Developer Insights Report

A Global Survey of Today's Developers | August 2015

{ **Application Developers Alliance** }

Contents

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Snapshot of Today's Global Developer

Today's developers can be portrayed by these core traits:

70%
Employed
Work in enterprises, 45% in orgs >100 employees

68%
Experienced
Have 5 or more years of experience

57%
Anxious to stay current
Challenged to keep up with dev technology

71%
Balanced
Work equally (71% of developers) on business & consumer apps

75%
Open source
Use open source software

74%
Team player
Work in teams, 85% in teams <15 devs

88%
Polyglot
Multilingual (programming languages)

66%
Energized
Excited about wearables (44%) and/or robotics (38%)

83%
Self-reliant
Use search engines and independent forums to get help

IDC Analyze the Future

Executive Summary

In April 2015, the Alliance commissioned IDC to conduct an extensive global survey of software developers yielding over 850 responses. The survey cut across a broad cross-section of developers engaged in all paramount activities of application development. Some of the key findings are:

- Developers use multiple languages in their programming. 88% have used more than one language and 18% have used more than 5 languages in the past year.

- The causes of software projects failing is a central debate. 48% of developers cited changing or poorly documented project requirements as the reason for failure while 40% cited underfunding or a lack of resources.

- Many more women are joining the developer ranks. While females comprise only 25% of all developers, they are more than 40% of newer developers.

- Mobile software development is now the norm. About 87% of respondents are engaged in mobile development, and 18% cited organizational commitment to a mobile-first approach.

- Java was the most highly cited programming language with 68% of developers possessing moderate or high Java skill levels. This is likely due to its entrenchment in enterprise systems and its use as the "native" language for Android. Javascript, which is built into all browsers, is the second most-cited programming language.

- Wearables, the Internet of Things (IoT) and robotics are the next wave technologies that are most exciting to developers today.

- Developers are anxious about staying current with the latest trends with 57% reporting they are challenged to keep up with new development technology

- Developers work in teams (74%) and are increasingly working in smaller teams. 60% of developers work in teams of 5 people or less, and 85% in teams of 15 people or less.

- Four in five developers use open source code in software development, and over two in five reported they contribute to open source projects. This is the highest IDC has noted in open source engagement and represents an important milestone for open source.

Who Developers Are

The Alliance Global Developer Insight survey highlights the striking characteristics of these highly skilled, highly sought after individuals.
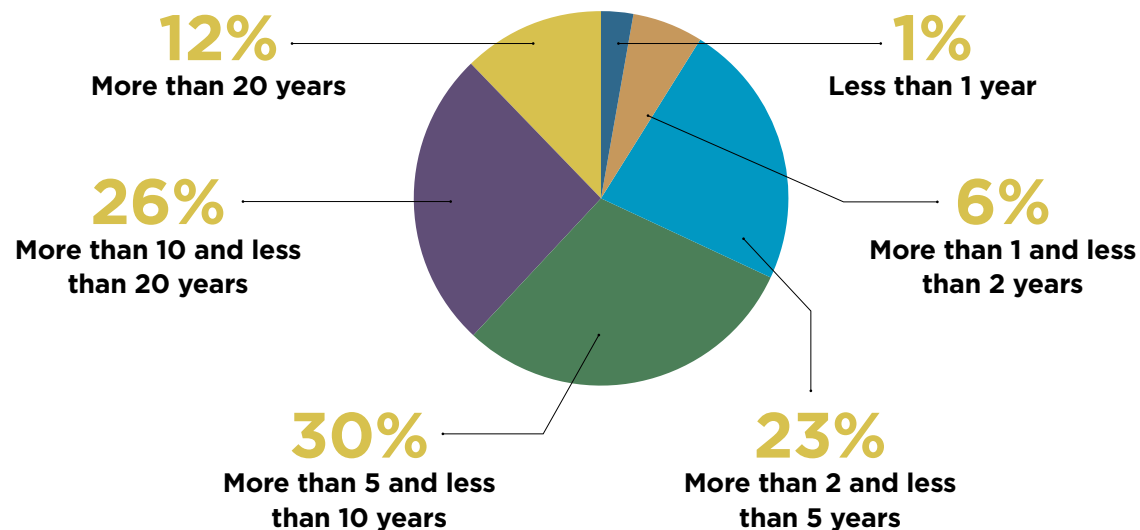
Developers take their job very seriously, are experienced team players, are passionate about all aspects of software development and are increasingly female.

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Experience

The survey shows that on the whole, software developers are very experienced. Developers consider software development to be highly complex, requiring considerable years of training or experience, and thus generally self-identify as an "established" software developer only after acquiring appropriate know-how. More than two thirds (68%) of developers reported as having over 5 years of experience and about an eighth (12%) have 20 or more years of experience. Given that the iPhone SDK shipped in October 2008 and was the genesis of the mobile app economy, we can ascertain that less than one third of all developers started developing during the mobile revolution.

Years of Development Experience

12%
More than 20 years

1%
Less than 1 year

26%
More than 10 and less than 20 years

6%
More than 1 and less than 2 years

30%
More than 5 and less than 10 years

23%
More than 2 and less than 5 years

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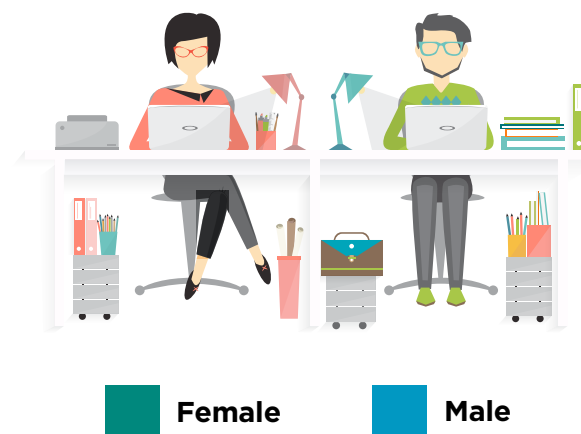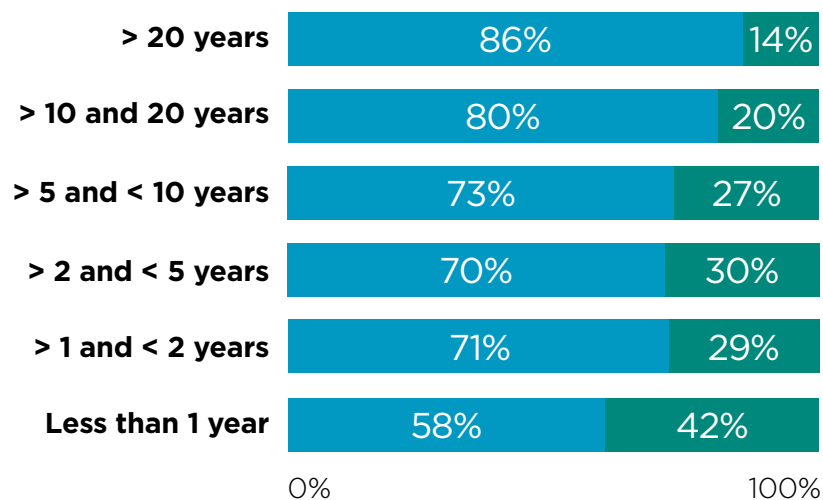Analyze the Future   N=855.

Drilling down further with regard to developers' experience, a clear trend of increased female participation in software development emerges. As would be expected, the most experienced (20+ years) developers are predominantly (86%) male. However, among the newer developers (1-5 years) nearly 30% are female, and 42% of the very newest developers are female.

The substantial increase in female developers in recent years corresponds with female enrollment trends in computer science programs. As a result, we expect the ratio of female developers to continue increasing over time.

