2017 Study on Mobile and Internet of Things Application Security

Sponsored by IBM and Arxan Technologies

Independently conducted by Ponemon Institute LLC
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Ponemon Institute, January 2017

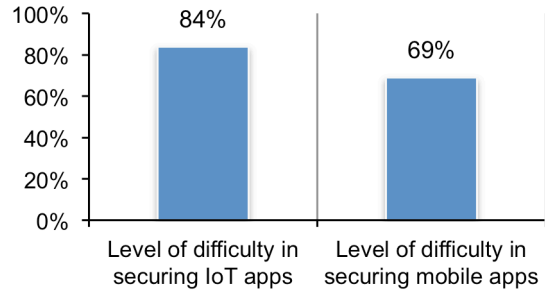
Part 1. Introduction

Ponemon Institute is pleased to present the findings of the *2017 Study on Mobile and Internet of Things Application Security* sponsored by IBM and Arxan Technologies. The purpose of this research is to understand how companies are reducing the risk of mobile apps and Internet of Things (IoT) in the workplace. The risks created by mobile apps have been well researched and documented. This study reveals how companies are unprepared for risks created by vulnerabilities in IoT apps.

We surveyed 593 IT and IT security practitioners who are involved in the security of mobile and IoT application security and familiar with their organization's security practices during the development of these applications and devices. Organizations participating in this study are users of mobile apps and IoT devices (44 percent and 48 percent, respectively), developers/manufacturers of mobile apps and IoT devices (27 percent and 21 percent, respectively) or both users and developers of mobile apps and IoT devices (29 percent and 31 percent, respectively).

The risk of unsecured IoT apps is growing. Respondents acknowledge the risk of security vulnerabilities in both mobile and IoT apps. However, as shown in Figure 1, more respondents are likely to say IoT apps are harder to secure (84 percent) versus mobile apps (69 percent). Additionally, 55 percent of respondents say there is a lack of quality assurance and testing procedures for IoT apps.

Figure 1.
How difficult is it to secure mobile and IoT apps?
1=easy to 10=very difficult, 7+ responses reported



Following are key findings from this research:

Many organizations are worried about an attack against mobile and IoT apps that are used in the workplace. As discussed previously, organizations are having a more difficult time securing IoT apps. In fact, respondents are slightly more concerned about getting hacked through an IoT app (58 percent) than a mobile app (53 percent). However, despite their concern organizations are not mobilizing against the threat. Forty-four percent of respondents say they are taking no steps and 11 percent are unsure if their organization is doing anything to prevent such an attack.

Malware is believed to pose a greater threat to mobile than IoT apps. Eighty-four percent of respondents are very concerned about the threat of malware to mobile apps and 66 percent of respondents say they are very concerned about this threat to IoT apps.

The use of mobile and IoT apps are threats to a strong security posture. Seventy-nine percent of respondents say the use of mobile apps and 75 percent of respondents say the use of IoT apps increase security risk very significantly or significantly.

Organizations have no confidence or are not confident they know all mobile and IoT apps in the workplace. Sixty-three percent of respondents are not confident (30 percent) or have no confidence (33 percent) their organizations know all of the mobile applications used by employees. An even larger percentage of respondents (75 percent) are not confident (38 percent) or have no confidence (37 percent) they know all of the IoT apps in the workplace. However,

respondents estimate that the average number of mobile apps in their organizations is 472 and the average number of IoT apps is 241.

Mobile and IoT risks exist because end-user convenience is considered more important than security. The security of apps often does not receive the priority it needs because of the pressure to ensure mobile and IoT apps are easy to use. Sixty-two percent of respondents rate end-user convenience when building and/or deploying mobile apps in the workplace as important and 68 percent of respondents rate end-user convenience when building and/or deploying IoT apps in the workplace as important considerations.

The functions most responsible for mobile and IoT security are outside the security function. Only 15 percent of respondents say the CISO is most responsible and only 11 percent of respondents say application development is primarily responsible for security of apps. In the case of IoT apps, only 5 percent of respondents say the CISO is primarily responsible. Instead, the head of product engineering and lines of business are most responsible (31 percent and 21 percent of respondents, respectively).

Hacking incidents and regulations drive growth in budgets. Only 30 percent of respondents say their organization allocates sufficient budget to protect mobile apps and IoT devices. If they had a serious hacking incident, their organizations would consider increasing the budget (54 percent of respondents). Other reasons to increase the budget are if new regulations were issued (46 percent of respondents) or if they were exposed to media coverage of a serious hacking incident affecting another company (25 percent of respondents).

Despite the risk, there is a lack urgency to address the threat. Only 32 percent of respondents say their organization urgently wants to secure mobile apps and 42 percent of respondents say it is urgent to secure IoT apps. Factors revealed in this study that might explain the lack of urgency include the following: not enough budget being allocated to the security of these apps and the individuals most often responsible for stopping attacks are not in the security function. Rather, they reside in the lines of business, development or engineering.

Material data breach or cyber attacks have occurred and are reasons for concern. Respondents report they know with certainty (11 percent), or most likely (15 percent) or likely (34 percent) that their organization had a security incident because of an insecure mobile app. Respondents report they are less certain whether their organization had a material data breach or cyber attack due to an insecure IoT app. Forty-six percent of respondents say with certainty (4 percent), most likely (11 percent) or likely (31 percent).

There is a high level of concern for insecure mobile and IoT apps. Seventy percent of respondents are very concerned about the use of insecure IoT apps and 64 percent are very concerned about the use of insecure mobile applications in the workplace.

Testing of mobile and IoT apps is ad hoc, if done at all. As discussed above, organizations may recognize the risk but a sense of urgency to mitigate the risk does not exist. This lack of urgency is reflected in mobile and IoT app security practices. Thirty-five percent of respondents say testing is not pre-scheduled or does not occur at all (26 percent of respondents). Almost half (48 percent of respondents) say testing of IoT apps does not occur. On average only 29 percent of mobile apps and 20 percent of IoT apps are tested for vulnerabilities. An average of 30 percent of mobile apps tested contain vulnerabilities and an average of 38 percent of IoT apps tested contain significant vulnerabilities.

Testing of mobile and IoT apps often does not occur until production. Fifty-eight percent of respondents say their organization waits until production to test their IoT apps and 39 percent of respondents say mobile apps are tested in production.

Pen testing is the primary means of securing mobile and IoT apps. The same approaches are used to secure mobile and IoT apps. Fifty-seven percent of respondents say the primary means of securing mobile apps is pen testing and 39 percent of respondents say pen testing is used to secure IoT apps. Fifty-five percent of respondents say their organization educates developers on safe coding for mobile apps and only 30 percent of respondents say their organization educates developers on safe coding practices for IoT apps.

Broken cryptography and unintended data leakage are the most difficult mobile risks to mitigate. Forty-nine percent of respondents say their organization follows guidance from the Open Web Application Security Project (OWASP). Seventy percent of respondents say broken cryptography and 65 percent say unintended data leakage are the most serious mobile app security risks. The least serious risk is the lack of binary protection.

Rush to release is the main reason why both mobile and IoT apps contain vulnerable code. Sixty-nine percent of respondents say pressure on the development team is why mobile apps contain vulnerable code and 75 percent of respondents say the same reason contributes to vulnerable code in IoT apps. Accidental coding errors in mobile and IoT apps are another primary reason for vulnerable code (65 percent of respondents). An additional issue affecting the security of apps is the lack of internal policies or rules that clarify security requirements.

Part 2. Key findings

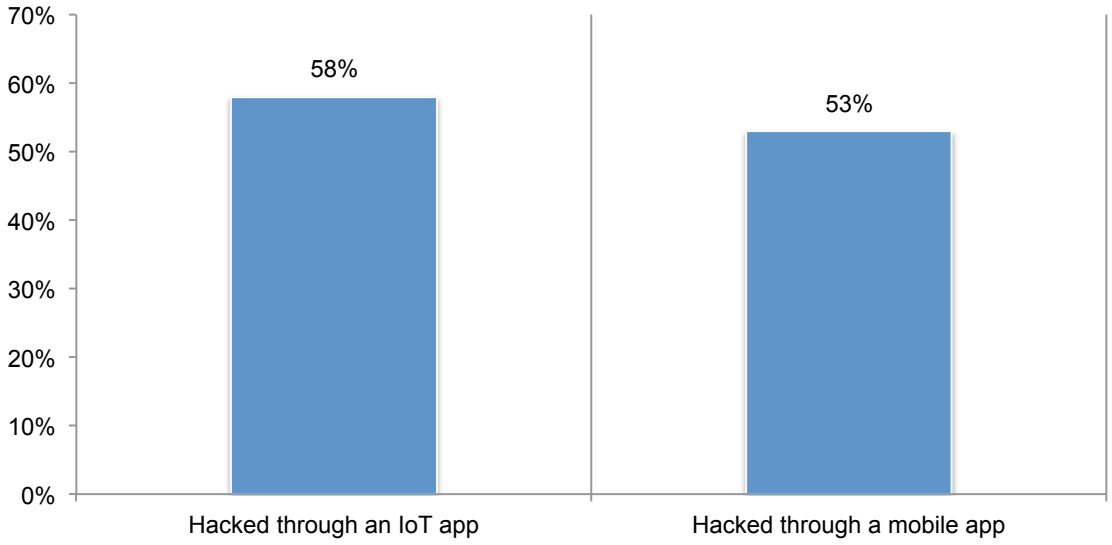
In this section, we provide an analysis of the findings. The complete audited findings are presented in the Appendix of this report. We have organized the report according to the following findings.

