use algorithms to efficiently analyze event logs for their security teams.

Overall, we expect an increase in high-profile breaches in the near future. This will push corporate boards and senior business executives even farther to face <u>decades</u> of inadequately staffing their security operations and must now conquer a severe cybersecurity talent gap. They only solution will be to train, train, train over the next four years until as the gap narrows organically.

LABOR TRENDS DISCUSSION, cont'd.

LABOR FORECAST*: Tech Workforce Transformation*

Popularity of Agile Compensation and Tech People Architecture practices as solutions to persistent IT labor problems.

Clearly the widespread acceptance of technology's singular role as an engine of innovation and competitiveness is an unquestioned, as is the energized role that has been thrust upon technology professionals and organizations everywhere to monetize technology. Too often those in the C-suite have been reluctant to hold their IT leaders accountable for such a heavy responsibility, instead choosing to create tech innovation departments and/or hire expensive consulting firms to do what they believe their IT leaders and tech workers are not capable of doing.

In 2018 senior business management has been asking tech leadership and business line leaders to be more accountable in managing large segments of technology talent---for architecting, building and securing new products and services that are largely technology based. And as these leaders are held accountable for higher levels of information and tech management, their performance is being more closely scrutinized. Examples include advanced analytics (for making more informed decisions), greater security (against dreaded cyber-attacks), and capitalizing on fast moving trends such as Blockchain, Machine learning, and digital innovation in general. Meanwhile, for the CIO, the imperative to streamline operations, reduce costs in every possible manner, and ensure compliance with countless regulations must still be met.

Taken together, this has placed tremendous pressure on tech leadership to execute flawlessly and predictably in unfamiliar areas. For many employers this can only be achieved with a dramatic transformation of the tech workforce to a more appropriately skilled group of professionals who are capable of a level of agility, flexibility and aptitude not commonly associated with their predecessors. Companies must be able to architect their human capital to meet business needs now and especially in the future.

Employers are having more difficulty finding and retaining tech talent which can perform at a high caliber on increasingly more difficult tasks. At the same time managers are feeling immense performance pressure. Plus, today the tech workforce is spread throughout the enterprise doing multidimensional jobs that are hard to categorize, price and manage. In this environment architecting of people management is the last and most logical frontier.

Our analysts are learning from tech executives that people architecture practices have been instrumental in dealing with lack of job title standardization in the marketplace and having too many job titles among their internal technology workforce. With so many dimensions and variability in tech jobs, employers have been progressively unable to cope with the complexity of defining, determining pay, and laying out career paths for all these jobs *that is consistent across the enterprise.*

For many, serious retention and hiring problems were showing up for the first time. Work around solutions used for years to cope with systemic weaknesses in their HR systems were no longer effective. Recruiters started picking off their best people and candidates were suddenly rejecting offers.

LABOR TRENDS DISCUSSION, cont'd.

The Agile Compensation and Tech People Architecture practices mentioned earlier focus on how key human capital management (HCM) elements such as job definition and design, skills demand and acquisition, compensation, incentives and recognition, professional development, and work/life balance plug into an overall optimized operational model. The model is tuned to new technologies, shifting business strategy and organizational imperatives, culture, and performance philosophies. Together they propel flexibility and scalability, like any disciplined architecture approach. ***This is exactly what has been missing for decades in the HR functions at many employers, resulting in constant labor gaps, skills deficits, and failure to execute consistently.***

For employers, Agile Compensation and Tech People Architecture has solved these problems:

- Reducing by 50% to 70% the number of tech related job titles necessary to plan and administer pay;

- Significantly increasing retention rates;

- Narrowing or altogether eliminating persistent technology skills gaps;

- Improving individual and team performance and more predictable execution;

- Increasing consistent availability and quality of skills and workers;

- Achieving higher utilization rates;

- Mapping out how workers can move more effectively through promotions/career paths

Why do we think that Tech People Architecture is a viable alternative for most employers? Because architecture practices are familiar to technology executives. Technical architecture practices have been successful for decades because, when done well, companies have achieved an understanding of what they have systems-wise and could then connect it to where they were going and how they were going to get there, all within a process inclusive of all the various stakeholders who shared the risk in the outcome. A technical architecture helped to clearly define enterprise technology capabilities and give companies more options and flexibility going forward.

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IT Skills & Certifications Pay Data Trend Charts

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IT Skills and Certifications Pay Index™ – 1st Quarter 2019 edition

(Data collected through April 1, 2019)

- **Tech Certifications**
- **Noncertified Teck Skills**
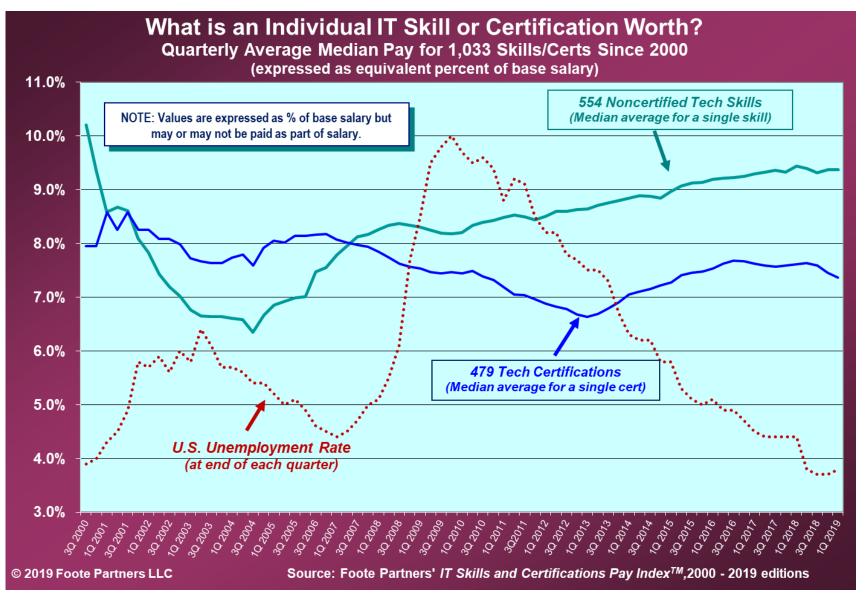- **IT Skills & Certifications Volatility Index™**

How to interpret gains and losses in IT skills and certifications pay premiums

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Quarterly gains and losses in premium pay reflect a widening or narrowing, respectively, in the gap between supply and demand for skills and certifications. This may occur for any number of reasons. For example, a quarterly decline in pay for a skill may signal that the market supply of talent for that skill is catching up to demand—not necessarily that demand is starting to wane. IT professionals are often attracted to a skill or certification if they perceive that it has rising value in the marketplace and therefore can help them to achieve higher pay, greater job security, a promotion, or more flexibility in their career choices. As they pursue greater competency in that skill or as more workers attain certification, supply increases and market pricing (which is elastic to the laws of supply and demand) will be driven downward unless demand is rising at the same proportional rate. Conversely, if demand rises and supply is not increasing to match that level of demand, pay premiums for specific skills and certifications will increase.

Therefore, when interpreting gains and losses in market pay it is important to consider all factors that could be driving supply and demand and market perception. Those factors range from:

- aggressive marketing of certifications by vendors;
- changes in certification programs (e.g. certification extensions or retirement);
- new technology and evolution/maturation of current technologies;
- technology adoption rate;
- product integration strategies,
- economic conditions;
- employment opportunities;
- mergers/acquisitions;
- budget cycles and the timing of skills and talent acquisition by employers;
- changes in labor sourcing plans pursuant to company strategies.

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What is an Individual IT Skill or Certification Worth?
Quarterly Average Median Pay for 1,033 Skills/Certs Since 2000
(expressed as equivalent percent of base salary)

NOTE: Values are expressed as % of base salary but may or may not be paid as part of salary.