Years of Experience by Gender

Experience	Male	Female
> 20 years	86%	14%
> 10 and 20 years	80%	20%
> 5 and < 10 years	73%	27%
> 2 and < 5 years	70%	30%
> 1 and < 2 years	71%	29%
Less than 1 year	58%	42%

0%   100%

Female   Male

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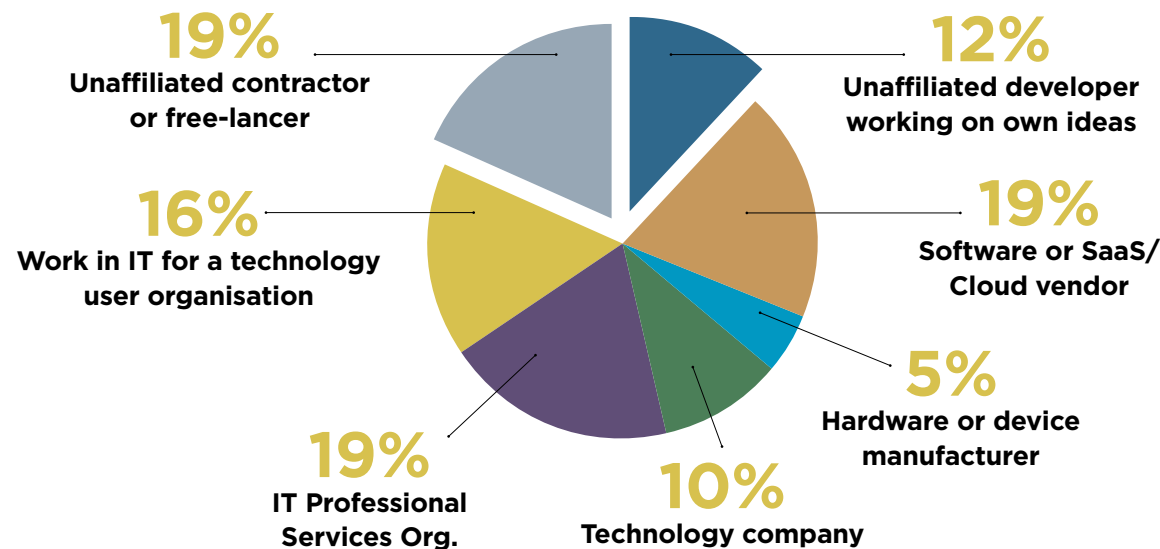Alliance }

Organizational Affiliation

We asked developers where they work and found that some 69% are employees or contractors involved with various types of organizations. The remaining 31% considered themselves independent developers, freelancers or developers working on their own ideas. For this study we labeled these developers as "Unaffiliated."

Developer Organizational Affiliation

19%
Unaffiliated contractor or free-lancer

12%
Unaffiliated developer working on own ideas

16%
Work in IT for a technology user organisation

19%
Software or SaaS/ Cloud vendor

19%
IT Professional Services Org.

10%
Technology company

5%
Hardware or device manufacturer

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Approximately one half of respondents worked for a technology vendor. Only 16% worked in an IT user organization.
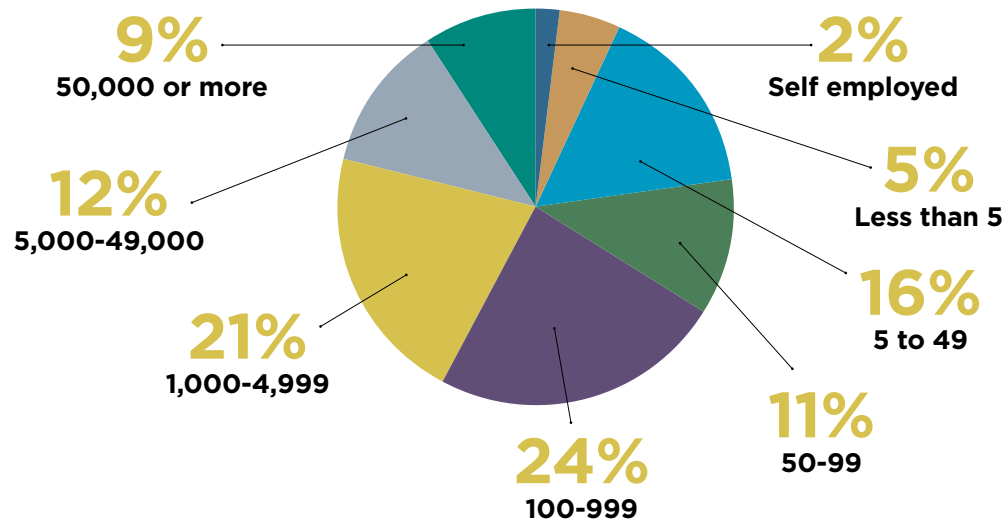
Of the 31% unaffiliated developers, 12% were completely independent and working on their own ideas. This is a sizable group which would have been unlikely even 5 years ago. We believe that mobile devices and the app economy are important factors contributing to this growth, though the rise of gaming, and the higher level of freelancing in the economy in general are also contributing factors.

The finding that 69% were affiliated or organizationally employed is consistent with IDC data that estimates that 40% of the world's 18.5 million developers are hobbyists — those who engage in software development outside of a job or their main job. IDC believes this reflects the increased engagement of business employees in application activities in what is known as the "citizen developer" phenomenon in enterprises.

Improved tools and the increased level of abstraction provided by modern model-driven application development tools are key to this increase. This research is referenced in the Appendix section of this study.

Of the survey respondents who were organizationally employed, 54% were "individual contributor" software developers and 46% had a management role. Two-thirds of organization-connected developers worked in companies greater than 100, which is consistent with census data on the number of employees in firms over 100 employees in size.

Org Sizes Where Developers Work

9%
50,000 or more

12%
5,000-49,000

21%
1,000-4,999

24%
100-999

11%
50-99

16%
5 to 49

5%
Less than 5

2%
Self employed

Working in Teams

Developers work in teams and are increasingly working in relatively small teams. Nearly three quarters (74%) of the survey sample reported they work in teams.

60% of the developers reported that they work in teams of 5 or fewer. Overall, 85% reported that they work in teams of 15 or fewer. IDC believes that this reflects the increased adoption of agile methodologies which benefits from smaller teams.

Developer Team Sizes

15%
Team of more than
16 developers

26%
Sole developer for
most of my projects

25%
Team of 6 to 15
developers

34%
Team of 5 or
fewer developers
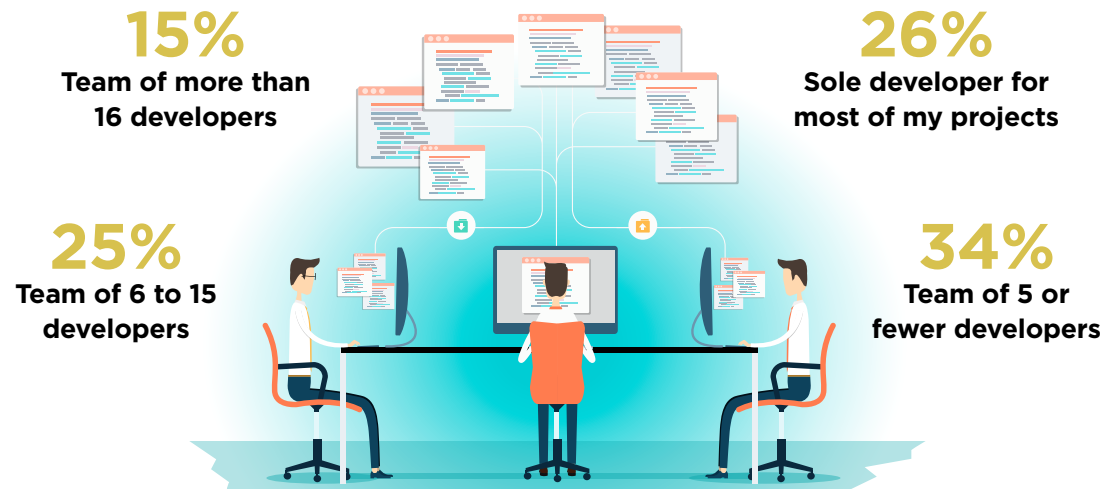
What Developers Do