- The risk of mobile and IoT apps
- Are organizations mobilized to reduce the risk?
- Current security practices in place

The risk of mobile and IoT apps

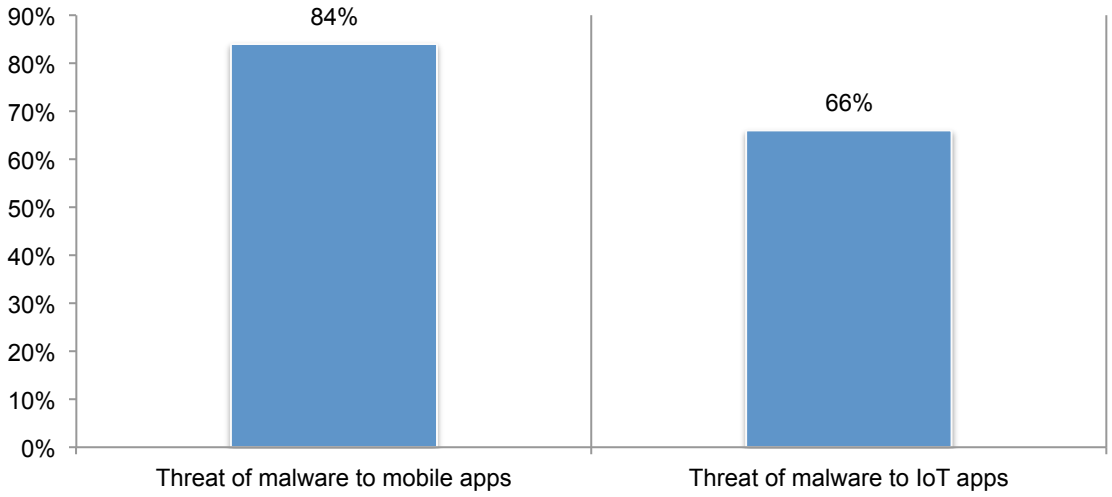
Many organizations are worried about an attack against mobile and IoT apps that are used in the workplace. As discussed previously, organizations are having a more difficult time securing IoT apps. In fact, respondents are slightly more concerned about getting hacked through an IoT app (58 percent) than a mobile app (53 percent), as shown in Figure 2. However, despite their concern organizations are not mobilizing against the threat. Forty-four percent of respondents say they are taking no steps to prevent such attacks and 11 percent are unsure if their organization is doing anything to prevent such an attack.

Figure 2. How concerned is your organization about getting hacked through a mobile or an IoT app?
Very concerned and Concerned responses combined



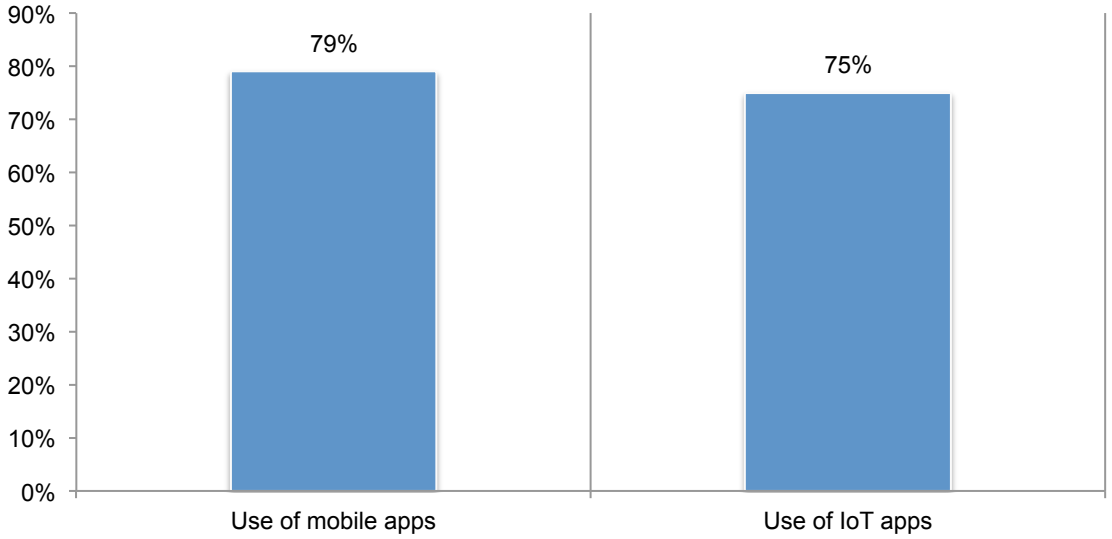
Malware is believed to pose a greater threat to mobile than IoT apps. According to Figure 3, 84 percent of respondents are very concerned about the threat of malware to mobile apps and 66 percent of respondents say they are very concerned about this threat to IoT apps.

Figure 3. How concerned is your organization about the threat of malware to mobile and IoT apps? 7+ on a scale of
1 = no concern to 10 = very concerned, 7+ responses reported



The use of mobile and IoT apps are threats to a strong security posture. As shown in Figure 4, 79 percent of respondents say the use of mobile apps and 75 percent of respondents say the use of IoT apps increases security risk very significantly or significantly.

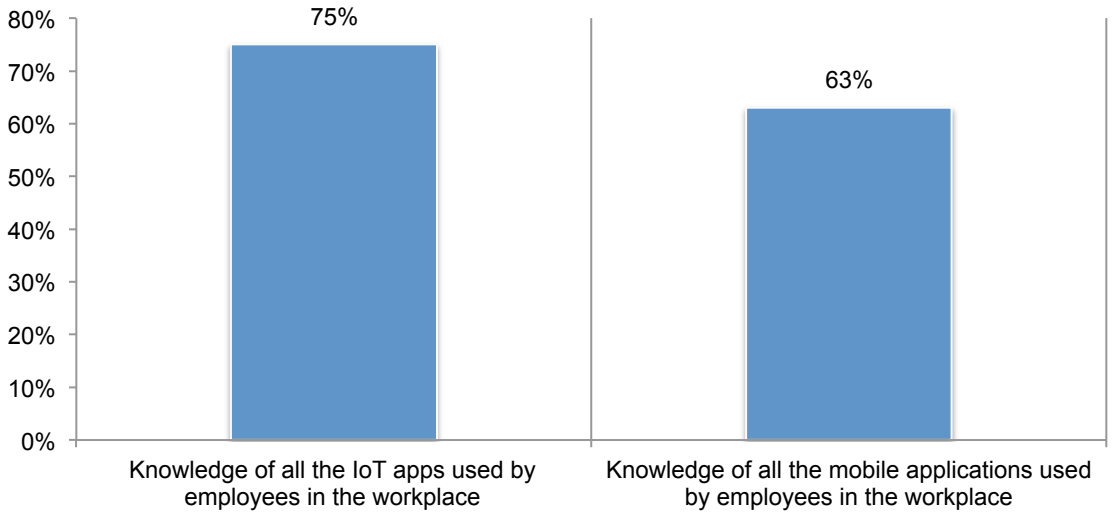
Figure 4. The use of mobile and IoT apps significantly increases security risks
Very significant and Significant increase responses are combined



Organizations have no confidence or are not confident they know all of the mobile and IoT apps in the workplace. As shown in Figure 5, 63 percent of respondents are not confident (30 percent) or have no confidence (33 percent) their organizations know all of the mobile applications used by employees.