554 Noncertified Tech Skills
(Median average for a single skill)

479 Tech Certifications
(Median average for a single cert)

U.S. Unemployment Rate
(at end of each quarter)

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Source: Foote Partners' *IT Skills and Certifications Pay Index™,*2000 - 2019 editions

SOURCE: Foote Partners *IT Skills and Certifications Pay Index™* 2000 to 2019 quarterly editions

Fig 5 - Premium Pay for Tech Certifications Wanes as Non-Certified Tech Skills Show Gains as Disruptive Technologies Intensify

(Average Median Pay for a Single Certified vs. Noncertified Tech Skill, Last 12 years – 77,915 IT professionals)

13 Yr Growth/Decline in Pay for 1,033 Tech Skills and Certifications
(through April 1, 2019)

Y-axis: Ave. Premium Pay for Individual Skill or Certification (expressed as % of Base Pay):

554 Noncertified Tech Skills (Median average pay, single skill)

479 Tech Certifications (Median average pay, single cert)

U.S. Unemployment Rate (at end of each quarter)

Official start of recession

Wall St. meltdown

Official end of recession

Persitent high IT skills market volatility, skills shortages, tech workforce restructuring

Key - MAJOR ECONOMIC MILESTONES
1. American Recovery and Reinvestment Act
2. Sequestration (Amer. Taxpayer Relief Act 2012)
3. Trump presidency/Stock market ascendacy

Source: Foote Partners, *IT Skills and Certifications Pay Index™* (1Q 2007 – 1Q 2019 data editions)

(Pay data supporting these charts available in the 2019 *IT Skills and Certifications Pay Index™*.)

Tech Certifications: Latest market value trends

(Data collected through April 1, 2019)

2-YEAR TECH CERTIFICATIONS PAY TRENDS

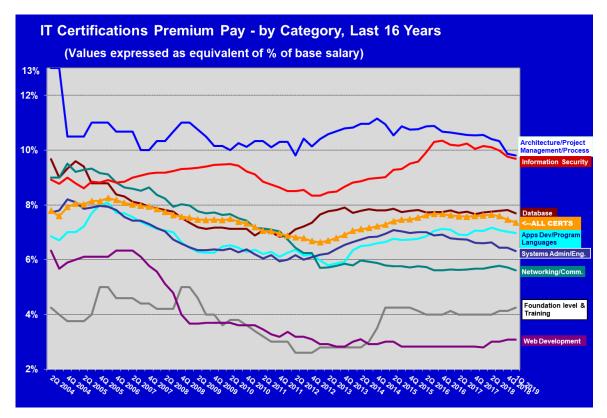(Through 4/1/2018 – 77,915 IT Professionals)

IT CERTIFICATIONS CATEGORIES	# of certs surveyed	Change in Average Premium Pay by Category			
		% Change 3 mos	% Change 6 mos	% Change ANNUAL	% Change 2 yrs
Foundation level and Training	8	3.0%	3.0%	6.3%	3.0%
Apps Development/Prog. Languages	51	-0.6%	-1.5%	-1.0%	-1.5%
Data/Database	45	-1.5%	-1.2%	-0.5%	-1.4%
Web Development	12	0.0%	2.8%	10.6%	9.4%
Networking & Communications	98	-1.9%	-2.9%	-1.0%	-0.5%
System Administration/Engineering	110	-1.8%	-1.9%	-4.2%	-6.7%
Information/Cyber Security	94	-0.6%	-3.0%	-4.5%	-4.9%
Architecture/Project Management/Process	61	-0.6%	-5.1%	-7.1%	-7.8%
ALL CERTIFICATIONS REPORTED	479	-1.2%	-3.0%	-3.3%	-3.4%

3 & 12 MONTH TECH CERTIFICATIONS PAY TRENDS BY CATEGORY

(Through 4/1/2018 – 77,915 IT Professionals)

% Change in Average Median Pay for a Single IT Certification

IT Certifications Premium Pay - by Category, Last 16 Years
(Values expressed as equivalent of % of base salary)

Avaya Certified Implementation Specialist
Avaya Certified Professional Design Specialist
Avaya Certified Solution Specialist
AWS Certified Solutions Architect – Associate
AWS Certified Solutions Architect – Professional
AWS Certified SysOpsAdministrator-Associate
AWS Certified Developer – Associate
AWS Certified DevOps Engineer - Professional
BICSI ITS Technician
Brocade Certified Network Engineer
Brocade Certified Network Professional
Brocade Certified Fabric Designer
Brocade Certified Fabric Professional
Certificate of Cloud Security Knowledge
Certification Authorization Professional
Certification of Competency in Business Analysis
Certified Analytics Professional
Certified Associate in Project Management
Certified Business Analysis Professional
Certified Business Continuity Professional
Certified Cloud Architect
Certified Cloud Security Professional
Certified Cloud Technology Professional
Certified Computer Examiner
Certified Computing Professional
Certified Cyber Forensics Professional
Certified Database Design Specialist
Certified Data Centre Management Professional
Certified Data Management Professional
Certified Disaster Recovery Engineer
Certified Forensic Computer Examiner
Certified Fraud Examiner
Certified Healthcare Information Security and
  Privacy Practitioner
Certified in Convergent Network Technologies
Certified in Risk and Information Systems Control
Certified in the Governance of Enterprise IT
Certified Information Privacy Manager- all countries
Certified Information Privacy Professional - all
  countries
Certified Information Privacy Technologist- all
  countries
Certified Information Security Manager)
Certified Information Systems Auditor (
Certified Information Systems Security Professional
Certified IP Telecom Network Specialist (
Certified IT Architect
Certified IT Compliance Professional
Certified Manager of Software Quality

Certified Penetration Testing Engineer
Certified Project Management Practitioner
Certified Protection Professional
Certified Salesforce Advanced Developer
Certified Salesforce Developer
Certified ScrumMaster
Certified Scrum Coach
Certified Scrum Developer
Certified Scrum Product Owner
Certified Scrum Professional
Certified Scrum Trainer
Certified Secure Software Lifecycle Professional
Certified Software Quality Analyst
Certified Technical Architect (Salesforce.com)
Certified Telecommunications Network Specialist
Check Point Certified Master Architect
Check Point Certified Security Administrator
Check Point Certified Security Expert
Cisco Certified Architect
Cisco Certified Design Associate
Cisco Certified Design Expert
Cisco Certified Design Professional
Cisco Certified Entry Network Technician
Cisco Certified Internetwork Expert
Cisco Certified Network Administrator - Cloud
Cisco Certified Network Associate
Cisco Certified Network Associate - CyberOps
Cisco Certified Network Associate - Data Center
Cisco Certified Network Associate - Routing and
  Switching
Cisco Certified Network Associate - Security
Cisco Certified Network Associate Wireless
Cisco Certified Network Professional Wireless
Cisco Certified Network Professional
Cisco Certified Network Professional - Cloud
Cisco Certified Network Professional - Data Center
Cisco Certified Network Professional - Routing and
  Switching
Cisco Certified Network Professional - Security
Cisco Certified Systems Instructor
Cisco Data Center Unified Fabric Design Specialist
Cisco Data Center Unified Fabric Support Specialist
Cisco Data Center Unified Computing Design
Specialist
Cisco Data Center Unified Computing Support
Specialist
Citrix Certified Administrator - Networking
Citrix Certified Associate – Virtualization
Citrix Certified Expert – Networking