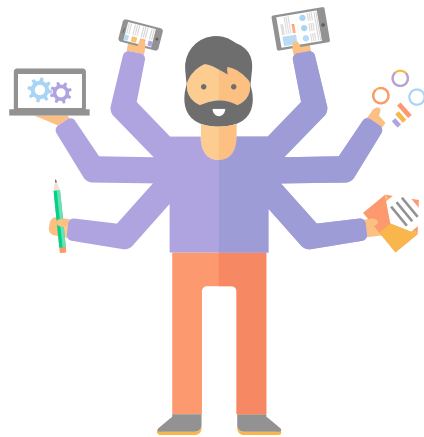While coding, or authoring of software, is the most common activity associated with software development, the discipline spans several different activities that encompass the entire lifecycle of software projects.
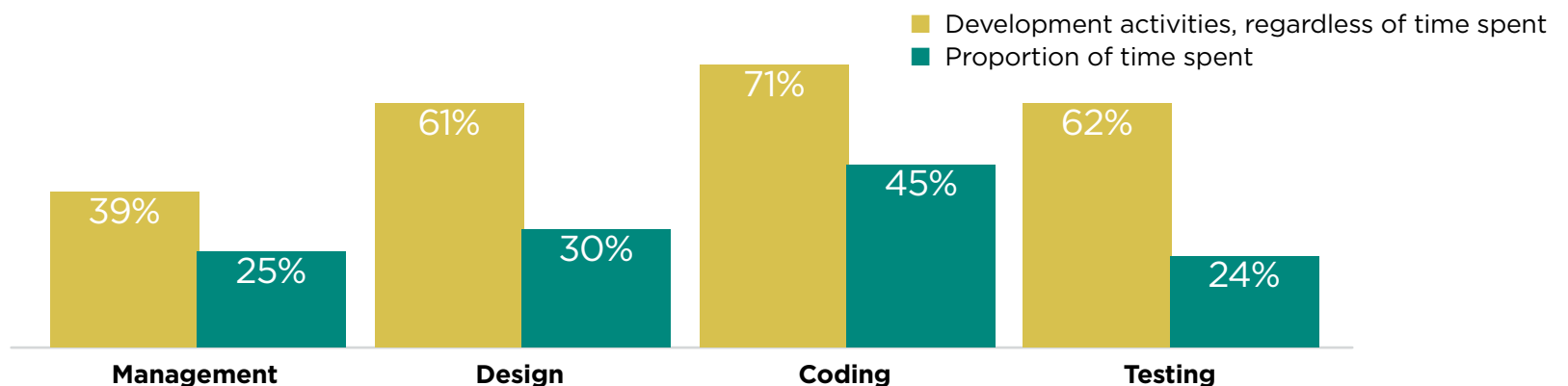
Each of the major phases of software development — including requirements gathering, coding, testing, and deployment management — was selected by over half of the respondents. This reveals the broad scope and diversity of many developers' skills (and of enterprise requirements).

The survey asked about specific activities in software development to understand at a granular level what developers do and how they spend their time. The most popular software development activity is - perhaps not surprisingly - coding, which came in at 71%.

Also not surprising is that functional testing and bug-tracking (which tend to happen after code creation), and requirements analysis and design (which generally happen before), had a roughly equal incidence rate of around 62% and 61%. These responses are generally consistent with prior IDC research.

The developers that selected coding identified that activity as consuming 45% of their time, by far the most time-consuming of all activities practiced.

Development Activities and Time Spent

Legend:
- Development activities, regardless of time spent
- Proportion of time spent

Management	Design	Coding	Testing
39% / 25%	61% / 30%	71% / 45%	62% / 24%

Developers' Focus

When asked about the types of apps they have built, 72% of developers selected business applications followed closely by consumer applications at 62% (multiple responses allowed). A smaller but still sizeable 28% selected gaming. An aggregation of the data reveals that 71% of developers are building out consumer and/or gaming apps. The consumer apps revolution continues to build momentum. With this trend, we expect the number of developers engaged in consumer development to move ahead of business development in the near future.

72%

**Develop business
applications**

71%

**Develop consumer
and/or gaming
applications**

28%

Develop games

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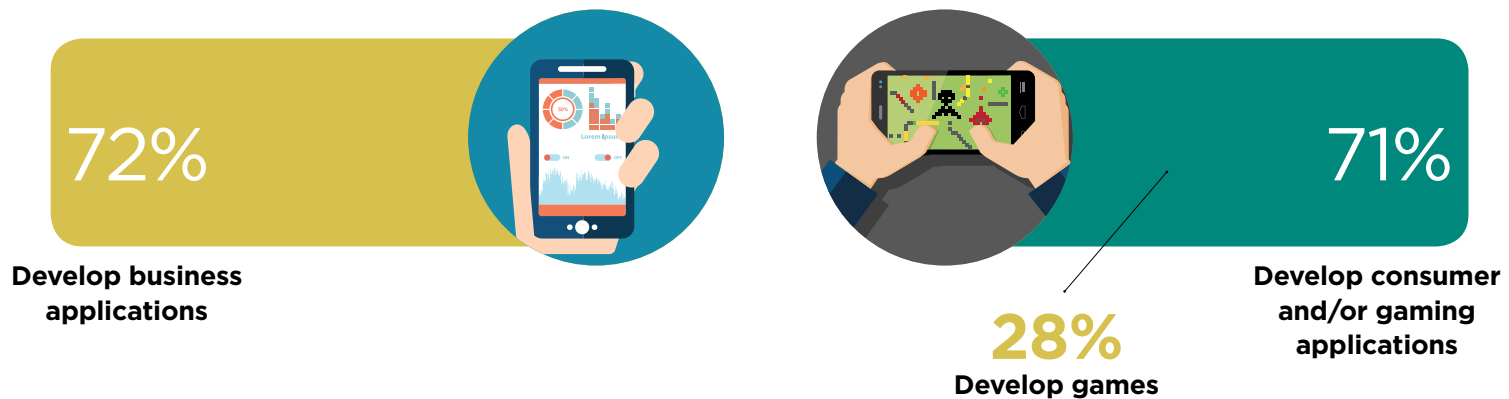
Mobile App Development

The survey found that 87% of organizations where developers worked were involved in mobile development, including 18% of organizations that identify a "mobile first" strategy as their key approach.