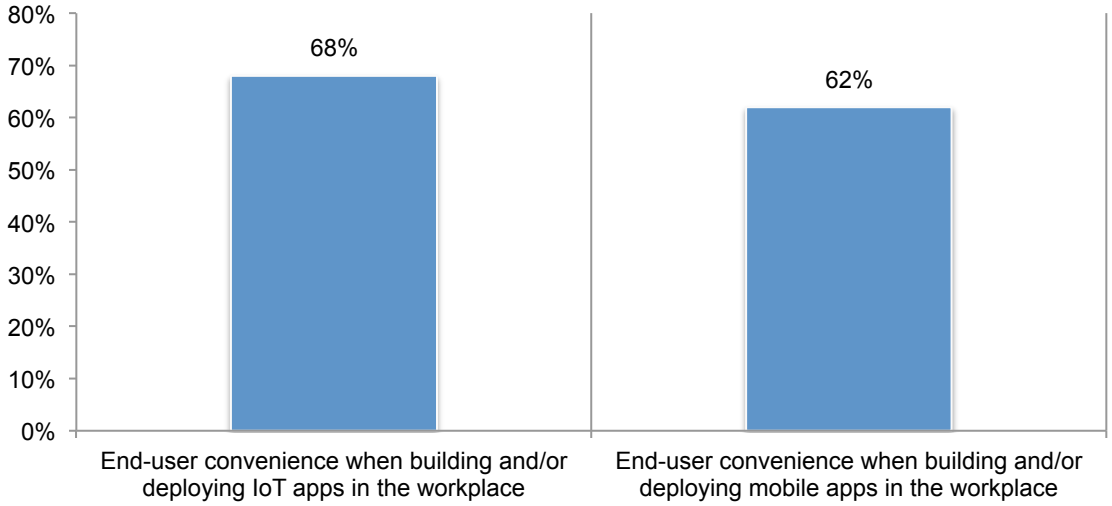
An even larger percentage of respondents (75 percent) are not confident (38 percent) or have no confidence (37 percent) that they know all of the IoT apps in the workplace. However, respondents estimate that the average number of mobile apps in their organizations is 472 and the average number of IoT apps is 241.

Figure 5. How confident are you that your organization knows all of the mobile and IoT apps in the workplace?
Not confident or No confidence responses are combined



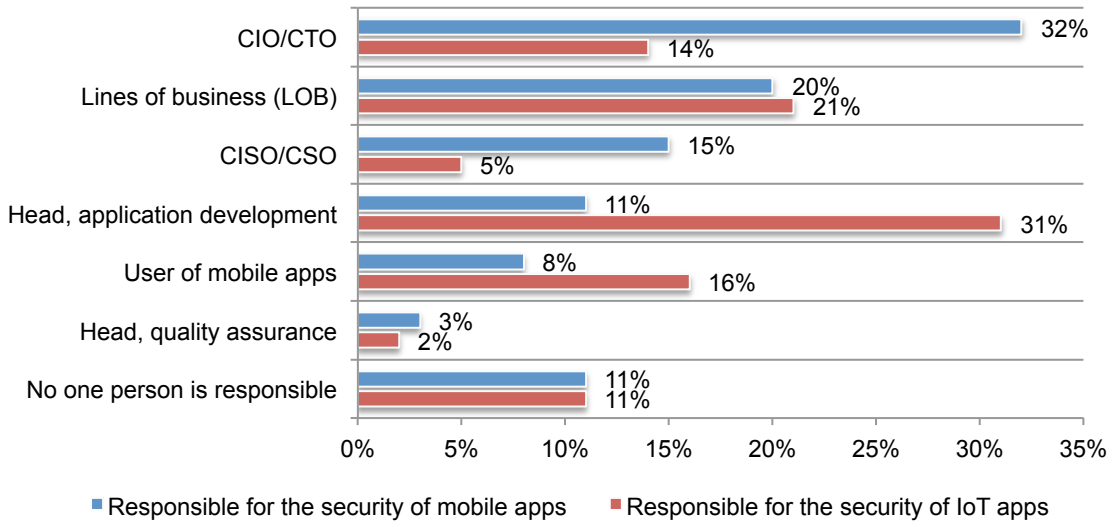
Mobile and IoT risks exist because end-user convenience is considered more important than security. The security of apps often does not receive the priority it needs because of pressures to ensure mobile and IoT apps are easy to use. As shown in Figure 6, 62 percent of respondents rate end-user convenience when building and/or deploying mobile apps in the workplace as important and 68 percent of respondents rate end-user convenience when building and/or deploying IoT apps in the workplace as important considerations.

Figure 6. How important is end-user convenience when building and/or deploying mobile and IoT apps?
1 = not important to 10 = very important, 7+ responses reported



The organizational functions most responsible for mobile and IoT security reside outside the security function. As shown in Figure 7, only 15 percent of respondents say the CISO is most responsible and only 11 percent of respondents say application development is primarily responsible for security of mobile apps. In the case of IoT apps, only 5 percent of respondents say the CISO is primarily responsible. Instead, the head of product engineering and lines of business are most responsible (31 percent and 21 percent of respondents, respectively).

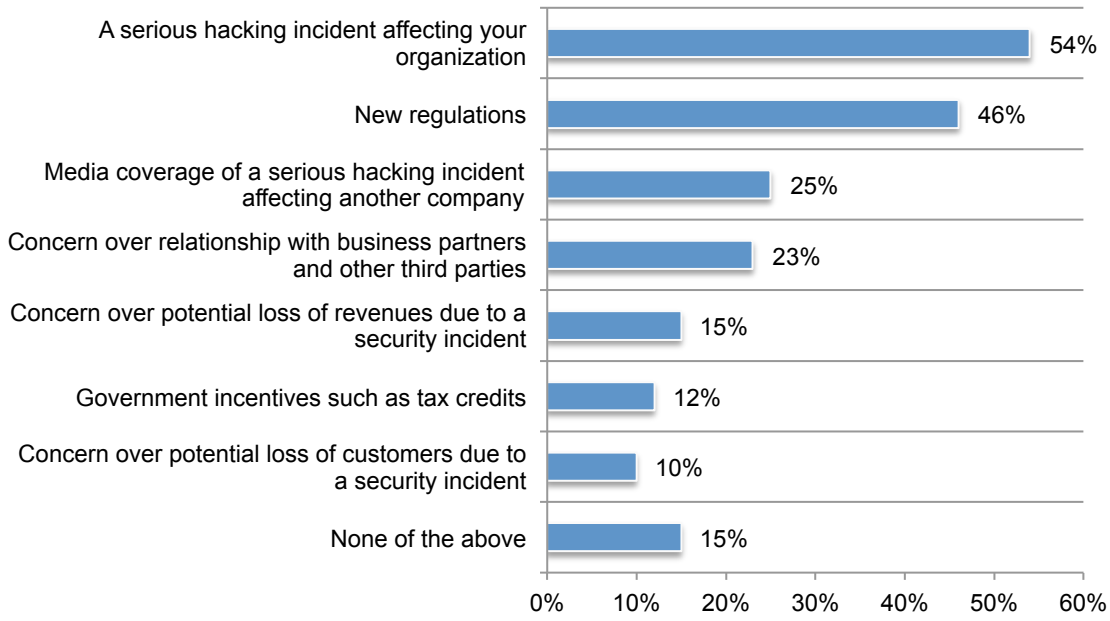
Figure 7. Who is primarily responsible for the security of mobile and IoT apps?



Not enough resources are being allocated. Only 30 percent of respondents say their organization allocates sufficient budget to protect mobile apps and IoT devices.

As shown in Figure 8, if they had a serious hacking incident, their organizations would consider increasing the budget (54 percent of respondents). Other reasons to increase the budget are if new regulations were issued (46 percent of respondents) or if they were exposed to media coverage of a serious hacking incident affecting another company (25 percent of respondents).

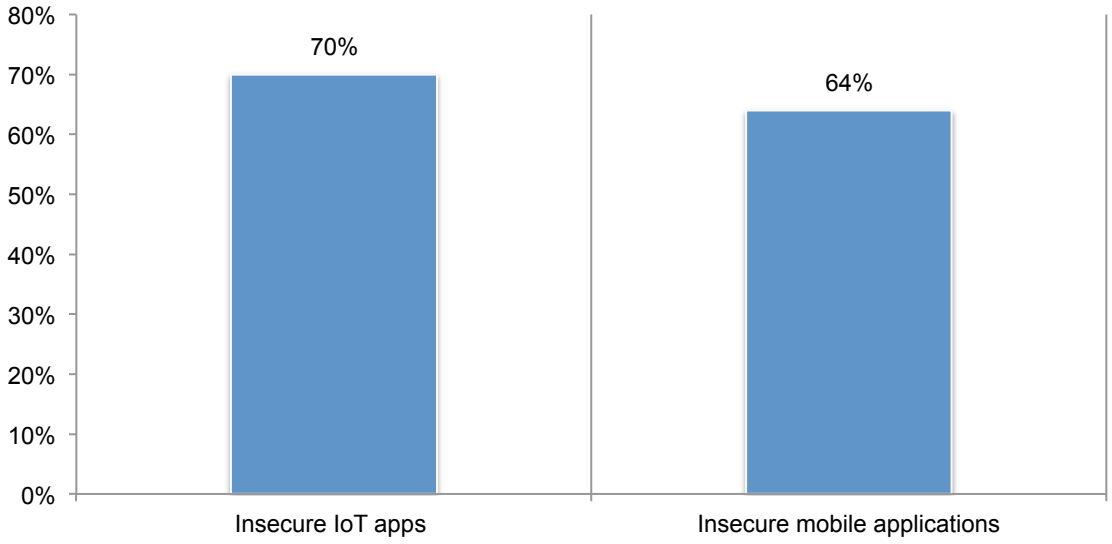
Figure 8. Would any of the following factors influence your organization to increase the budget?
Two responses permitted



Are organizations mobilized to reduce the risk?