Citrix Certified Expert – Virtualization
Citrix Certified Instructor (CCI - Virtualization, Networking,
  or Mobility)
Citrix Certified Professional – Mobility
Citrix Certified Professional - Networking
Citrix Certified Professional-Virtualization
Certified Database Design Specialist
CIW Certified Database Design Specialist
CIW Network Technology Associate
CIW Web Design Professional
CIW Web Development Professional
CIW Web Foundations Associate
Cloud U (Rackspace)
Cloudera Certified Associate Administrator
Cloudera Certified Associate Data Analyst
Cloudera Certified Associate Spark and Hadoop
Developer
Cloudera Certified Professional: Data Engineer
CompTIA A+
CompTIA Advanced Security Practitioner
CompTIA Certified Technical Trainer
CompTIA Cloud Essentials
CompTIA Cloud+
CompTIA Cybersecurity Analyst+
CompTIA Linux+
CompTIA Mobile App Security+
CompTIA Mobility+
CompTIA Network (Network+)
CompTIA PenTest
CompTIA Project+
CompTIA Security+
CompTIA Server+
CompTIA Storage+
Convergence Technologies Professional
CSX CyberSecurity Practitioner
CWNP Certified Wireless Security Professional
CWNP/Certified Wireless Analysis Professional
CWNP/Certified Wireless Design Professional
CWNP/Certified Wireless Network Administrator
CWNP/Certified Wireless Network Trainer
CWNP/Certified Wireless Network Expert
CWNP/Certified Wireless Technology Specialist
Cyber Security Forensic Analyst
EC-Council Certified Advanced Network Defense
EC-Council Certified Encryption Specialist
EC-Council EC-Council Certified Incident Handler
EC-Council Certified Network Defender
EC-Council Certified Secure Programmer
Certified Ethical Hacker

EC-Council Certified Security Analyst
EC-Council Computer Forensic Investigator
EC-Council Disaster Recovery Professional
EC-Council Licensed Penetration Tester
EMC Cloud Architect Expert
EMC Cloud Architect Specialist
EMC Cloud Engineer
EMC Data Center Architect (all versions)
EMC Data Science Associate
EMC Data Science Specialist, Advanced Analytics
EMC Implementation Engineer - Expert
EMC Implementation Engineer - Specialist
EMC Information Storage Associate
EMC Platform Engineer - Specialist
EMC Storage Administrator - Associate
EMC Storage Administrator - Expert
EMC Storage Administrator - Specialist
EMC System Administrator – Documentum Specialist
EMC Technology Architect - Expert
EMC Technology Architect - Specialist
GIAC Assessing and Auditing Wireless Networks
GIAC Certified Forensics Analyst
GIAC Certified Forensics Examiner
GIAC Certified Incident Handler
GIAC Certified Intrusion Analyst
GIAC Certified Penetration Tester
GIAC Certified Perimeter Protection Analyst
GIAC Certified Project Manager
GIAC Certified Unix Security Administrator
GIAC Certified Web Application Defender
GIAC Certified Windows Security Administrator
GIAC Critical Controls Certifications
GIAC Cyber Threat Intelligence
GIAC Enterprise Defender
GIAC Exploit Researcher and Advanced Penetration
  Tester
GIAC Information Security Fundamentals
GIAC Information Security Professional
GIAC Mobile Device Security Analyst
GIAC Network Forensic Analyst
GIAC Python Coder
GIAC Reverse Engineering Malware
GIAC Secure Software Programmer--Java
GIAC Security Essentials
GIAC Security Expert
GIAC Security Leadership
GIAC Systems and Network Auditor
GIAC Web Application Penetration Tester

Google Cloud Certified Professional Cloud Architect
Google Cloud Certified Professional Data Engineer
Google Professional Cloud Developer
Google Professional Cloud Network Engineer
Google Professional Cloud Security Engineer
HDI Customer Service Representative
HDI Desktop Support Manager
HDI Desktop Support Technician
HDI Support Center Analyst
HDI Support Center Director
HDI Support Center Manager
HDI Support Center Team Lead
HDI Technical Support Professional
Help Desk Analyst: Tier 1 Support Specialist/Ed2Go
Help Desk Team Lead/RCCSP
HP Accredited Integration Specialist
HP Accredited Solutions Expert (all)
HP Accredited Technical Professional (all)
HP ASE – Cloud Integrator V2
HP ASE - Storage Solutions Architect V1 /V2
HP ASE Cloud Architect V2
HP ASE Vertica Big Data Solutions Administrator V1
HP ATP - Cloud Administrator V1
HP ATP - Storage Solutions V1 /V2
HP ATP Big Data Vertica Solutions V1
HP Master Accredited Solutions Expert (all)
Huawei Certified Network Associate (all)
Huawei Certified Network Professional (all)
Huawei Certified Network Expert (all)
IBM Advanced Systems Administrator (all)
IBM Certified Administrator for SOA Solutions:
WebSphere Process Server
IBM Advanced Systems Administrator (all)
IBM Certified Administrator - Cognos
IBM Certified Advanced Application Developer (all)
IBM Certified Application Developer (all)
IBM Certified Database Administrator - DB2
IBM Certified Designer - Cognos BI
IBM Certified Developer - Cognos
IBM Certified Solution Advisor - Cloud Computing Architecture V5
IBM Certified Solution Advisor - DevOps V2
IBM Certified Solution Architect – Cloud Computing Infrastructure V1
IBM Certified Solution Designer (all)
IBM Certified Solution Developer - DB2 SQL

IBM Certified Solution Developer: WebSphere (all)
IBM Certified Specialist - z System (all)
IBM Certified Specialist - Virtualized Storage V1
IBM Certified Systems Administraton: WebSphere DataPower SOA
IBM Certified Systems Administrator - AIX V1
IBM Certified Systems Administrator - WebSphere AS
IBM Certified Systems Administrator (all)
Information Systems Security Architecture Professional
Information Systems Security Engineering Professional
Information Systems Security Management Professional
ITIL Expert Certification
ITIL Foundation Certification
ITIL Intermediate Certification
ITIL Master Certification
JBoss Certified Developer (Seam, Persistence, ESB)
Juniper Networks Certified Internet Associate
Juniper Networks Certified Internet Expert
Juniper Networks Certified Internet Professional
Juniper Networks Certified Internet Specialist
Linux Professional Institute certification (LPIC- 2)
Linux Professional Institute certification (LPIC- 3)
Microsoft Certified Professional
Microsoft Certified Solutions Associate(all)
Microsoft Certified Solutions Associate: Cloud Platform
Microsoft Certified Solutions Associate: Microsoft Dynamics 365
Microsoft Certified Solutions Associate: SQL 2016 DBA
Microsoft Certified Solutions Associate: SQL Server 2012/2014/2016
Microsoft Certified Solutions Associate: Web Applications
Microsoft Certified Solutions Associate: Windows Server 2012/2016
Microsoft Certified Solutions Developer
Microsoft Certified Solutions Developer: Applications Builder
Microsoft Certified Solutions Expert – Server Infrastructure
Microsoft Certified Solutions Expert: Business Intelligence

Microsoft Certified Solutions Expert: Cloud Platform and Infrastructure
Microsoft Certified Solutions Expert: Data Management and Analytics
Microsoft Certified Solutions Expert: Data Platform
Microsoft Certified Solutions Expert: Desktop Infrastructure
Microsoft Certified Trainer
Microsoft Office Specialist
Microsoft Specialist in Windows 10
Mongo DB Certified DBA
Mongo DB Certified Developer
MongoDB Certified Developer Associate
NetApp Certified Data Administrator, ONTAP
NetApp Certified Implementation Engineer
NetApp Certified Storage Associates – Hybrid Cloud
NetScout/nGenius Certified Analyst
NetScout/nGenius Certified Expert
NetScout/nGenius Certified Master
NetScout/nGenius Certified Professional
Novell/Certified Administrator
Novell/Certified Novell Engineer
Novell Certified Instructor
Novell Certified Linux Engineer
Novell Certified Linux Professional
Novell Identity Manager Administrator
Open Group Certified Architect)
Open Group Certified IT Specialist
Oracle Business Intelligence Foundation Suite 11G Certified Implementation Specialist
Oracle Certified Associate - DBA (OCA)
Oracle Certified Associate - Java SE Programmer
Oracle Certified Associate - MySQL 5
Oracle Certified Associate - WebLogic Server Administrator
Oracle Certified Expert - Java Platform EE Developer (all)
Oracle Certified Expert - MySQL 5.1 Cluster Database Administrator
Oracle Certified Expert - Siebel CRM Business Analyst
Oracle Certified Expert - Solaris 10 Network Administrator for Solaris
Oracle Certified Master - DBA (OCM)
Oracle Certified Master - Java EE Enterprise Architect
Oracle Certified Master - Java SE Developer
Oracle Certified Professional - Advanced PL/SQL Developer
Oracle Certified Professional - Application Server Administrator