Business Approach to Mobile Software Development

13%
Does not develop
mobile apps

18%
Committed
to mobile-first
approach

35%
Has developed
some mobile
apps for B2C

34%
Has developed
both B2C
and B2E
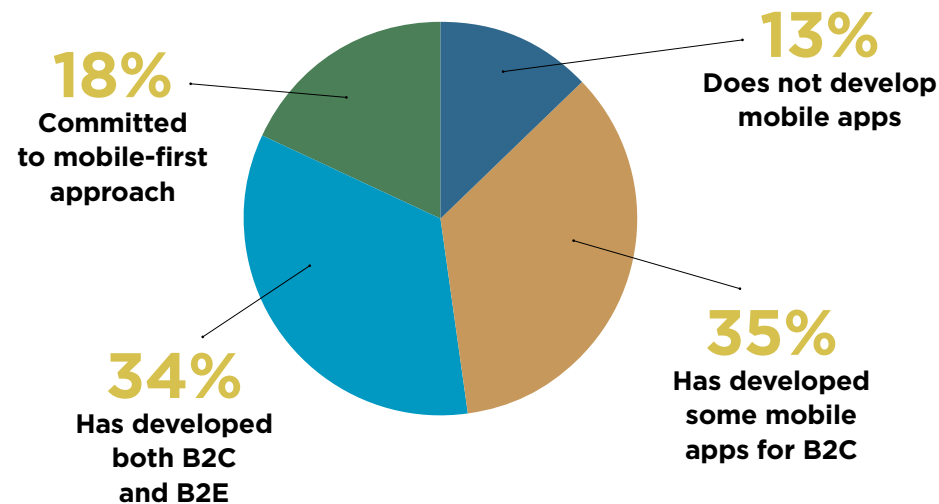
When examining all respondents who identified as developing mobile client software (i.e., mobile developers), we see preferences between native versus Web platform approaches. Almost 70% of developers are creating native apps while mobile Web and hybrid Web are both about 50%. Third party application platforms such as Xamarin, Kony, Appcelerator, Red Hat Mobile Platform, etc are referenced by 1 in 5 developers. Individual developers still prefer native mobile development.
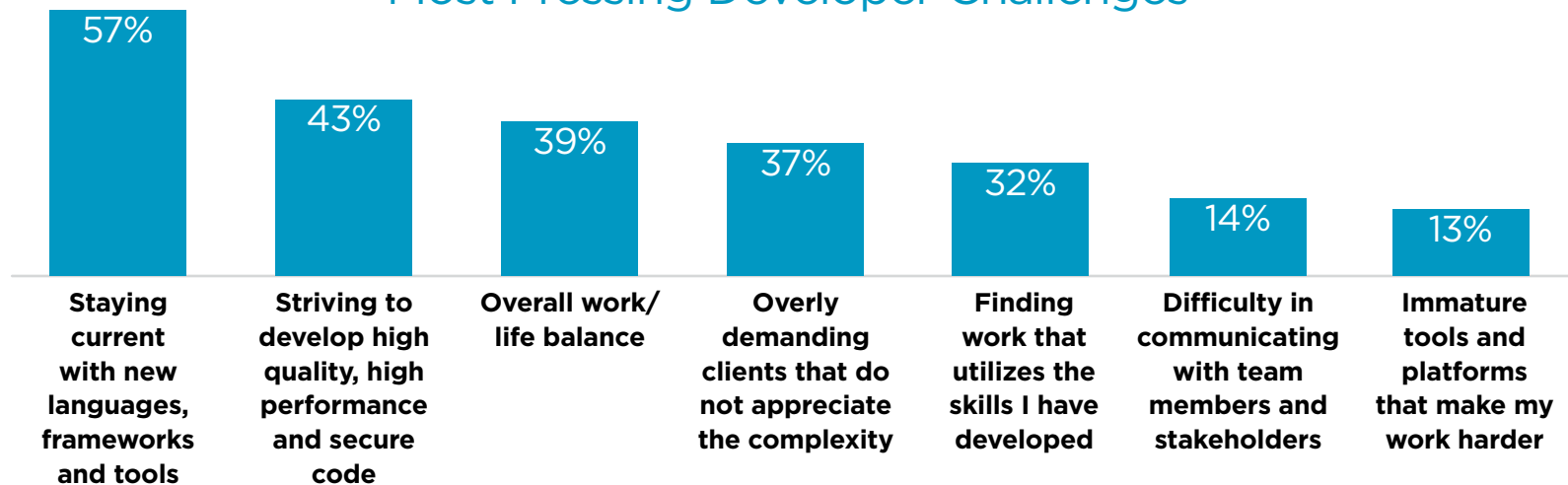
Native vs. Web Platforms

69% — Native mobile platform

52% — Mobile web platform

48% — Hybrid mobile platform

22% — Third party application platforms

How Developers Feel

One of the important goals of the survey was to probe developers regarding a variety of important issues, then in future surveys we plan to track their changes and evolution. We included a broad question on the most pressing long-running challenges developers face. The biggest concern by far was the challenge of staying current with the technology of their craft, with a 57% incidence rate.

Most Pressing Developer Challenges

57%	43%	39%	37%	32%	14%	13%
Staying current with new languages, frameworks and tools	Striving to develop high quality, high performance and secure code	Overall work/ life balance	Overly demanding clients that do not appreciate the complexity	Finding work that utilizes the skills I have developed	Difficulty in communicating with team members and stakeholders	Immature tools and platforms that make my work harder

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Where Developers Get Help

As for where developers go to get technical help, most (63%) said they first utilize a search engine. We have seen a continuing shift in the l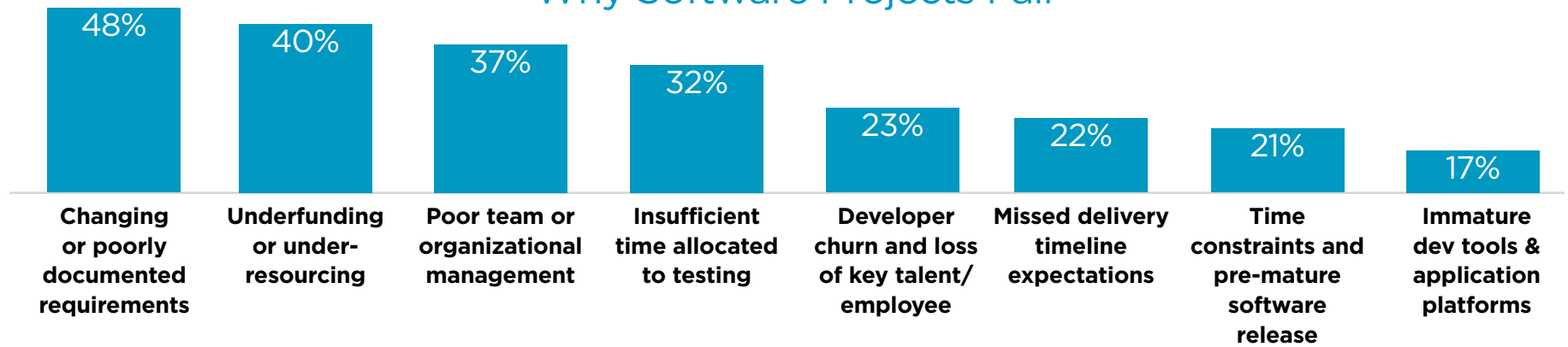ast decade away from vendor networks (now at 38%) or more traditional sources of information like books and magazines (now at 19%). The second most popular option is independent forums such as StackOverflow. A deeper exploration of the survey data showed that some 83% of developers cited either search engines or independent forums as a primary source, suggesting that developers are a highly independent group and platform vendors must accommodate this trend in their outreach strategies.