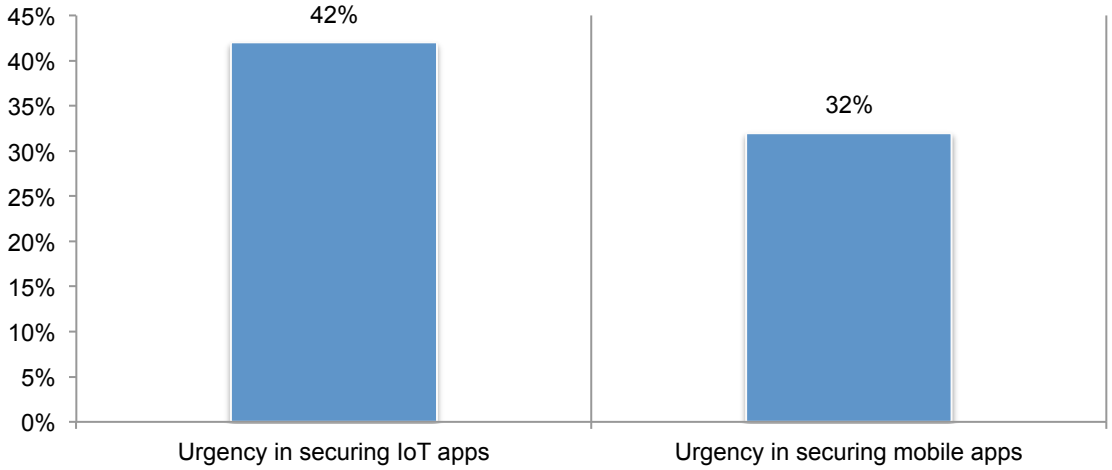
The risk of mobile and IoT apps in the workplace is recognized. As shown in Figure 9, 70 percent of respondents are very concerned about the use of insecure IoT apps and 64 percent are very concerned about the use of insecure mobile applications in the workplace.

Figure 9. How concerned are you about the use of insecure mobile and IoT apps in the workplace?
1 = not concerned to 10 = very concerned, 7+ responses reported



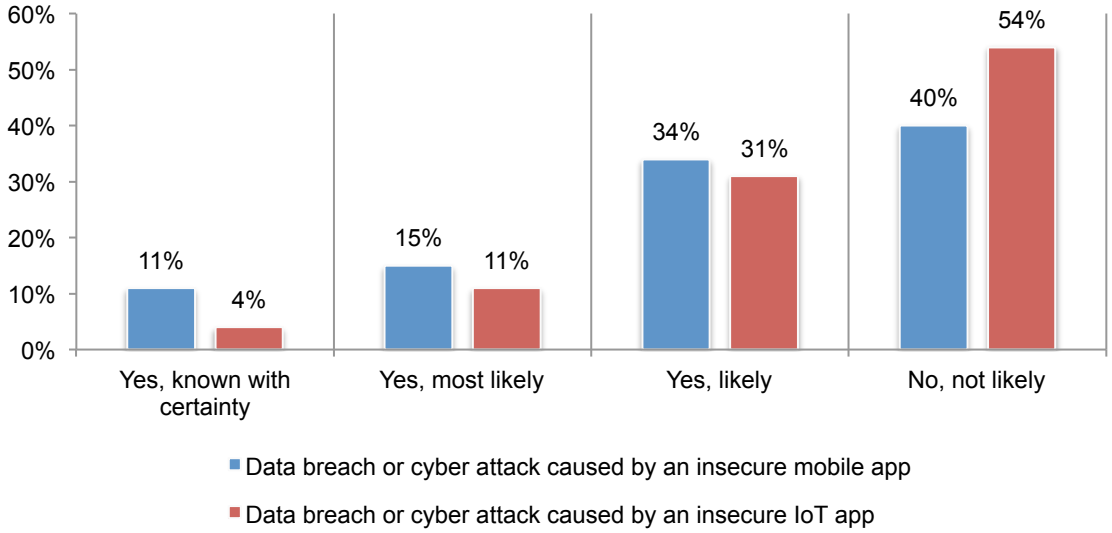
Despite the risk, there is a lack urgency to address the threat. According to Figure 10, only 32 percent of respondents say their organization urgently wants to secure mobile apps and 42 percent of respondents say it is urgent to secure IoT apps. Factors revealed in this study that might explain the lack of urgency include the following: not enough budget being allocated to the security of these apps and the individuals most often responsible for stopping attacks are not in the security function. Rather, they reside in the lines of business, development or engineering.

Figure 10. Please rate your organization's urgency in securing mobile and IoT apps
1 = low urgency to 10 = high urgency, 7+ responses reported



Material data breach or cyber attacks have occurred and are reasons for concern. According to Figure 11, respondents report they know with certainty (11 percent), or most likely (15 percent) or likely (34 percent) that their organization had a security incident because of an insecure mobile app. Respondents report they are less certain whether their organization had a material data breach or cyber attack due to an insecure IoT app. Forty-six percent of respondents say with certainty (4 percent), most likely (11 percent) or likely (31 percent).

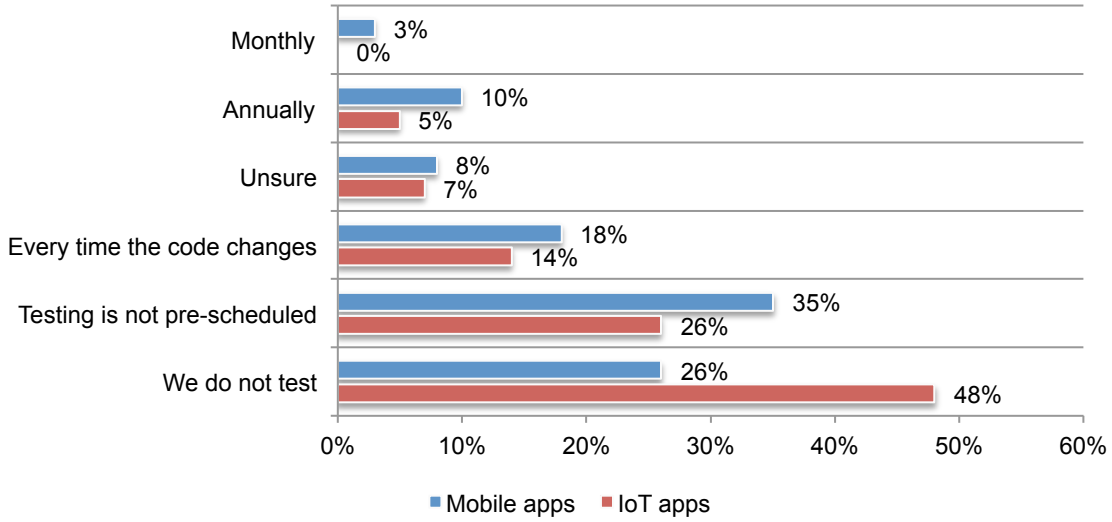
Figure 11. Has your organization experienced a data breach or cyber attack because of an insecure mobile or IoT app?



Current security practices in place

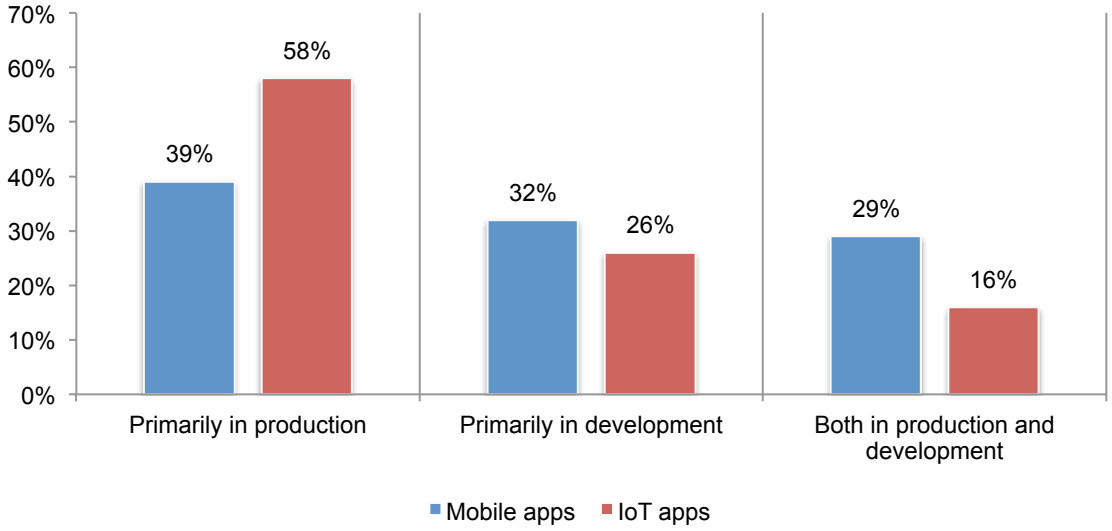
Testing of mobile and IoT apps is ad hoc, if done at all. As discussed above, organizations may recognize the risk but a sense of urgency to mitigate the risk does not exist. This lack of urgency is reflected in mobile and IoT app security practices. As shown in Figure 12, 35 percent of respondents say mobile app testing is not pre-scheduled or does not occur at all (26 percent of respondents). Almost half (48 percent of respondents) say testing of IoT apps does not occur. On average only 29 percent of mobile apps and 20 percent of IoT apps are tested for vulnerabilities. An average of 30 percent of mobile apps tested contain vulnerabilities and an average of 38 percent of IoT apps tested contain significant vulnerabilities.