Oracle Certified Professional - Database Cloud Administrator
Oracle Certified Professional - DBA (OCP)
Oracle Certified Professional - E-Business Suite 12
Oracle Certified Professional - Forms Developer
Oracle Certified Professional - Java EE Web Services Developer
Oracle Certified Professional - Java SE Programmer
Oracle Certified Professional - MySQL 5 Database Administrator
Oracle Certified Professional - MySQL 5 Developer
Oracle Certified Professional - PL/SQL Developer
Oracle Certified Professional - Solaris 10 Systems Administrator
Oracle Certified Professional, Java EE Web Component Developer
Oracle Certified WebLogic Server System Administrator Certified Expert
Oracle Exadata 11g Certified Implementation Specialist
Oracle Linux Certified Administrator
Oracle SOA Infrastructure Implementation Certified Expert
Oracle VM 3.0 for x86 Certified Implementation Specialist
Pegasystems Certified Lead System Architect
Pegasystems Certified Senior Systems Architect
Pegasystems Certified System Architect
Pegasystems Certified Pega Business Architect
PHP Certification
PMI Agile Certified Practitioner
PMI Portfolio Management Professional (PfMP)
PMI Professional in Business Analysis (PMI-PBA)
PMI Program Management Professional (PgMP)
PMI Project Management Professional (PMP)
PMI Risk Management Professional (PMI-RMP)
Prince2 Foundation
Prince2 Practitioner
Professional Certified Investigator
Professional in Project Management (GAQM)
Qualified Information Security Professional Q/ISP
Rackspace Certified Technician
Red Hat Certified Architect
Red Hat Certified Architect: Application Development
Red Hat Certified Architect: Application Platform
Red Hat Certified Architect: Cloud
Red Hat Certified Architect: DevOps
Red Hat Certified Datacenter Specialist

Red Hat Certified Engineer in Red Hat OpenStack
Red Hat Certified Engineer
Red Hat Certified Specialist in Virtualization
Red Hat Certified System Administrator in Red Hat OpenStack
Red Hat Certified Systems Administrator
RSA Certified Administrator (RSA/CA)
RSA Certified Instructor (RSA/CI)
Salesforce.com Certified Force.com Advanced Developer
Salesforce.com Certified Force.com Developer
Salesforce.com Certified Technical Architect
Salesforce.com Certified Administrator
Salesforce.com Certified Advanced Admnistrator
SAS Certified Advanced Programmer for SAS 9
SAS Certified Base Programmer for SAS 9
SAS Certified Big Data Professional Using SAS 9
SAS Certified Data Integration Developer for SAS 9
SAS Certified Data Scientist Using SAS 9
SAS Certified Predictive Modeler - SAS Enterprise Miner 14
SAS Certified Statistical Business Analyst - SAS 9
SAS® Certified Advanced Analytics Professional Using SAS®9
SAS® Certified BI Content Developer for SAS®9
SAS® Certified Data Quality Steward for SAS®
Security Certified Network Architect
Security Certified Network Professional
Security Certified Network Specialist
Siebel 8 Consultant Certified Expert
Six Sigma Black Belt
Six Sigma Green Belt
Six Sigma Master Black Belt
Six Sigma Yellow Belt
SNIA Certified Storage Architect
SNIA Certified Storage Networking Expert
SNIA Certified Storage Professional
SNIA Certified Systems Engineer Sniffer Certified Expert
SolarWinds Certified Professional
SUSE Certified Administrator
SUSE Enterprise Engineer
SUSE Enterprise Architect
Systems Security Certified Practitioner
Teradata 14 Certified Associate
Teradata 14 Certified Database Administrator
Teradata 14 Certified Enterprise Architect
Teradata 14 Certified Master

Teradata 14 Certified Professional
Teradata 14 Certified Solutions Developer
Teradata 14 Certified Technical Specialist
TIBCO Certified Professional
TIBCO Certified SOA Architect
TOGAF 9 Certified
VMware Certified Advanced Professional 6.5– Data Center Virtualization Design
VMware Certified Advanced Professional – Network Virtualization
VMware Certified Advanced Professional (all)
VMware Certified Advanced Professional 6– Data Center Virtualization Deployment
VMware Certified Advanced Professional 6/7 - Cloud Mgt and Automation Deployment
VMware Certified Advanced Professional 6/7 - Cloud Mgt and Automation Design
VMware Certified Associate - Cloud
VMware Certified Associate - Data Center Virtualization
VMware Certified Design Expert – Network Virtualization
VMware Certified Design Expert - Cloud Mgt and Automation
VMware Certified Design Expert (all)
VMware Certified Design Expert 6 - Data Center Virtualization
VMware Certified Professional - Digital Workspace
VMware Certified Professional - Network Virtualization
VMware Certified Professional 6 - Data Center Virtualization
VMware Certified Professional 6.5 - Data Center Virtualization
VMware Certified Professional 6/6.5
VMware Certified Professional 6/7 - Cloud Mgt and Automation

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Tech Skills (Non-certified): Latest market value trends

(Data collected through April 1, 2019)

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2-YEAR NON-CERTIFIED TECH SKILLS PAY TRENDS

(Through 4/1/2018 – 77,915 IT Professionals)

NONCERTIFIED IT SKILLS CATEGORIES	# of skills surveyed	Change in Average Premium Pay by Category			
		% Change 3 mos	% Change 6 mos	% Change ANNUAL	% Change 2 yrs
Systems/Networking	86	-0.6%	-0.2%	-0.8%	0.3%
Messaging and Communications	14	0.0%	-1.0%	-7.9%	-8.5%
SAP & Enterprise Business Applications	130	-1.9%	-3.4%	-6.2%	-6.4%
Apps Development Tools & Platforms	95	0.8%	2.9%	4.9%	10.4%
Web/e-Commerce Development	84	-1.0%	-1.5%	-4.3%	-2.2%
Data/Database	45	3.0%	5.8%	6.6%	9.4%
Operating Systems	15	2.3%	1.5%	2.7%	2.7%
Management/Methodology/Process	85	-0.1%	1.2%	0.1%	-3.1%
ALL NONCERTIFIED SKILLS REPORTED	554	0.0%	0.6%	-0.7%	0.8%

NON-CERTIFIED TECH SKILLS PAY TRENDS BY CATEGORY
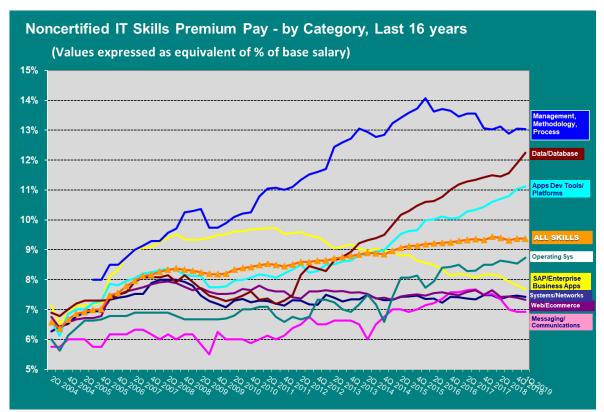
Average Median Pay for a Single Tech Skill (Non-certified)

(Through 4/1/2018 – 77,915 IT Professionals)

SOURCE**:** Data supporting these charts is from Foote Partners *IT Skills & Certifications Pay Index™* (2004 to 2019 quarterly editions)