Where Developers Get Help

Source	Percentage
Search engines (e.g. Google/Bing)	63%
Independent dev networks & forums	55%
Vendor/product info/blogs/forums	38%
Personal networks of friends, etc...	33%
Formal Training	31%
Magazines or books	19%
User group meets and professional societies	11%

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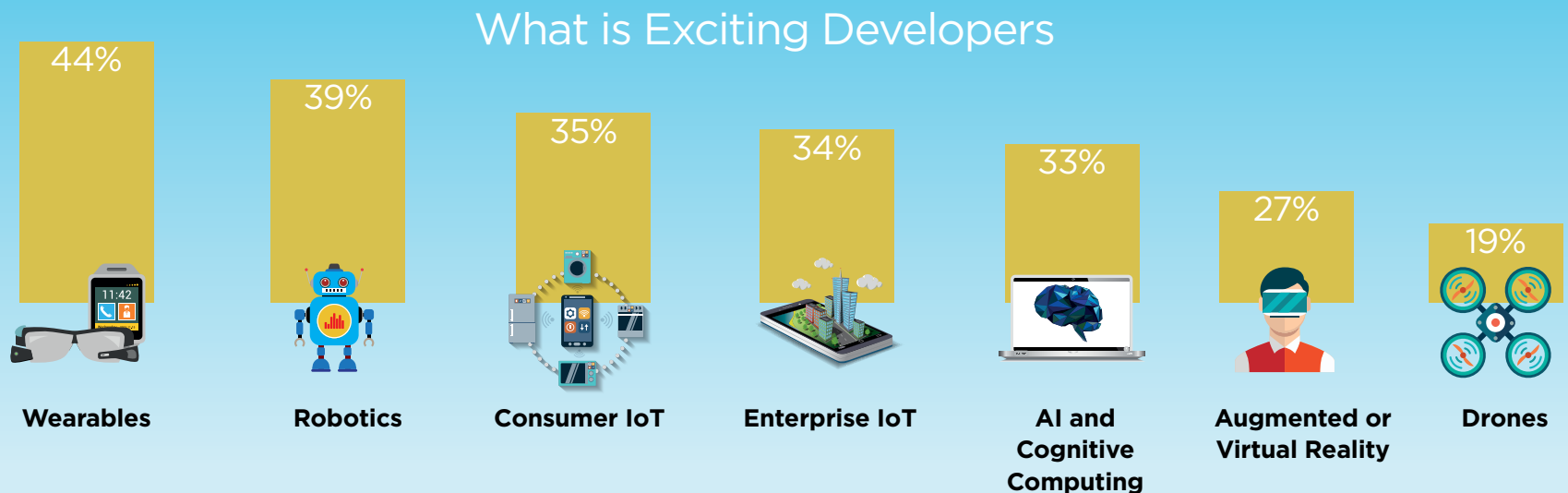
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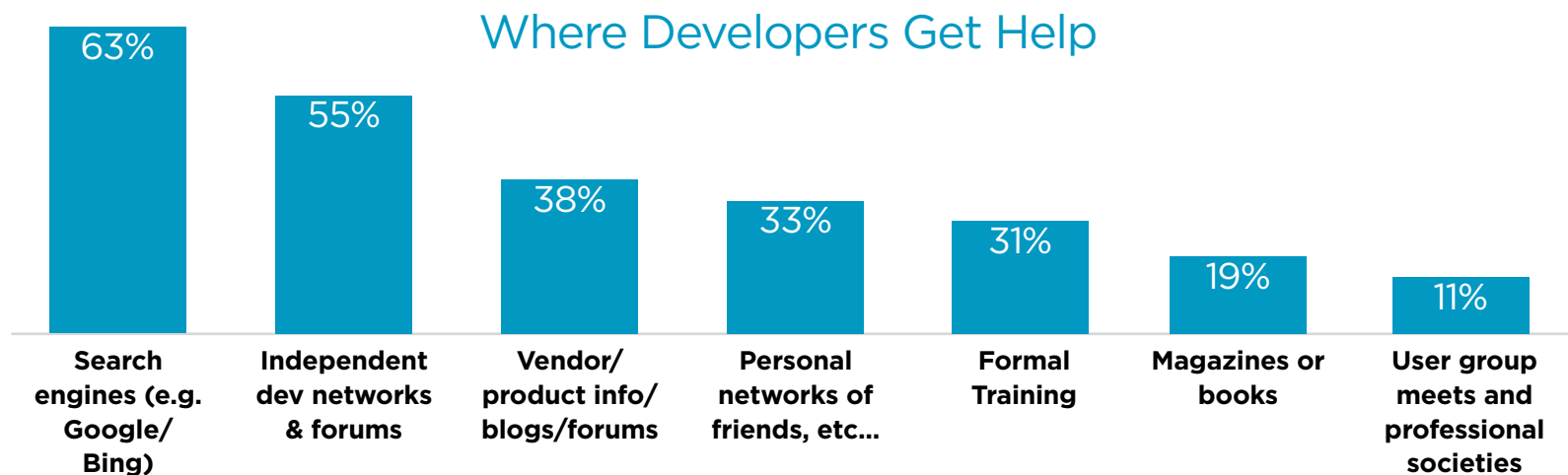
Why Software Projects Fail

The causes of software projects failing is a central debate. The reason most cited for project failure was changing or poorly documented project requirements. Historically, this reason has been relatively small, and the practices around requirements gathering have not been as active a debate. Developers love to code, but also need effective communications systems in place. Potentially tied together are the next reasons for failure around underfunding or under-resourcing (40%) and team management (37%). Tools and platform vendors would be well advised to understand these results to uncover unmet developer needs.

Why Software Projects Fail

48%	40%	37%	32%	23%	22%	21%	17%
Changing or poorly documented requirements	Underfunding or under-resourcing	Poor team or organizational management	Insufficient time allocated to testing	Developer churn and loss of key talent/ employee	Missed delivery timeline expectations	Time constraints and pre-mature software release	Immature dev tools & application platforms

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What is Exciting Developers

We wanted to guage what next wave of technologies are exciting for developers. We provided respondents with a list of current and emerging areas in the industry. The lead area of developer excitement is wearables, cited by 44% of the respondents. Robotics was a surprise trend, coming in second. If we combine IoT across both consumer and business, it would come on top at 48%. Another surprise was drones, cited by 19% of the developers. Since drones are essentially a sub-branch of robotics, combining the responses for robotics and drones shows an incidence rate of 46%, second to the combined IoT.

What is Exciting Developers

Wearables	Robotics	Consumer IoT	Enterprise IoT	AI and Cognitive Computing	Augmented or Virtual Reality	Drones
44%	39%	35%	34%	33%	27%	19%

N=855.

What Developers Use

As programming practices have matured, software development tools have proliferated. The areas of mobile, cloud and devOps have enjoyed an explosion of tools and in some cases new categories such as cross-platform mobile advertising tools. While the tool categories listed address different aspects of application development and management, it is interesting to note that some are used more broadly than others.

Tools in Use

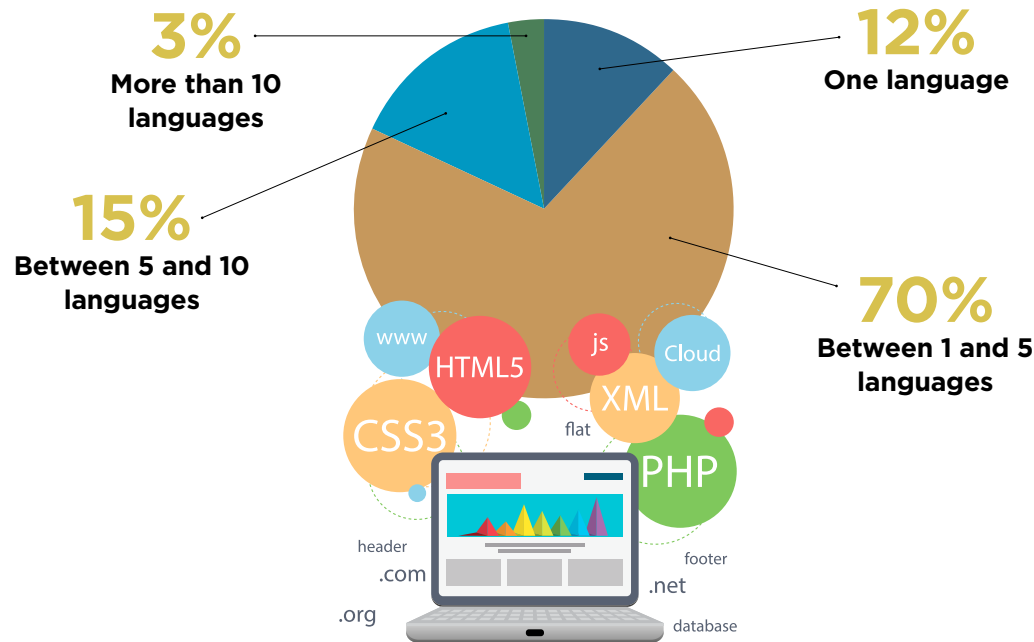| Tool	%
Code text editors	58%
IDEs	56%
SQL databases	50%
Debuggers	49%
Testing tools	42%
Bug-tracking software	40%
UI design and prototyping tools	38%
Project management tools	38%
Code analysis tools	36%
Performance profiling tools	33%
App servers and middleware	31%
DB modeling & design tools	31%
Requirements management tools	29%
System and object modeling tools	25%
Cross-platform mobile AD tools	24%
Load and stress testing tools	23%
Commercial software components	22%
Release management tools	22%
Business rules engines	16%
NoSQL databases	15%