Figure 12. How often does your organization test mobile and IoT apps?



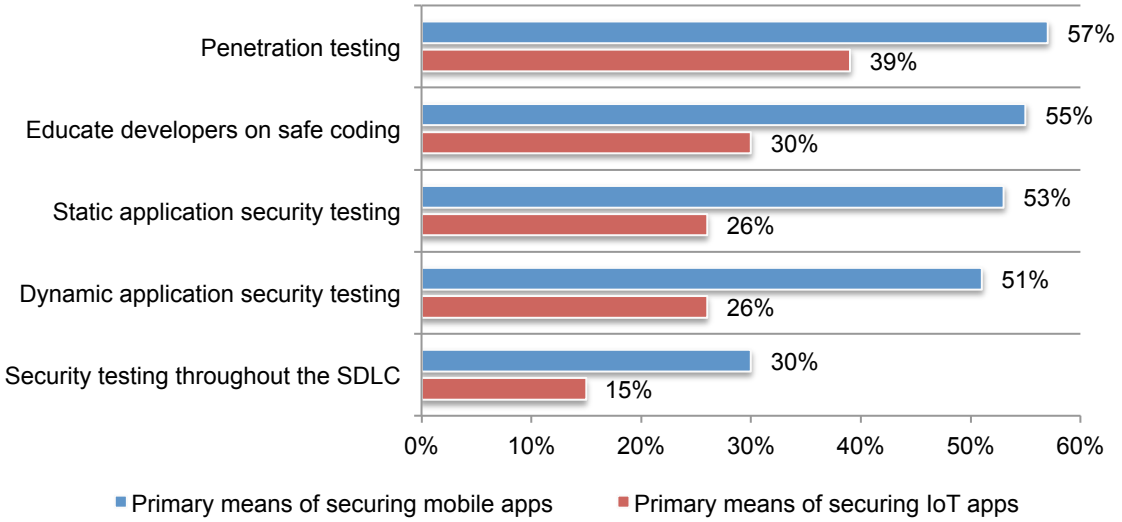
Testing of mobile and IoT apps often does not occur until production. According to Figure 13, 58 percent of respondents say their organization waits until IoT apps are tested in production and 39 percent of respondents say mobile apps are tested in production.

Figure 13. Where are mobile and IoT apps tested?



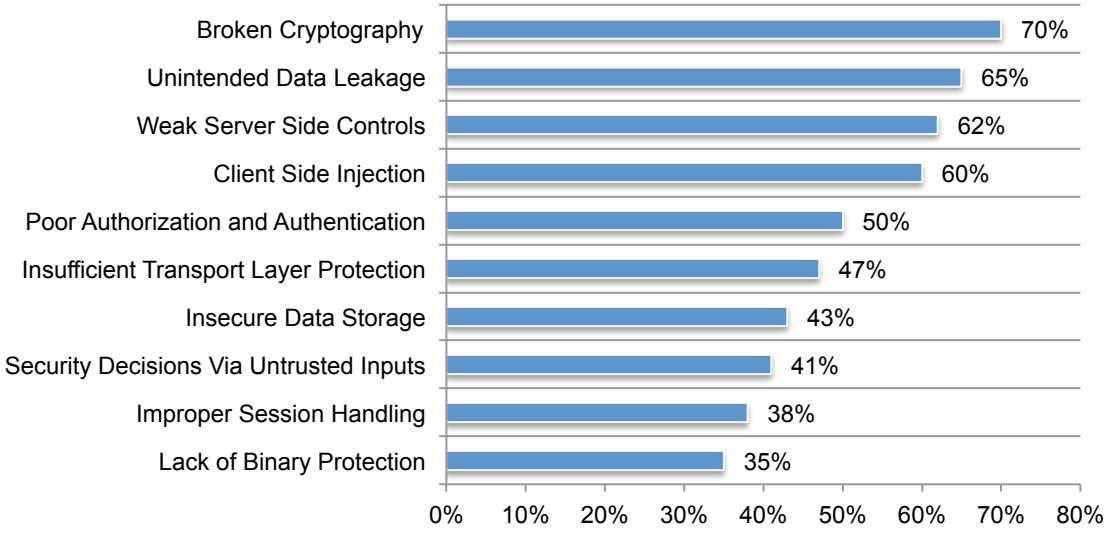
Pen testing is the primary means of securing mobile and IoT apps. The same approaches are used to secure mobile and IoT apps. As shown in Figure 14, 57 percent of respondents say the primary means of securing mobile apps is pen testing and 39 percent of respondents say pen testing is used to secure IoT apps. Fifty-five percent of respondents say their organization educates developers on safe coding for mobile apps and only 30 percent of respondents say their organization educates developers on safe coding practices for IoT apps.

Figure 14. The top five means of securing mobile and IoT apps
More than one response permitted



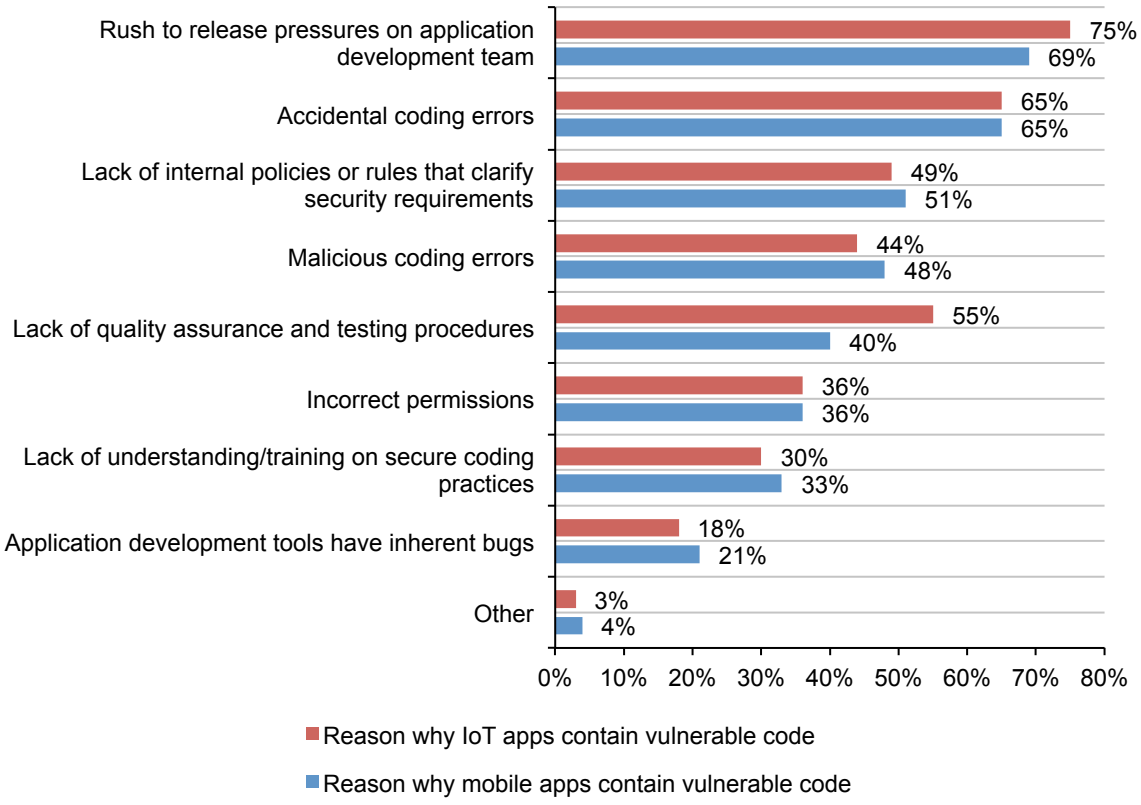
Broken cryptography and unintended data leakage are the most difficult mobile risks to mitigate. As shown in Figure 15, 49 percent of respondents say their organization follows guidance from the Open Web Application Security Project (OWASP). Seventy percent of respondents say broken cryptography and 65 percent say unintended data leakage are the most serious mobile app security risks. The least serious risk is the lack of binary protection.