Noncertified IT Skills Premium Pay - by Category, Last 16 years

(Values expressed as equivalent of % of base salary)

Apps Dev. Tools/Platforms

- Agile software development
- Amazon Kinesis
- Amazon Web Services (EC2, S3, ASW, SQS, ELB, et. al.)
- Apache Ant
- Apache Cloudstack
- Apache Cordova
- Apache Flex
- Apache Hadoop
- Apache Lucene
- Apache Maven
- Apache Pig/Pig Latin
- Apache Spark
- Apache Struts/Struts2
- Apache Tomcat
- Apache Zookeeper
- Automated Testing
- AWS CloudFormation
- AWS Lambda
- Bitbucket
- Boost C++
- Business Objects
- C
- C#
- C++
- C++ /CLI
- CA PPM(Clarity PPM)
- Cerner Millennium
- Clojure
- Cloudera software
- Cloud Foundry PaaS
- Cobol
- Cognos
- Confluence
- Cucumber
- Delphi
- Drupal
- Eclipse
- Epic Systems applications
- Ethereum
- F#
- Git/GitHub
- GitLab
- Go language (Golang)
- Gosu/Guidewire
- Google Kubernetes
- Gradle
- Grails/Groovy

- Grunt
- Hibernate/NHibernate
- HP ALM (App. Lifecycle Mgt)
- Integration Testing
- iRise
- Jasmine
- Java SE/Java EE
- JBehave
- Jenkins
- JIRA
- JUnit
- MapReduce
- MATLAB
- Microsoft Azure
- Microsoft SQL Server Mgt Studio
- Microsoft Team Foundation Server
- NetWeaver
- Nim
- NUnit
- Objective-C
- Objective Caml (Ocaml)
- OpenShift
- Oracle APEX
- Oracle Apps Developer Framework
- PL/SQL
- Powerbuilder
- Progress 4GL/Development tools
- Prometheus
- R language
- Ruby
- Ruby on Rails
- SaaS
- SAS
- Scala
- Scrum
- Selenium
- ServiceNow ITSM
- SPSS
- SQL
- Swift
- Tcl
- TransacT-SQL/tSQLt
- UML (unified modeling language)
- Visual Basic 6.0
- Visual C++
- VMware Cloud Foundry PaaS
- WebSphereMQ,
- Xcode

SAP & Enterprise Bus. Apps.

- ABAP (all modules)
- Baan
- Enterprise Application Integration (EAI)
- IBM Sterling
- J.D. Edwards /Oracle
- Lawson
- Microsoft Dynamics
- NetWeaver
- NetWeaver Portal (SAP EP)
- Oracle BPM
- Oracle CRM
- Oracle E-Business suite
- Oracle Eloqua
- Oracle ERP
- Oracle Financials
- Oracle HFM (Hyperion Fin. Mgt)
- Oracle HRMS
- Oracle NetSuite
- Oracle Payroll
- Oracle Retail
- Oracle SCM
- Oracle SOA Suite
- Pega
- PeopleSoft (CRM/Financials/HCM)
- Remedy
- Salesforce
- Accelerated SAP (SLM)
- SAP AFS
- SAP ALE
- SAP APO
- SAP Auto-ID infrastructure
- SAP Digital Banking
- SAP Basis Components
- SAP BI Accelerator
- SAP BODI
- SAP Data Services (SAP BODS)
- SAP BOXI/Crystal Reports
- SAP BPC
- SAP BSP
- SAP Business One
- SAP Business Workflow/Webflow
- SAP CA
- SAP CAF
- SAP CAR
- SAP CCM
- SAP CE
- SAP CFM
- SAP CO

- SAP CO-PA
- SAP CRM
- SAP CS
- SAP EBP
- SAP EDI
- SAP EHS
- SAP EPM
- SAP ERP
- SAP ESA
- SAP Exchange Infrastructure (XI)
- SAP FI (Financial Accounting)
- SAP FI - CA
- SAP FI – FSCM
- SAP FI - Travel Management
- SAP Fiori
- SAP F&R
- SAP FS (Insurance)
- SAP GRC
- SAP GTS
- SAP HANA
- SAP HCM (SAP HR)
- SAP HCM ESS/MSS
- SAP HR-PA
- SAP Hybris
- SAP Integrated Business Planning
- SAP IS-Retail
- SAP IS-U (Utilities)
- SAP ITS
- SAP Leonardo
- SAP LES
- SAP LO
- SAP Lumira
- SAP Manufacturing
- SAP MDG (Master Data Governance)
- SAP MDM
- SAP MDX
- SAP MI
- SAP MII
- SAP MM
- SAP MRO
- SAP MRS
- SAP Netweaver Applications Server
- SAP Netweaver BW (BIW)
- SAP NetWeaver Visual Composer
- SAP NWDI
- SAP NWDS
- SAP Oil & Gas
- SAP PI (NetWeaver Process Integ.)
- SAP PLM

- SAP PM
- SAP POSDM
- SAP PP
- SAP PS
- SAP PSCD
- SAP Public Sector Management
- SAP PY (Payroll)
- SAP QM
- SAP Service & Asset Mgt
- SAP S/4HANA
- SAP SCM
- SAP SD
- SAP SD - GTS
- SAP Security
- SAP SEM
- SAP SM
- SAP Smart Forms
- SAP Solution Manager
- SAP SRM
- SAP TM
- SAP UI5 (UI development toolkit for HTML5)
- SAP Web Application Server
- SAP WEBI
- SAP WM
- SAP WM – EWM
- SAP Xcelsius
- Siebel/Siebel Analytics
- Software AG webMethods
- SuccessFactors
- Web Dynapro
- Workday HCM

Web/e-Commerce Development

Active Server Pages
ActiveX
Adobe Experience Manager
Ajax
AngularJS
Apache Solr
Apache web server
Apache Wicket
Apex Code
Backbone.js
CGI
Cold Fusion MX
Content management systems
CSS/CSS3
Django
Docker
Documentum
Elasticsearch
Ember.js
Front End Development
Google Analytics
Google App Engine
Google Cloud Platform
HTML5
JavaBeans/EJB 3.0
JavaFX
HTML5
JavaBeans/EJB 3.0
JavaFX
JavaScript
JavaScript
Java Server Pages
JBoss Enterprise
Jetty
Joomla!
jQuery
JSON
KnockoutJS
Magento
Magnolia
Microsoft .NET
Microsoft BizTalk Server
Microsoft Commerce Server
Microsoft Identity Integration Server
Microsoft Internet Information Services
Microsoft Internet Security and
    Acceleration Server (ISA)

Microsoft SharePoint/SharePoint
Server
Microsoft Silverlight
Microsoft Visual Studio
Mobile applications development
Mule/MuleESB
Node.js
Oracle Fusion
Oracle WebLogic
Oracle Workflow
Pandas
Perl
PHP (all)
Python
React.js
Redux
REST
RESTful
SailPoint
Scalable Vector Graphics (SVG)
Secure software development
Sitecore CMS
SOAP
Social Media/Networks
Spring Framework
TIBCO
UDDI
Umbraco
VBScript
Video/graphics editing
Visual Interdev
VoiceXML
Web collaboration appliances Web
collaboration appliances
Web Content Development
Web Design/Development
WebSphere
WebSphere Datapower
Wikis
WSDL
XAML/XACML
XHTML MP
XML (all variants