It is not surprising that the most universal tools are code editors and integrated development environments (IDEs). Historically, IDEs have been the mainstay of professional developers as they provide a central console for managing most aspects of software projects (especially code authoring). It is perhaps this constant integration of added function that have given developers some pause in using IDEs in all situations. Code editors tend to be light-weight, easy to install and start, and focused on the authoring process. In recent years, there has been a flight to lightweight tools and middleware.

The chart reflects the prioritization of tools and middleware for the maturing software industry. For example, certain niche tools like business rules engines have compelling uses in certain situations but — with an incidence rate of 16% — are clearly not universally deployed. Another interesting observation is that relational databases (SQL databases) continue to dominate (50%) compared to recently popular NoSQL databases (15%) which feature different styles of lightweight storage algorithms to support new styles of applications.

Programming Languages

Programming languages are the most technically intensive skills developers must learn.

We asked about the number of programming languages developers used in the last year.
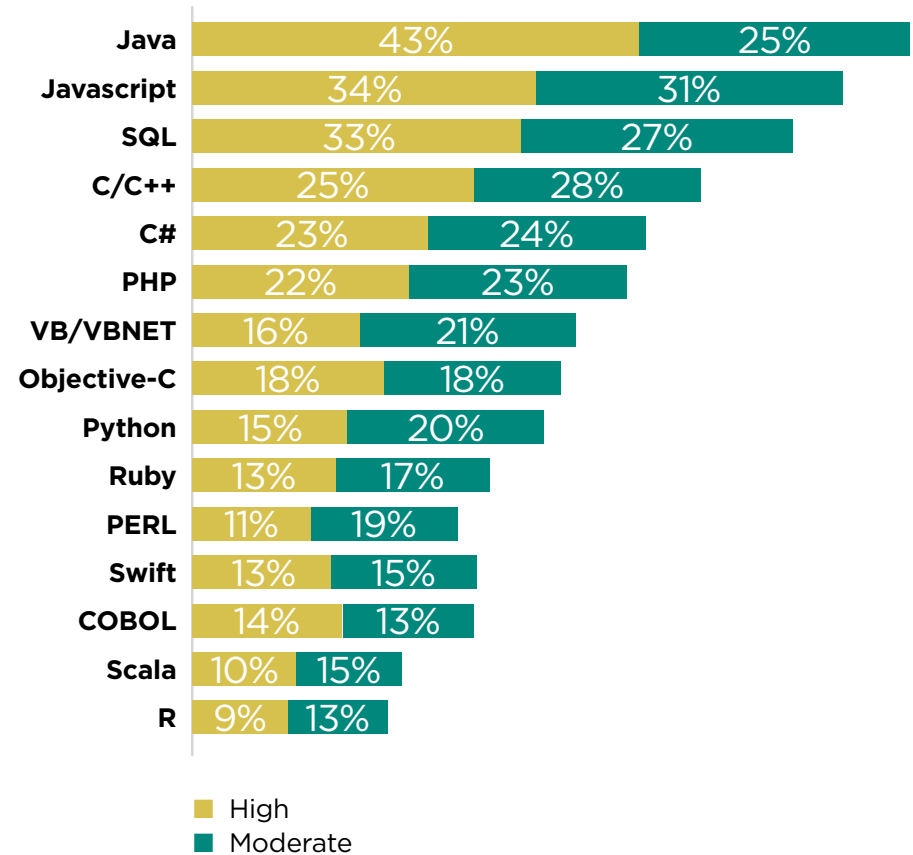
Today's Polyglot Programmer

3%
More than 10
languages

12%
One language

15%
Between 5 and 10
languages

70%
Between 1 and 5
languages

www
HTML5
js
Cloud
CSS3
flat
XML
PHP
header
.com
footer
.net
.org
database

The data shows 88% used more than one programming language, and about 18% used more than five. Historically, software developers build a skill set in a given language and learn it over a number of years. It wasn't long ago when most developers identified themselves as "a C developer" or a "Java developer." Today, however, the world is more complex, the tools are more powerful and the learning curves are somewhat faster. There has also been an explosion of new programming languages addressing specific domains of software construction (e.g. Erlang for realtime systems, Node for asynchronous programming, Rust for better multicore programming, etc...) and many have gained respectable levels of traction. To build today's apps, a development team may need to use multiple languages and some developers are conversant with multiple languages adequately enough to support multi-lingual software projects.

IDC's model of programming languages categorizes them into five major groups which we refer to as programming language ecosystems. These typically tier along the level of abstraction in the programming mode. We have found historically that developers tend to operate comfortably inside one ecosystem. (See the Appendix for more information about these language groupings and their relative size.)

This survey ranks the most popular programming languages, highlighting two levels of developer skill depth for each language.

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The top answer is Java, which is the most popular programming language for enterprise systems and has received a boost in its popularity from its selection as the "native" programming language for the Android platform. Second is JavaScript, which is the standardized language for programming browser front-ends. While JavaScript is often used with other mark-up languages like HTML and CSS, we deliberately focused on JavaScript as it reflects a deeper level of Web development beyond website layout.

Developer Language Skills

Language	High	Moderate
Java	43%	25%
Javascript	34%	31%
SQL	33%	27%
C/C++	25%	28%
C#	23%	24%
PHP	22%	23%
VB/VBNET	16%	21%
Objective-C	18%	18%
Python	15%	20%
Ruby	13%	17%
PERL	11%	19%
Swift	13%	15%
COBOL	14%	13%
Scala	10%	15%
R	9%	13%

■ High
■ Moderate

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SQL (structured query language), which is the lingua franca of relational databases, ranks third—and indeed, a third of all developers have a high level of SQL skill. Other languages that rank highly are C/C++ which is largely used for system level development where performance is critical, and C# which is the de facto Microsoft ecosystem language for desktop and server applications. C# is the language of .NET, so it rises in correlation of the popularity of the Microsoft platform.
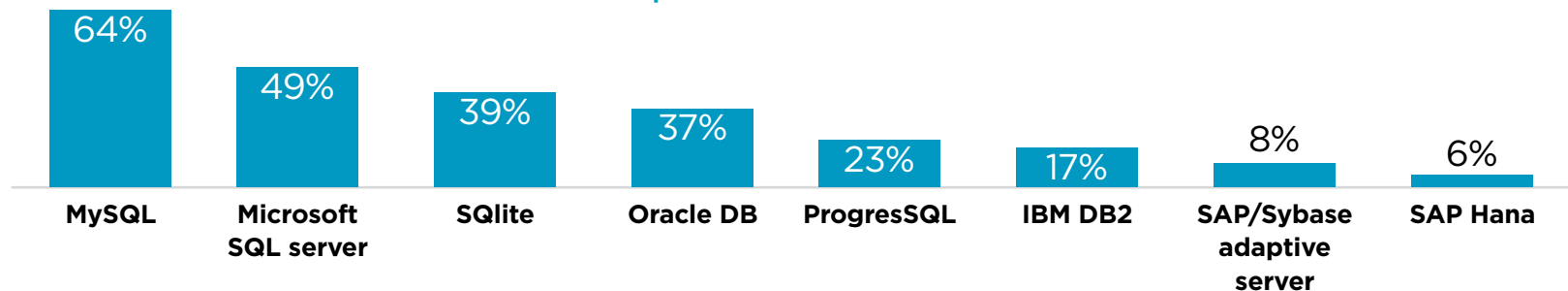

To build today's systems, a development team may have to use multiple languages, and some new developers are conversant with multiple languages adequately enough to support multi-lingual software projects.