Figure 15. The most difficult OWASP mobile app security risks to mitigate
Very difficult and Difficult responses combined



Rush to release is the main reason why both mobile and IoT apps contain vulnerable code. As revealed in Figure 16, 69 percent of respondents say pressure on the development team is why mobile apps contain vulnerable code and 75 percent of respondents say the same reason contributes to vulnerable code in IoT apps. Accidental coding errors in mobile and IoT apps are another primary reason for vulnerable code (65 percent of respondents). An additional issue affecting the security of apps is the lack of internal policies or rules that clarify security requirements.

Figure 16. The main reasons why mobile and IoT apps contain vulnerable code
More than one response permitted



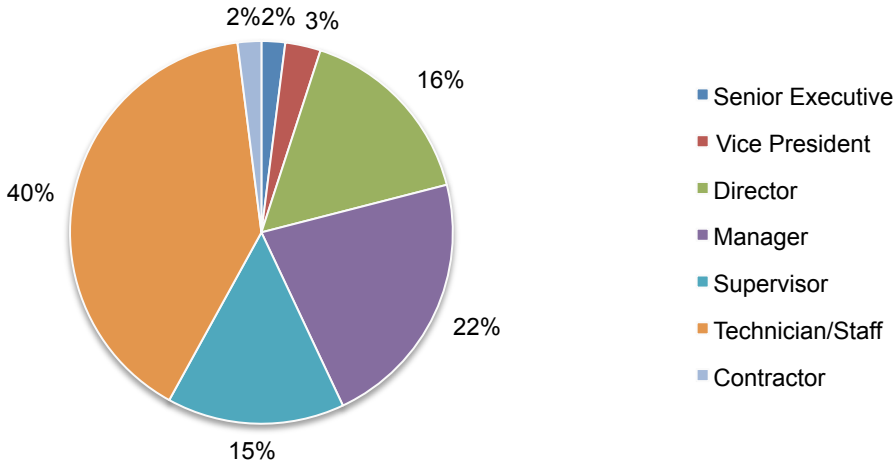
Part 3. Methods

A sampling frame of 16,450 IT and IT security practitioners who are involved in the security of mobile and IoT application security and familiar with their organization's security practices during the development of these applications and devices were selected as participants in the research. Table 1 shows 651 total returns. Screening and reliability checks required the removal of 58 surveys. Our final sample consisted of 593 surveys, or a 3.6 percent response.

Table 1. Sample response	Freq	Pct%
Sampling frame	16,450	100.0%
Total returns	651	4.0%
Rejected or screened surveys	58	0.4%
Final sample	593	3.6%

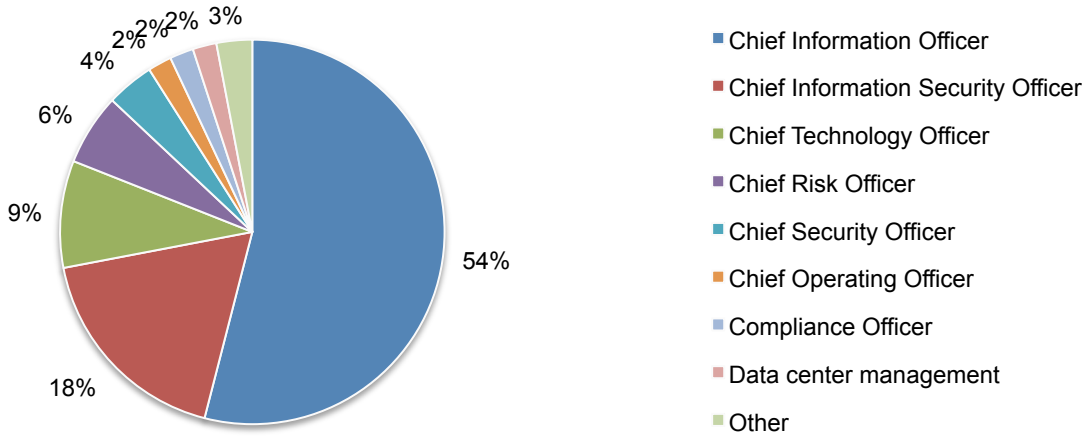
Pie Chart 1 reports the respondent's current position within the organization. By design, more than half of the respondents (58 percent) are at or above the supervisory levels.

Pie Chart 1. Current position level within the organization



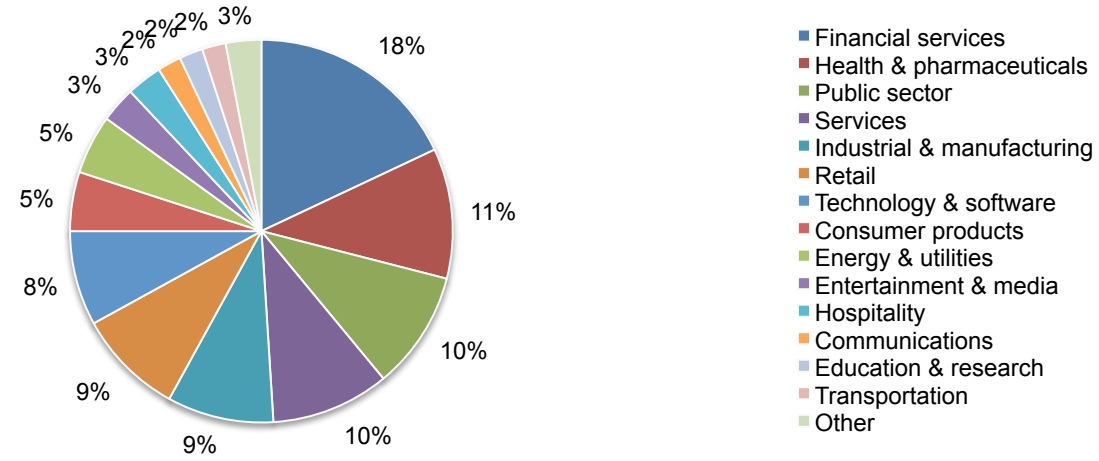
As shown in Pie Chart 2, 54 percent of respondents report directly to the chief information officer and 18 percent report to the chief information security officer.

Pie Chart 2. The primary person reported to within the organization



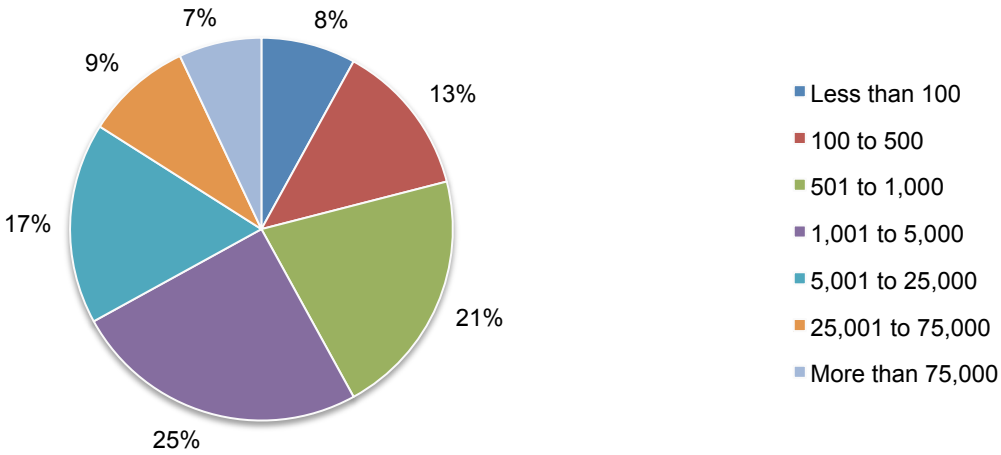
Pie Chart 3 reports the industry classification of respondents' organizations. This chart identifies financial services (18 percent of respondents) as the largest segment, followed by health and pharmaceutical (11 percent of respondents) and public services (10 percent of respondents).

Pie Chart 3. Primary industry classification



According to Pie Chart 4, 58 percent of the IT respondents and end user respondents are from organizations with a global headcount of more than 1,000 employees.

Pie Chart 4. Worldwide headcount of the organization



Part 4. Caveats to this study

There are inherent limitations to survey research that need to be carefully considered before drawing inferences from findings. The following items are specific limitations that are germane to most Web-based surveys.