Management, Methodology and Process

Artificial Intelligence
Big Data Analytics

Bioinformatics
Business Analysis
Business Analytics
Business intelligence
Business process management/
  modeling/improvement
Business performance
  management (software/systems)
Capacity Planning/Management
Change management
 COBIT
Collaboration software
Complex Event Processing/Event
  Correlation
Configuration Management
Continuous Improvement
Continuous Integration CRM
Cryptography (encryption, VPN)
Cybersecurity
Cyber Threat Intelligence
Data Acquisition and Control
Systems
Data Analytics
Data Architecture
Data Cleansing
Data Governance
Data Integration
Data Management
Data Modelling
Data Quality
Data Security
Data Science
Data Visualization
DevOps
Digital Analytics
Digital Forensics
eDiscovery
E-Procurement
ERP
Game Development
General Data Protection
Regulation(GDPR) (EU) 2016/679
Google TensorFlow
Incident Management
Information management
IT Governance
ITIL V3
Kanban

Machine Learning
Marketo
Metadata design and development
Microservices
Microsoft SQL Server Analysis Services
Microsoft Visio
Network Architecture
Penetration testing
Predictive Analytics and Modeling
Prescriptive Analytics
Program Management
Project management/governance
QlikView
Quality management/TQM
Quantitative Analysis/Regression Analysis
Razor
Requirements Engineering/Analysis
Risk analytics/assessment
Risk management
Robotic Process Automation
Security architecture and models
SEO
Service Management
Six Sigma/Lean Six Sigma
Social media analysis/analytics
Software development lifecycle
management
Splunk
Tableau
Test automation
Test Driven Development/Scripting
TIBCO ActiveMatrix BusinessWorks
TOGAF (Enterprise Architecture)
User Acceptance Testing
User Experience/Interface Design
Usability Research/Human Factors
  Research
Waterfall
Web Analytics
Webtrends analytics
Zachman Framework

Database

Amazon DynamoDB
Apache Cassandra
Apache CouchDB
Apache Hive
Azure Cosmos DB

Azure Data Factory
Azure SQL Database
Amazon RedShift
Azure SQL Database
Amazon RedShift
Base SAS
Blockchain
Cloudera Impala
Couchbase Server
Database management
Data mining
Data security
DB2
dBASE/xBASE
ETL (Extract, transform, load)
Hbase
Informatica
Java Database Connectivity
Master data management
Microsoft Access
Microsoft Exchange Server
    2003/2007/2010/2013
Microsoft SQL Server
    2016/2014/2012/2008/2005
MongoDB
MySQL
NoSQL
OpenEdge ABL (Progress 4GL)
Oracle Application Server
Oracle Business Intelligence Enterprise
    Edition Plus
Oracle Coherence
Oracle DB 9i/10g/11i/12c
Oracle Enterprise Manager
Oracle Exadata
Oracle Forms
Oracle Reports
PostgreSQL
Redis
Riak
Smart Contract
Sqoop
Sybase Adaptive Server
Teradata
TIBCO Spotfire
Visual SQL

Systems/Networks

Active Directory
Ansible
Apache Flume
Arista
ATM
Azure Active Directory
Business continuity and disaster recovery
    planning
CA Endevor
Chef/Opscode
Cisco ASA
Cisco CUCM
Cisco ICM
Cisco ISE/Identity Services Engine
Cisco IPCC
Cisco Nexus
Cisco Prime
Cisco UCCE
Cisco UCCX
Citrix XenApp
Citrix XenServer
Cloud architecture
Cloud security
DHCP
EIGRP
Ethernet
Fast Ethernet
Gigabit Ethernet(1 GigE/10 GigE)
HP Converged System
HP Quality Center
HTTPS
IaaS (Infrastructure as a Service)
Infrastructure architecture
Intrusion prevention/detection systems
IPX/SPX
Juniper
LAN
LTE
Microsoft Application Virtualization
Microsoft Hyper-V
Microsoft SCCM
Microsoft SCVMM
Microsoft Virtual Server
Mobile device management
Mobile security
Multiprotocol Label Switchin

NAS/Network Attached Storage
Network access control/Identity mgt
    systems
Network security management
Novell Netware
PaaS
Performance Analysis/Tuning
Performance Testing
Puppet
Rackspace Cloud
RedHat OpenShift
Routing (e.g. OSPF)
Salt
SAN/Storage Area Networks
Security skills (project-based)
Security Information and Event
    Management (SIEM)
Smart Contract
SMTP
SNA
SolarWinds
Storage virtualization/administration
TCP/IP
Terraform
Tivoli
Vagrant
vCloud
Virtualization (various)
Virtual security
VMware Server/ESX, ESXi Server
VMware NSX
VoIP/IP telephony
VPN/OpenVPN
WAN/3G/4G services
Web Infrastructure
Web services security
Wireless Network Mgmnt
Wireless security
Wireless sensors/RFID
Wireline Networking/Telecomm.
WML

Messaging & Communications

ActiveMQ
Apache Camel
Apache Kafka
IBM Domino
Java Messaging Service
Message-oriented Middleware
    (Wave, XMPP/Jabber, etc.)
Microsoft Exchange
Novell Groupwise
Oracle Comm Messaging Server
Outlook/cc:mail/various clients
RabbitMQ
TIBCO Enterprise Message Service
TIBCO Rendezvous
 Unified Communications/Messaging

Operating Systems

AIX
Apache Cloudstack
CoreOS
HP-UX
Linux
Mac OS X
Mobile operating systems (iOS,
Android)
OpenStack
Red Hat Enterprise Linux
Solaris
SUSE
Unix (all)
VMware vSphere
Windows 8/10
Windows NT
Windows Server 2008/2012

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Q2 2019 Trend Charts

2019 IT Skills & Certifications Volatility Index™

(Data collected through April 1, 2019)

Demand dynamics in benchmarked certified and non-certified IT skills pay

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TREND HIGHLIGHTS   2019 IT Skills & Certifications Volatility Index™

Volatility in market value for individual IT skills and certifications---defined as incidence of gains or declines over a period of time in premium pay earned by IT professionals for specific technical and business skills---increased from January 1, 2019 to April 1, 2019 according to the latest update of Foote Partners' long-running *IT Skills and Certifications Pay Index™* of market values for tech skills. Market value is measured by tracking additional cash compensation paid to workers by their employers for specific certified and non-certified skills they possess.

Current Quarterly Recap (data collected through April 1, 2019)

TOTAL: All Skills and Certifications

- **22.5%** of skills and certifications (229 of 1,017) changed in market value in 1st Quarter 2019 compared to **23.4%** in the prior quarter

- **106** gained value and **123** declined in value

CERTIFIED SKILLS

- **16.5%** of reported certifications (77 of 466) changed market value in 1st Quarter 2019, up slightly from **16.2%** volatility in the prior quarter.

- **27** certifications gained market value; **570** declined in value

NON-CERTIFIED SKILLS

- **27.6%** of reported skills (152 of 551) changed value in 1st Quarter 2019, down from **29.2%** in the prior quarter.

- **79** gained in market value; **73** declined in value

Tracking skills volatility is useful in many ways: analyzing and forecasting demand for skills; monitoring IT workforce transition; and understanding IT management decision making. In fact, we believe statistical volatility in IT skills pay offers a more complete story of true labor market conditions than salary movements and hiring behavior, among other common indicators. Important in this distinction is that skills can be segmented and benchmarked more meaningfully than jobs allowing to microanalyses.