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Databases and Platforms

The popularity of SQL should come as no surprise given the emergence of relational database systems approximately three decades ago. According to IDC's Software Tracker database, the RDBMS category is responsible for $30 billion, or a third of all 2014 spending on application development and deployment software licensing and subscriptions The two largest products in the space today are Oracle Database and Microsoft SQL Server, but both lag behind MySQL.

Most Popular SQL Databases

MySQL	Microsoft SQL server	SQlite	Oracle DB	ProgresSQL	IBM DB2	SAP/Sybase adaptive server	SAP Hana
64%	49%	39%	37%	23%	17%	8%	6%

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MySQL's success is rooted in its availability as open source starting in the early days of the Web. Today MySQL has become the database most widely used by developers.

Open source availability also plays a major role in the adoption of the relatively new group of non-relational database products, collectively known as NoSQL databases. These data stores, which cater to simpler data structures often accessed directly from inside application code, come in various types. We asked developers which groups they use the most. Of those developers that use NoSQL databases, three quarters (75%) use document-oriented databases (e.g. MongoDB, Couchbase, etc.).

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The survey results highlight the importance of open source for today's developers. Indeed, open source has gone mainstream even in relative conservative sectors of enterprise IT. Approximately 77% of developers said they use open source, and 43% were involved in contributing to open source. Futhermore, while Linux desktops account for less than 1% of all desktops, they are used by 12% of software developers in our survey.

Open Source Involvement

77%
Use open source software
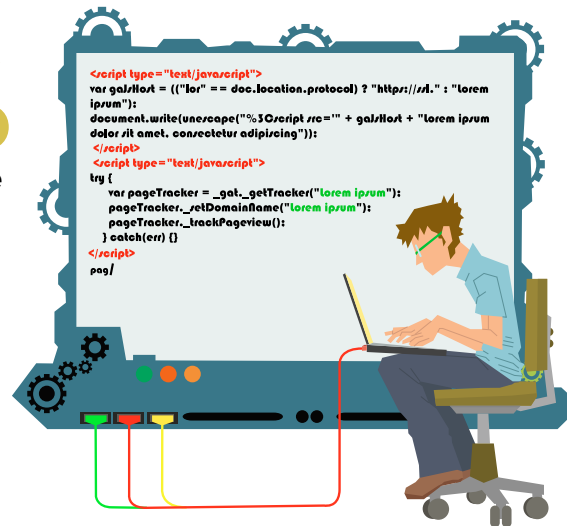
43%
Contribute to open source projects

13%
Do not use or contribute to open source software

Cloud

The rise of cloud computing is evident in our survey. We asked developers which types of back-end systems and styles of cloud computing they use. 50% are using some form of Infrastructure-as-a-Service (IaaS) clouds. The growth of Platform-as-a-Service (PaaS) adoption – now 29% — is accelerating, which is significant because PaaS can be considered more productive for developers but is less mature.

Server and Cloud Backends

55%
On-premises servers

50%
IaaS Cloud

29%
PaaS Cloud

17%
MBaaS Cloud
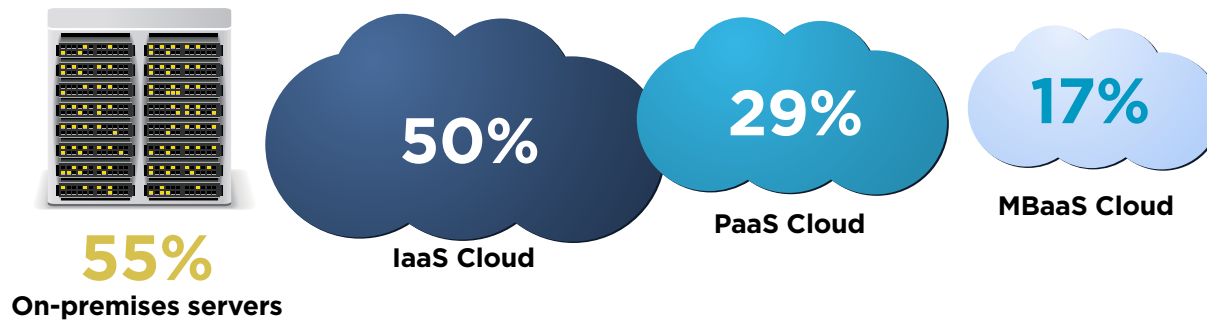
Conclusion

The Alliance Global Developer Insights survey shows an increasingly diverse developer universe that is dealing with the increasingly stressful and complex demands of modern business. The survey provides a broad view of the nature of modern application development, highlighting the increased focus on front-end development, the rise of the consumer app developer and continued adoption of agile methodologies as organizations focus on smaller software development teams. This is encouraging, as agile drives towards faster development and it is generally accepted that smaller teams work faster. The survey also shows that mobile application development is becoming the norm and that developers are excited about IoT, wearables and programmable robots and drones.

The Alliance Global Developer Insights survey shows an increasingly diverse developer universe that is dealing with the increasingly stressful and complex demands of modern business.

Methodology

The Alliance Global Developer Insights survey is focused on the individuals who are actively involved with software development, by performing any of the various roles across the software development life cycle:

- Determining software user requirements and systems analysis

- Designing and architecting software (including UX design and prototyping)

- Coding and maintaining software

- Testing and bug-fixing software

- Deploying and maintaining released software

Survey respondents were recruited by both the Alliance and IDC to complete the survey online in a three week period from late March to mid April.

By design, the survey was intended to be broad and cover all developers across all platforms, including desktop, Web, mobile, cloud and server back-ends. There was no specific focus on any programming language, or developer ecosystem. Developers from the consumer space and the enterprise space were allowed to take the survey without restriction.
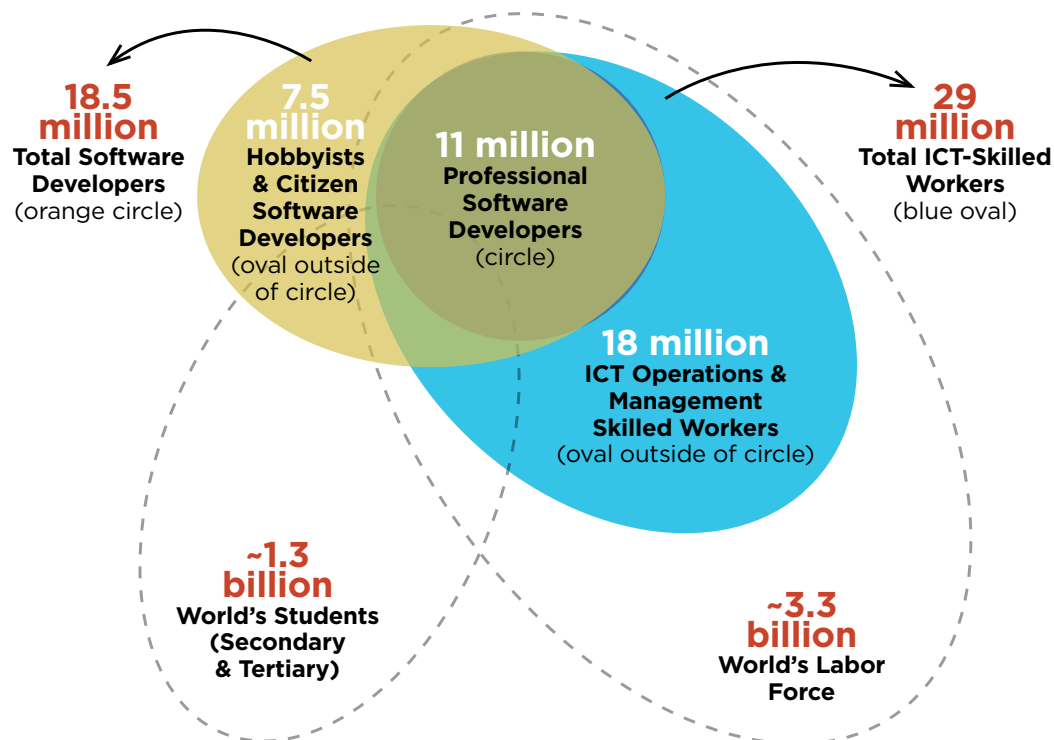
A total of 855 developers responded to the survey, with 78% reached in the USA and the remaining 22% from 50 other countries. While IDC and the Alliance opened this survey to all geographies, the respondent base was more highly concentrated in the USA. According to IDC estimates, USA normally accounts for only 19% of world-wide developers. The male-female split in the survey is representative of the developer community found in the United States.