- Non-response bias: The current findings are based on a sample of survey returns. We sent surveys to a representative sample of individuals, resulting in a large number of usable returned responses. Despite non-response tests, it is always possible that individuals who did not participate are substantially different in terms of underlying beliefs from those who completed the instrument.

- Sampling-frame bias: The accuracy is based on contact information and the degree to which the list is representative of individuals who are involved in the security of mobile and IoT application security in their organizations. We also acknowledge that the results may be biased by external events such as media coverage. Finally, because we used a Web-based collection method, it is possible that non-Web responses by mailed survey or telephone call would result in a different pattern of findings.

- Self-reported results: The quality of survey research is based on the integrity of confidential responses received from subjects. While certain checks and balances can be incorporated into the survey process, there is always the possibility that a subject did not provide accurate responses.

Appendix: Detailed Survey Results

The following tables provide the frequency or percentage frequency of responses to all survey questions contained in this study. All survey responses were captured in December 2016.

Survey response	Freq	Pct%
Total sampling frame	16,450	100.0%
Total returns	651	4.0%
Rejected surveys	58	0.4%
Final sample	593	3.6%

Part 1. Screening

S1. Do you have any role or involvement in securing mobile or IoT applications?	Pct%
Yes, significant involvement	33%
Yes, some involvement	40%
Yes, minimal involvement	27%
No involvement (Stop)	0%
Total	100%

S2. How familiar are you with your organization's security practices during the development of applications for mobile and IoT devices?	Pct%
Very familiar	45%
Familiar	40%
Somewhat familiar	15%
No knowledge (Stop)	0%
Total	100%

Part 2. General Questions

Q1. What best describes your organization's role in development of mobile apps?	Pct%
Mostly a user of mobile apps	44%
Mostly a developer/manufacturer of mobile apps	27%
Both user and developer of mobile apps	29%
None of the above (stop)	0%
Total	100%

Q2. What best describes your organization's role in development of IoT devices?	Pct%
Mostly a user of IoT devices	48%
Mostly a developer/manufacturer of IoT devices	21%
Both user and developer/manufacturer of IoT devices	31%
None of the above (stop)	0%
Total	100%

Q3. How concerned are you about the use of insecure mobile applications in the workplace?	Pct%
1 or 2 (Not concerned)	6%
3 or 4	11%
5 or 6	19%
7 or 8	35%
9 or 10 (Very concerned)	29%
Total	100%
Extrapolated value	6.90

Q4. How concerned are you about the use of insecure IoT apps in the workplace?	Pct%
1 or 2 (Not concerned)	7%
3 or 4	8%
5 or 6	15%
7 or 8	30%
9 or 10 (Very concerned)	40%
Total	100%
Extrapolated value	7.26

Q5. How confident are you that your organization knows all the mobile applications used by employees in the workplace?	Pct%
Very confident	16%
Confident	21%
Not confident	30%
No confidence	33%
Total	100%

Q6. How confident are you that your organization knows all the IoT apps used by employees in the workplace?	Pct%
Very confident	11%
Confident	14%
Not confident	38%
No confidence	37%
Total	100%

Q7a. Has your organization experienced a material data breach or cyber attack over the past 12 months that was caused by an insecure mobile app?	Pct%
Yes, known with certainty	11%
Yes, most likely	15%
Yes, likely	34%
No, not likely	40%
Total	100%

Q7b. Has your organization experienced a material data breach or cyber attack over the past 12 months that was caused by an insecure IoT app?	Pct%
Yes, known with certainty	4%
Yes, most likely	11%
Yes, likely	31%
No, not likely	54%
Total	100%

Q8. What best describes the types of mobile platforms supported by your organization today for accessing or developing business apps? Please select all that apply.	Pct%
iOS	58%
Android	60%
Windows	43%
Blackberry	8%
Other (please specify)	0%
Total	169%

Q9a. How concerned is your organization about getting hacked through a mobile app?	Pct%
Very concerned	28%
Concerned	25%
Somewhat concerned	13%
Not concerned	34%
Total	100%

Q9b. How concerned is your organization about getting hacked through an IoT app?	Pct%
Very concerned	27%
Concerned	31%
Somewhat concerned	12%
Not concerned	30%
Total	100%

Q9c. If you responded very concerned or concerned (Q9a & 9b), is your organization taking steps to prevent hacks?	Pct%
Yes, significant steps	15%
Yes, some steps	30%
No steps	44%
Unsure	11%
Total	100%

Q10a. Who within your organization is primarily responsible for the security of mobile apps?	Pct%
CIO/CTO	32%
CISO/CSO	15%
Lines of business (LOB)	20%
Head, application development	11%
Head, quality assurance	3%
User of mobile apps	8%
No one person is responsible	11%
Other (please specify)	0%
Total	100%

Q10b. Who within your organization is primarily responsible for the security of IoT apps?	Pct%
CIO/CTO	14%
CISO/CSO	5%
Lines of business (LOB)	21%
Head, product engineering	31%
Head, quality assurance	2%
User of IoT devices	16%
No one person is responsible	11%
Other (please specify)	0%
Total	100%

Q11a. Approximately, how many mobile apps are used by your organization today?	Pct%
Less than 50	11%
51 to 100	22%
101 to 500	26%
501 to 1,000	26%
More than 1,000	15%
Total	100%
Extrapolated value	472

Q11b. Approximately, how many IoT apps are used by your organization today?	Pct%
Less than 50	32%
51 to 100	31%
101 to 500	19%
501 to 1,000	14%
More than 1,000	4%
Total	100%
Extrapolated value	241

Q12a. How often does your organization test mobile applications?	Pct%
Annually	10%
Monthly	3%
Weekly	0%
Every time the code changes	18%
Testing is not pre-scheduled	35%
Unsure	8%
We do not test	26%
Total	100%

Q12b. How often does your organization test IoT apps?	Pct%
Annually	5%
Monthly	0%
Weekly	0%
Every time the code changes	14%
Testing is not pre-scheduled	26%
Unsure	7%
We do not test	48%
Total	100%

Q13a. On average, what percent of mobile applications are tested for vulnerabilities?	Pct%
< 10%	8%
10 to 20%	33%
21 to 30%	23%
31 to 40%	13%
41 to 50%	12%
51 to 75%	6%
76 to 100%	5%
Total	100%
Extrapolated value	29%

Q13b. On average, what percent of IoT apps are tested for vulnerabilities?	Pct%
< 10%	36%
10 to 20%	28%
21 to 30%	13%
31 to 40%	13%
41 to 50%	5%
51 to 75%	3%
76 to 100%	2%
Total	100%
Extrapolated value	20%

Q14a. On average, what percent of tested mobile applications contain significant vulnerabilities?	Pct%
None	0%
1 to 10%	9%
11 to 20%	19%
21 to 30%	27%
31 to 40%	24%
41 to 50%	14%
51 to 75%	5%
76 to 100%	2%
Total	100%
Extrapolated value	30%

Q14b. On average, what percent of IoT apps contain significant vulnerabilities?	Pct%
None	0%
1 to 10%	6%
11 to 20%	13%
21 to 30%	20%
31 to 40%	19%
41 to 50%	22%
51 to 75%	12%
76 to 100%	8%
Total	100%
Extrapolated value	38%

Q15a. Where do you test mobile apps? Please check all that apply.	Pct%
Primarily in production	39%
Primarily in development	32%
Both in production and development	29%
Total	100%

Q15b. Where do you test IoT apps? Please check all that apply.	Pct%
Primarily in production	58%
Primarily in development	26%
Both in production and development	16%
Total	100%

Q16a. How does the use of mobile apps by employees affect your organization's security risk posture?	Pct%
Very significant increase in security risk	32%
Significant increase in security risk	47%
Nominal increase in security risk	16%
No increase in security risk	5%
Total	100%

Q16b. How does the use of IoT apps affect your organization's security risk posture?	Pct%
Very significant increase in security risk	33%
Significant increase in security risk	42%
Nominal increase in security risk	19%
No increase in security risk	6%
Total	100%

Q17a. Does your organization have a policy that defines the acceptable use of mobile apps in the workplace?	Pct%
Yes	51%
No	49%
Total	100%

Q17b. Does your organization have a policy that defines the acceptable use of IoT apps in the workplace?	Pct%
Yes	40%
No	60%
Total	100%

Q18a. Has your organization created a security infrastructure or plan for the use of IoT?	Pct%
Yes	31%
No	64%
Unsure	5%
Total	100%

Q18b. If yes, how often do you review the effectiveness of the security infrastructure or plan?	Pct%
Annually	34%
Bi-annually	0%
Quarterly	11%
We don't review the effectiveness	49%
Unsure	6%
Total	100%

Q19a. Does your organization follow guidance from the Open Web Application Security Project (OWASP) to mitigate or reduce mobile app and IoT security risks?	Pct%
Yes	49%
No	51%
Total	100%