Similar to jobs, IT skills have broad skills categories that can be tracked (e.g., security, networking, systems, database, applications development). But unlike jobs, skills pay can be pinpointed to hundreds of niches and specialization. Also, unlike most job trends analyses, within skills categories and niches are *vendor-specific* and *vendor independent* skill specializations for more granular tracking, analysis, and forecasting.
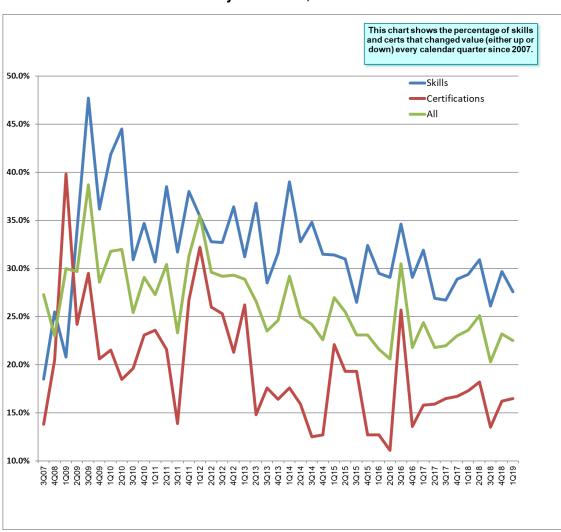
Skills and certifications volatility prior to 2008 averaged in the 14% - 19% range. Quarterly volatility in the last two years has been in the 20% to 31% range. This is an important shift that we believe signals a move that employers are taking a more long-term view to building their tech workforces for emerging technologies such as Blockchain, AI/Machine learning, and a variety of digital solutions. Tech leaders right now are demanding more agility, faster reaction times, and more predictable execution; this is keeping volatility high as skills markets constantly adjust to meet surges in demand for specific certified and non-certified skills.

They will be able to achieve those capabilities through applying architecture principles and practices to people management. We discuss this in greater detail earlier in this report.

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TECH SKILLS VOLATILITY HIGHLIGHTS - 13 Year Trending

IT Skills and Certifications Volatility Index™ – 1,033 Skills and Certifications

This chart shows the percentage of skills and certs that changed value (either up or down) every calendar quarter since 2007.

Legend: Skills, Certifications, All

Recent IT skills and certifications volatility trends

QUARTERLY SUMMARY

1st Quarter 2019 volatility in skills and certifications values measured 22.5%, a point lower that the 23.2% the prior quarter and close to the average for the past 12 months and 24 months.

NON-CERTIFIED SKILLS VOLATILITY in this quarter was two points lower than the prior quarter: 27.6% vs. 29.7%

<u>FINDING</u>: *Q1 volatility was a point lower than average quarterly volatility for the past 12 months.*
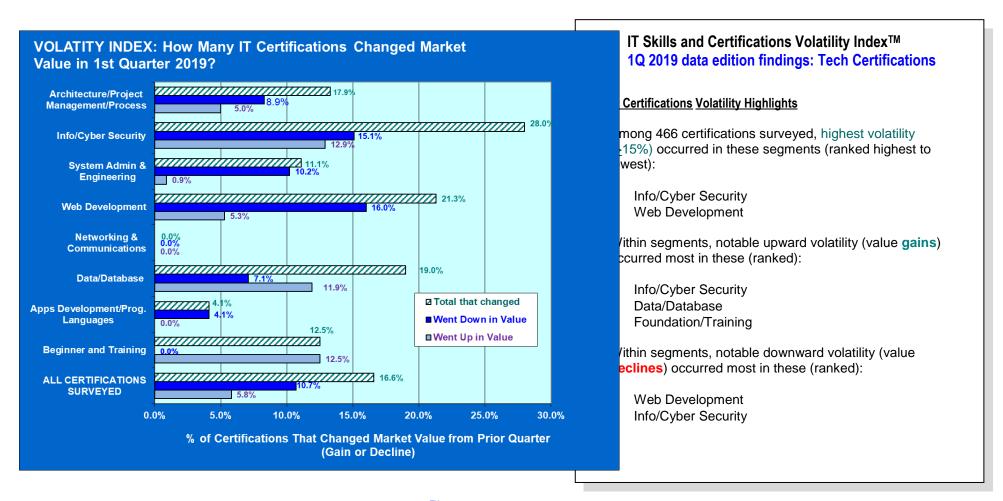
IT CERTIFICATIONS VOLATILITY in this quarter, 16.5%, was virtually unchanged from the prior quarterly (16.2%).

<u>FINDING</u>: *Q1 volatility was virtually the same as the averages for the last 12, 24, and 26 months*

(Pay data supporting these charts available in the *IT Skills and Certifications Pay Index™* – 2007 to 2019 quarterly data edition)

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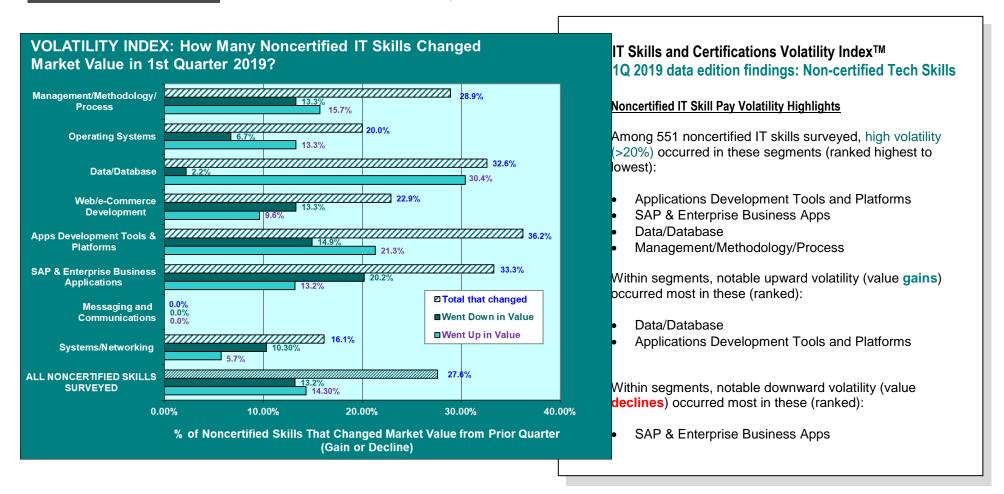
VOLATILITY HIGHLIGHTS **Tech Certifications – 1st Quarter 2019 data**

VOLATITY INDEX: How Many IT Certifications Changed Market Value in 1st Quarter 2019?

% of Certifications That Changed Market Value from Prior Quarter (Gain or Decline)

IT Skills and Certifications Volatility Index™
1Q 2019 data edition findings: Tech Certifications

Certifications Volatility Highlights

mong 466 certifications surveyed, highest volatility 15%) occurred in these segments (ranked highest to west):

   Info/Cyber Security
   Web Development

ithin segments, notable upward volatility (value **gains**) ccurred most in these (ranked):

   Info/Cyber Security
   Data/Database
   Foundation/Training

ithin segments, notable downward volatility (value **eclines**) occurred most in these (ranked):

   Web Development
   Info/Cyber Security

(Source: Foote Partners LLC, 2019 IT Skills & Certifications Pay Index™)

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VOLATILITY HIGHLIGHTS Noncertified Tech Skills – 1st Quarter 2019 data

VOLATILITY INDEX: How Many Noncertified IT Skills Changed Market Value in 1st Quarter 2019?

% of Noncertified Skills That Changed Market Value from Prior Quarter (Gain or Decline)

- Total that changed
- Went Down in Value
- Went Up in Value

IT Skills and Certifications Volatility Index™
1Q 2019 data edition findings: Non-certified Tech Skills

Noncertified IT Skill Pay Volatility Highlights

Among 551 noncertified IT skills surveyed, high volatility (>20%) occurred in these segments (ranked highest to lowest):

- Applications Development Tools and Platforms
- SAP & Enterprise Business Apps
- Data/Database
- Management/Methodology/Process

Within segments, notable upward volatility (value **gains**) occurred most in these (ranked):

- Data/Database
- Applications Development Tools and Platforms

Within segments, notable downward volatility (value **declines**) occurred most in these (ranked):

- SAP & Enterprise Business Apps

(Source: Foote Partners LLC, 2019 IT Skills & Certifications Pay Index™)

IT Skills and Certifications Pay Index™

- Pay premiums for **1,033 certified and noncertified IT skills**
  - Three data points for each position: 10th, 50th, 90th percentile

- Verified and validated IT skills pay data from **77,915 IT professionals at 3,318 employers** in US and Canada

- Current data collected through April 1, 2019 (updated quarterly)

- Excel format data tables. Master agreements for data loading in place with MarketPay, CompAnalyst, WillisTowersWatson.