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Appendix

IDC's long-running tracking of worldwide developer populations pins the total number of developers at 18.5 million. This number is based on a bottom-up methodology of estimating developers according to labor and education statistics available for a number of countries.

Developer Source Populations

18.5 million
Total Software Developers (orange circle)

7.5 million
Hobbyists & Citizen Software Developers (oval outside of circle)

11 million
Professional Software Developers (circle)

29 million
Total ICT-Skilled Workers (blue oval)

18 million
ICT Operations & Management Skilled Workers (oval outside of circle)

~1.3 billion
World's Students (Secondary & Tertiary)

~3.3 billion
World's Labor Force

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Developer Count Source: IDC 2014 Worldwide Software Developer and ICT-Skilled Worker EstimatesDoc # 24470. Note: Diagram is conceptual and not in proportion to the data.

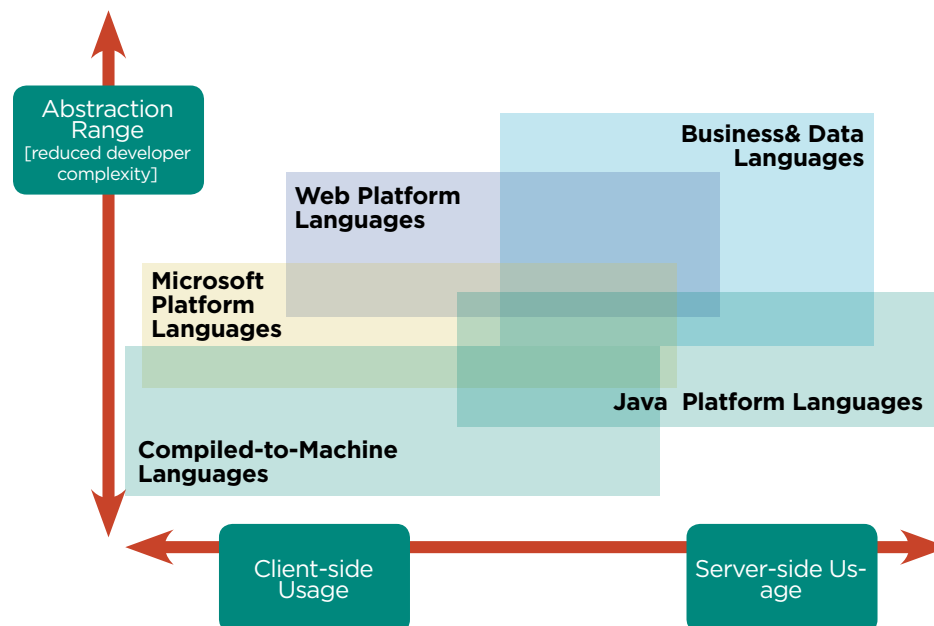pg **35**

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There are 11 million professional developers in the world and 7.5 million hobbyists or informal developers (students, hackers, game and lone mobile devs, early stage startup devs, etc.). The top countries in software developers are the US, China and India which account for almost 40% of all software developers in the world.

There are many ways to segment developers, but one important way is by the types of languages they are skilled in. The programming language and model landscape can be classified on a continuum of abstraction where the lowest are close to the machine and require a lot of detailed skill and complexity to program and the highest operate at the business or domain level and require less technical skill but strong business knowledge and facility with general logic and data relationships. The programming languages and models tend to group and cluster around certain ecosystems which are highlighted in the rectangles of following figure.

Developer Skills Ecosystems

In this figure, the x-axis describes the suitability of the various language groups for front-end or back-end application development. The y-axis represents increased abstraction or distance from a hardware machine-model of programming. These ecosystems of skills are important because developers tend to identify with them and are more likely to learn languages within the ecosystem than outside of it. Most developers tend to have skills in multiple languages and ecosystems however, but generally have primary affinity to a certain level of abstraction.

Developer Skills Ecosystems

Abstraction Range [reduced developer complexity]

Business& Data Languages

Web Platform Languages

Microsoft Platform Languages

Compiled-to-Machine Languages

Java Platform Languages

Client-side Usage

Server-side Us-age

Source: IDC,2015

Examples of the programming languages that dwell in the various ecosystem are detailed in following figure.

Language Groups in Detail

Ecosystem	Compiled-to-Machine Languages	Web Platform Languages	Business & Data Languages	Java Platform Languages	Microsoft Platform Languages
Description	• Full ahead-of-time compilation process • Generates machine code (not bytecode)	• Runs in Web browsers or web servers • General scripting & interpreted languages	• High abstraction • Manipulates data objects	• Java and clones • Generates Java or Java bytecode	• Microsoft languages • Support Windows Platform
Usage Scenario	• Commercial software, • Embedded applications • Mobile apps • Scientific programming • Legacy work	• Web & mobile applications • Server-side scripting • Systems management	• Business & process apps and BPM tools • Model-driven app platforms • Mobile apps • Citizen developer opportunistic & RAD	• Industrial-strength back-ends • Enterprise apps • Commercial/ISV apps • Embedded & mobile	• Client-side Window platform apps • Business apps • Commercial/ISV apps • Embedded & mobile
Examples	• C/C++ • Objective C/Apple Cocoa • COBOL • Fortran • Pascal/Modula • Delphi • Ada • PL/1	• HTML • XML • JavaScript • Flash/ActionScript • CFML/CFScript • PHP, Ruby, Python, Perl, • LUA, Lisp	• SQLPL-SQL, T-SQL • PowerBuilder • Uniface, Unify • Progress 4GL • Cache/MUMPS • Pick Basic • SQR, RPGS, R, SAS Macro	• Java/Android dalvik • Jruby • Jython • Groovy • Scala • Clojure • Rhino	• C# • Visual Basic • VB.NET • VBA/Access • Visual Foxpro • F# • Windows PowerShell

About The Alliance

The Application Developers Alliance is a non-profit global membership organization that supports developers as creators, innovators, and entrepreneurs. In partnership with its more than 200 corporate members, the Alliance promotes the continued growth of the industry and advocate on behalf of developers on public policy and industry issues. The Apps Alliance serves a growing network of over 60,000 developers globally. Corporate members include: mobile app publishers, platforms, wireless carriers, hardware manufacturers, ad networks, enterprise tools and service providers.