Q19b. Following are the OWASP top 10 mobile app security risks. Please rate each one based on difficulty to minimize each risk. Percentage very difficult and difficult response combined.	Pct%
M1: Weak Server Side Controls	62%
M2: Insecure Data Storage	43%
M3: Insufficient Transport Layer Protection	47%
M4: Unintended Data Leakage	65%
M5: Poor Authorization and Authentication	50%
M6: Broken Cryptography	70%
M7: Client Side Injection	60%
M8: Security Decisions Via Untrusted Inputs	41%
M9: Improper Session Handling	38%
M10. Lack of Binary Protection	35%

Q20a. What is your organization's primary means of securing mobile apps? Please select all that apply.	Pct%
Educate developers on safe coding	55%
Code review and debugging system	26%
Static application security testing	53%
Dynamic application security testing	51%
Penetration testing	57%
Security testing throughout the SDLC	30%
Data masking or redaction of live data (during testing)	29%
Security patch management	30%
Run-time application self protection	28%
Other (please specify)	3%
None of the above	20%
Total	382%

Q20b. What is your organization's primary means of securing IoT apps? Please select all that apply.	Pct%
Educate developers on safe coding	30%
Code review and debugging system	15%
Static application security testing	26%
Dynamic application security testing	26%
Penetration testing	39%
Security testing throughout the SDLC	15%
Data masking or redaction of live data (during testing)	11%
Security patch management	5%
Run-time application self protection	12%
Other (please specify)	2%
None of the above	45%
Total	226%

Q21a. What do you see as the main reason(s) why your organization's mobile apps contain vulnerable code? Please select all that apply.	Pct%
Accidental coding errors	65%
Malicious coding errors	48%
Lack of internal policies or rules that clarify security requirements	51%
Lack of understanding/training on secure coding practices	33%
Rush to release pressures on application development team	69%
Lack of quality assurance and testing procedures	40%
Application development tools have inherent bugs	21%
Incorrect permissions	36%
Other (please specify)	4%
Total	367%

Q21b. What do you see as the main reason(s) why your organization's IoT apps contain vulnerable code? Please select all that apply.	Pct%
Accidental coding errors	65%
Malicious coding errors	44%
Lack of internal policies or rules that clarify security requirements	49%
Lack of understanding/training on secure coding practices	30%
Rush to release pressures on application development team	75%
Lack of quality assurance and testing procedures	55%
Application development tools have inherent bugs	18%
Incorrect permissions	36%
Other (please specify)	3%
Total	375%

Assume your budget or spending level on mobile application and IoT security increased by 20 percent, how would this impact your organization's ability to detect and/or prevent the above threats? Your best guess is welcome.	
Q22a. Increase (improvement) in detection rate.	Pct%
No increase	0%
1 to 10%	12%
11 to 20%	36%
21 to 30%	26%
31 to 40%	17%
41 to 50%	6%
51 to 75%	2%
76 to 100%	1%
Total	100%
Extrapolated value	23%

Q22b. Increase (improvement) in prevention rate.	Pct%
No increase	0%
1 to 10%	21%
11 to 20%	36%
21 to 30%	30%
31 to 40%	11%
41 to 50%	2%
51 to 75%	0%
76 to 100%	0%
Total	100%
Extrapolated value	19%

Q23. Approximately, how much does your organization spend on mobile application and/or IoT security each year? Please choose the range that best approximates the total investment in terms of technologies, personnel, managed or outsourced services and other cash outlays. Alternatively, please provide your best estimate in the space provided below.	Pct%
None	0%
1 to $100,000	5%
100,001 to $250,000	8%
250,001 to $500,000	13%
500,001 to $1,000,000	23%
1,000,001 to $2,500,000	19%
2,500,001 to $5,000,000	11%
$5,000,001 to $10,000,000	10%
$10,000,001 to $25,000,000	4%
$25,000,001 to $50,000,000	2%
More than $50,000,000	0%
Total	95%
Extrapolated value	$3,182,750

Q24a. Does your organization allocate sufficient budget to protect mobile apps and IoT devices?	Pct%
Yes	30%
No	70%
Total	100%

Q24b. If no, would any of the following factors influence your organization to increase the budget? Please select your top two concerns.	Pct%
New regulations	46%
A serious hacking incident affecting your organization	54%
Media coverage of a serious hacking incident affecting another company	25%
Government incentives such as tax credits	12%
Concern over potential loss of revenues due to a security incident	15%
Concern over potential loss of customers due to a security incident	10%
Concern over relationship with business partners and other third parties	23%
None of the above	15%
Other	0%
Total	200%

Q25. Please rate the level of difficulty in securing mobile apps.	Pct%
1 or 2 (Easy)	3%
3 or 4	12%
5 or 6	16%
7 or 8	36%
9 or 10 (Very difficult)	33%
Total	100%
Extrapolated value	7.18

Q26. Please rate the level of difficulty in securing IoT apps.	Pct%
1 or 2 (Easy)	0%
3 or 4	5%
5 or 6	11%
7 or 8	30%
9 or 10 (Very difficult)	54%
Total	100%
Extrapolated value	8.16

Q27. Please rate your organization's level of concern about the threat of malware to mobile apps.	Pct%
1 or 2 (No concern)	0%
3 or 4	5%
5 or 6	11%
7 or 8	30%
9 or 10 (Very concerned)	54%
Total	100%
Extrapolated value	8.16

Q28. Please rate your organization's level of concern about the threat of malware to IoT apps.	Pct%
1 or 2 (No concern)	3%
3 or 4	8%
5 or 6	23%
7 or 8	36%
9 or 10 (Very concerned)	30%
Total	100%
Extrapolated value	7.14

Q29. Please rate your organization's urgency in securing mobile apps.	Pct%
1 or 2 (Low urgency)	18%
3 or 4	23%
5 or 6	27%
7 or 8	16%
9 or 10 (High urgency)	16%
Total	100%
Extrapolated value	5.28

Q30. Please rate your organization's urgency in securing IoT apps.	Pct%
1 or 2 (Low urgency)	12%
3 or 4	18%
5 or 6	28%
7 or 8	23%
9 or 10 (High urgency)	19%
Total	100%
Extrapolated value	5.88

Q31. Please rate the importance of end-user convenience when building and/or deploying mobile apps in the workplace.	Pct%
1 or 2 (Not important)	2%
3 or 4	8%
5 or 6	28%
7 or 8	33%
9 or 10 (Very important)	29%
Total	100%
Extrapolated value	7.08

Q32. Please rate the importance of end-user convenience when building and/or deploying IoT apps in the workplace.	Pct%
1 or 2 (Not important)	3%
3 or 4	8%
5 or 6	21%
7 or 8	35%
9 or 10 (Very important)	33%
Total	100%
Extrapolated value	7.24

Q33. Using the following 10-point scale, please rate the importance of mobile application security relative to all other data and IT security measures deployed by your organization.	Pct%
1 or 2 (Less important)	10%
3 or 4	19%
5 or 6	26%
7 or 8	25%
9 or 10 (More important)	20%
Total	100%
Extrapolated value	6.02

Q34. Using the following 10-point scale, please rate the importance of IoT security relative to all other data and IT security measures deployed by your organization.	Pct%
1 or 2 (Less important)	7%
3 or 4	17%
5 or 6	26%
7 or 8	32%
9 or 10 (More important)	18%
Total	100%
Extrapolated value	6.24

Part 3. Your Role

D1. What organizational level best describes your current position?	Pct%
Senior Executive	2%
Vice President	3%
Director	16%
Manager	22%
Supervisor	15%
Technician/Staff	40%
Contractor	2%
Other	0%
Total	100%

D2. Check the Primary Person you or your IT security leader reports to within the organization.	Pct%
Chief Executive Officer	1%
Chief Operating Officer	2%
Chief Financial Officer	1%
General Counsel	1%
Chief Information Officer	54%
Chief Technology Officer	9%
Chief Information Security Officer	18%
Chief Security Officer	4%
Compliance Officer	2%
Data center management	2%
Chief Risk Officer	6%
Other	0%
Total	100%

D3. What best describes your organization's industry focus?	Pct%
Agriculture and food service	1%
Communications	2%
Consumer products	5%
Defense & aerospace	1%
Education & research	2%
Energy & utilities	5%
Entertainment & media	3%
Financial services	18%
Health & pharmaceuticals	11%
Hospitality	3%
Industrial & manufacturing	9%
Public sector	10%
Retail	9%
Services	10%
Technology & software	8%
Transportation	2%
Other	1%
Total	100%

D4. What is the worldwide headcount of your organization?	Pct%
Less than 100	8%
100 to 500	13%
501 to 1,000	21%
1,001 to 5,000	25%
5,001 to 25,000	17%
25,001 to 75,000	9%
More than 75,000	7%
Total	100%

Please contact research@ponemon.org or call us at 800.877.3118 if you have any questions.

Ponemon Institute

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