- Certifications Guide containing basic information about surveyed IT certifications (pre-requisites; costs; test content; lab requirements, etc.)

Pricing: $5,800 single edition. $19,800 annual subscription

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Definition of IT skills premium pay

- Pay that IT workers receive for possessing high-value IT and business skills used on the job

- Given in the form of a bonus, or embedded in base salary to adjust for the presence of a dominant vendor or technology central to job performance (examples: Cisco Network Engineer, Python Software Engineer, Redhat Linux Systems Administrator, or SAP Developer.)

- Often used to adjust either base pay or total pay in situations where job title does not match actual on-the-job duties and responsibilities, and changing the job title is not an attractive option

- May be used as a reward, recruiting inducement, retention tool, or as a guide for creating consulting rate cards

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ABOUT THIS RESEARCH

Foote Partners' primary research survey for tracking IT skills and certifications pay and supply/demand volatility is the industry-leading *IT Skills and Certifications Pay Index™* **(ITSCPI),** launched in 1999 and updated every three months since that time. Data covering 300,616 tech professionals at 3,318 employers in 83 U.S. and Canada cities are reported for IT salaries and skills pay earned for 222 positions and 1,033 certified and noncertified technical and business skills. Verified and validated pay data for 77,915 tech workers has been included in the 1st Quarter 2019 data edition of the ITSCPI, compiled from data collected through April 1, 2019.

Demographics of the participating organizations for our latest update are as follows, measured most appropriately for the type of business, by revenues, assets, total premiums and operating budgets:
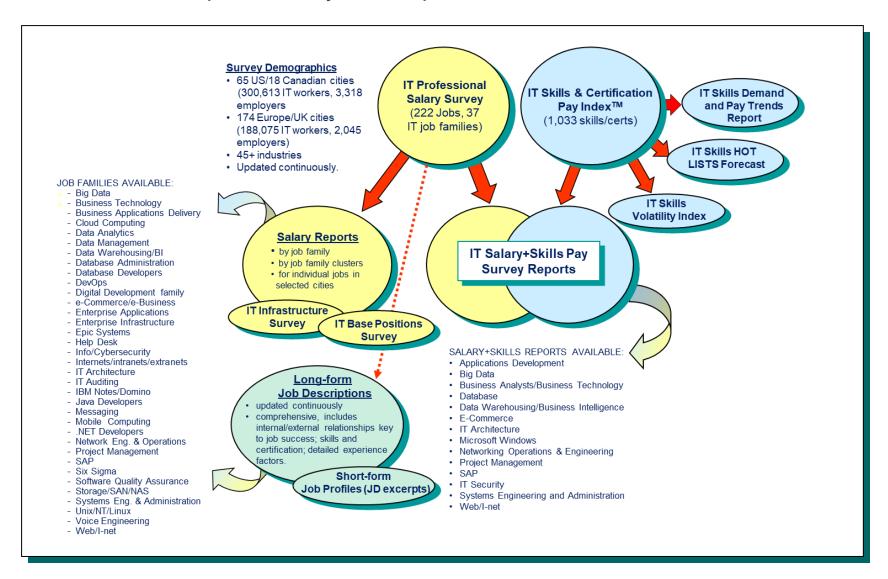
- 18% of participating organizations have $5 billion+ in sales/$15+ billion in total assets

- 28% of participating organizations earn more than $1 billion in annual revenues or more than $5 billion in total assets

- 46% of participating organizations have $500+ million in sales/$1+ billion in total assets/$500+ million in premiums/$500+ million operating budget (government, educational, not-for-profit)

- 54% of participating organizations fall in the SMB (small-to-medium sized business) segment, generally defined as organization under $500 million in sales.

- [Public sector] 5% have operating budgets of $500 million or more, [nonprofit/educational sectors] 4% with operating budgets $100 million to less than $500 million

TO OBTAIN A COPY OF THE LATEST *IT SKILLS AND CERTIFICATIONS PAY INDEX™*

Please visit the Foote Partners web site: http://www.footepartners.com/itcompensation.html

Foote Partners 2Q 2019 IT Compensation Survey Product Map

Survey Demographics
- 65 US/18 Canadian cities (300,613 IT workers, 3,318 employers
- 174 Europe/UK cities (188,075 IT workers, 2,045 employers)
- 45+ industries
- Updated continuously.

IT Professional Salary Survey
(222 Jobs, 37 IT job families)

IT Skills & Certification Pay Index™
(1,033 skills/certs)

IT Skills Demand and Pay Trends Report

IT Skills HOT LISTS Forecast

IT Skills Volatility Index

JOB FAMILIES AVAILABLE:
- Big Data
- Business Technology
- Business Applications Delivery
- Cloud Computing
- Data Analytics
- Data Management
- Data Warehousing/BI
- Database Administration
- Database Developers
- DevOps
- Digital Development family
- e-Commerce/e-Business
- Enterprise Applications
- Enterprise Infrastructure
- Epic Systems
- Help Desk
- Info/Cybersecurity
- Internets/intranets/extranets
- IT Architecture
- IT Auditing
- IBM Notes/Domino
- Java Developers
- Messaging
- Mobile Computing
- .NET Developers
- Network Eng. & Operations
- Project Management
- SAP
- Six Sigma
- Software Quality Assurance
- Storage/SAN/NAS
- Systems Eng. & Administration
- Unix/NT/Linux
- Voice Engineering
- Web/I-net

Salary Reports
- by job family
- by job family clusters
- for individual jobs in selected cities

IT Infrastructure Survey

IT Base Positions Survey

IT Salary+Skills Pay Survey Reports

Long-form Job Descriptions
- updated continuously
- comprehensive, includes internal/external relationships key to job success; skills and certification; detailed experience factors.

Short-form Job Profiles (JD excerpts)

SALARY+SKILLS REPORTS AVAILABLE:
- Applications Development
- Big Data
- Business Analysts/Business Technology
- Database
- Data Warehousing/Business Intelligence
- E-Commerce
- IT Architecture
- Microsoft Windows
- Networking Operations & Engineering
- Project Management
- SAP
- IT Security
- Systems Engineering and Administration
- Web/I-net

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ABOUT FOOTE PARTNERS

Foote Partners, LLC is a technology analyst firm and independent benchmark research organization focusing on the people (versus vendor) side of managing technology and technology value creation. A thought leader and trusted advisor to thousands of employers on five continents who purchase our products and services, our company provides pragmatic benchmark research and forward-thinking advice and market intelligence targeting the tech workforce in the modern highly integrated business/IT hybrid environment in which all private and public organizations now operate.

Our products are deeply grounded in specialized proprietary data-driven statistical and empirical research, benchmark surveys, and business intelligence collected from thousands of North American employers with whom we have deep longstanding research partnerships. These partnerships have been created and supported specifically to enable unique market intelligence views and difficult-to-find decision support research on the multiple facets of IT human capital management. As a group, these U.S., Canadian, and European partners were selected to meet strict criteria for what we believe is the most meaningful demographic representation for tech professionals in each local labor markets.

Founded in 1997 and comprised of former Gartner industry analysts, McKinsey & Company, Mercer and WillisTowersWatson senior consultants, and former corporate HR, IT, and business executives, the firm's research division publishes 70+ quarterly-updated benchmarking, analytical research and forecasting products that help employers benchmark their IT compensation, solve difficult information technology management and workforce problems, and strengthen their ability to execute complex business solutions.

Foote Partners tech compensation survey findings and labor market trend analyses are featured regularly in countless business, HR, and IT media sources and periodicals around the globe, including *Bloomberg BusinessWeek, Forbes, Fortune, Wall Street Journal*, *New York Times*, *CIO Magazine, ComputerWorld,* and WorldatWork's *Journal* and *Workspan Magazine*; and in appearances on network and cable television, National Public Radio, and countless podcasts and webcasts.

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