

The Rise of Indoor Positioning



A 2016 Global Research Report
On The Indoor Positioning Market

Message from IndoorAtlas

As the location services market continues to grow, the piloting and deployment of IPS (Indoor Positioning Systems) is in full momentum across many regions around the globe. I am truly excited to see this positive growth. Organizations of different sizes and verticals are looking for ways to drive new revenues, user experiences and brand advantages through deploying location-based services to their mobile applications. Although the indoor positioning market may be in relative infancy, our independent research reveals that many organizations have already started down the path of deploying IPS, and of those that have not, the majority will plan to in the next two years.

Driven by trends that include smartphone penetration, changing consumer buying behavior and time spent indoors, the future potential of our market looks extremely bright. However, organizations that want to offer location-based apps with a high user experience, still have many hurdles to overcome, including how to maintain high levels of positioning accuracy at scale and with a low total cost of ownership. Our research shows tremendous demand, growth and deployments for IPS. But we also see the industry at a crossroad, where new IPS technologies are required to let indoor positioning continue to expand globally. This survey demonstrates that global customers see this too and are looking for ways to address this problem.

At IndoorAtlas, we set out from the start to address the challenges of scale, accuracy, cost and ease of deployment. We wanted to make it easier for organizations to purchase, deploy and maintain IPS across one or multiple venues. Our geomagnetic Platform-as-a-Service was designed with the developer in mind - with a simple workflow, cloud platform and Software Development Kit (SDK) that's available for both Android and iOS users. What's more, we have the ability to leverage existing investments made in infrastructure such as WiFi and beacons at venues for further optimization and returns on your capital and operational expenditure.

We've come a long way since our inception in 2012 – we are now an award winning global company with 25,000 developers on our platform and nearly one million monthly active users. That's why customers in over 100 countries, such as Baidu and Yahoo! JAPAN, trust us for their indoor positioning needs.

I hope that you gain good insights from this research. We welcome you to learn more about our technology and use cases at www.indooratlas.com. From there you can sign up and start using our service for free.

Janne



Dr Janne Haverinen
CEO & Founder of IndoorAtlas

Research scope

In May 2016, IndoorAtlas commissioned independent market research with a specialist research firm, Vanson Bourne, on the indoor positioning market. A total of 301 business and marketing decision makers who are responsible for the development and strategy of location-based applications were interviewed across the United States, United Kingdom, Asia (Singapore and Hong Kong) and Australia. All respondents were from mid-large organizations, with at least 250+ employees within the following sectors:

- Health services
- Leisure, travel and transport
- Marketing and media
- Retail

Interviews were conducted online using a rigorous multi-level screening process to ensure that only suitable candidates had the opportunity to participate.

The research project was completed in July 2016.



Introduction

The indoor positioning market is estimated to grow to \$4.4 billion by 2019 (MarketsandMarkets) with strong demand in healthcare, retail, hospitality, travel and other sectors. Today, more than 80-90% of people’s time is spent indoors (Strategy Analytics). Combine that with rising smartphone penetration and changing consumer mobile buyer behavior, it is no wonder that startups and established organizations are quickly looking for ways to provide location-based apps to engage their users indoors. This in turn has increased the number of pilots and deployments of Indoor Positioning Systems (IPS) – the underlying technology that enables indoor positioning for location-based apps.

IPS provide an opportunity for organizations to engage customers inside large indoor spaces with their brands, their products, their partners or anything that helps them to further increase customer relationships and sales.

IPS locate people or objects inside a building using radio waves, magnetic fields, acoustic signals, or other sensory information collected by a smartphone, tablet or other smart devices. Organizations can use IPS to develop features for their location-based apps and popular features include;

- Proximity marketing/advertising
- Way-finding/navigation
- Search
- Asset or people tracking

There are three mainstream types of IPS that organizations can implement in their indoor venues, either exclusively or together as a hybrid solution to provide more accuracy:

1. **Bluetooth Low Energy Beacons (BLE beacons):** are battery powered small devices that transmit a signal in a very small area (usually up to 20 meters/70ft), allowing apps to react to a person’s location within range. They are all about proximity, not exact location.
2. **WiFi:** For WiFi positioning, the so-called fingerprinting method is used to locate users of wireless networks through their wireless access points. A WiFi positioning system can be used to identify WiFi hotspots, or to locate signals from a particular user device, such as a smartphone. The strength of WiFi signals are significant but in order to achieve 10 meter accuracy with WiFi, many access points need to be installed throughout a venue.

3. **Geomagnetic:** Modern buildings have a unique magnetic landscape produced by the Earth’s magnetic field that interacts with steel and other materials found in structures of buildings. By utilizing the smartphone’s built-in magnetic sensor (the compass) as well as other sensing technologies, software can pinpoint and track a user’s location indoors to achieve sub-two meters (3-6 feet) positioning accuracy. IndoorAtlas is the global leader in geomagnetic indoor positioning technology.

This research report validates the growth in the IPS market with nearly all survey participants stating they are either deploying or planning to deploy IPS in the next two years. However, there is one clear roadblock reported in this survey that is hampering organizations today – scale.

Unlike Global Positioning Systems (GPS), IPS doesn’t rely on existing satellite signals. It is the responsibility of IT managers, marketing managers, facilities personnel and other stakeholders to purchase, install and maintain IPS systems. Respondents reported that thousands of WiFi and beacon devices will be required across their indoor venues to achieve high levels of positioning accuracy needed for their mobile users – a clear challenge for even the largest of organizations to overcome.

This white paper examines:

- The momentum and adoption of IPS
- The trends driving the IPS market
- Popular use cases for location-based apps
- The key challenges organizations are facing with the IPS method(s) they are using
- The opportunities for geomagnetic indoor positioning



The rise of indoor positioning

Growth

The survey reveals that the majority of organizations across the globe are adopting IPS to deliver location-based apps. Nearly all respondents surveyed have deployed or will deploy IPS in the next two years. Specifically, 72% of respondents' organizations have implemented IPS, or are in the process of implementing it.

Implementing IPS

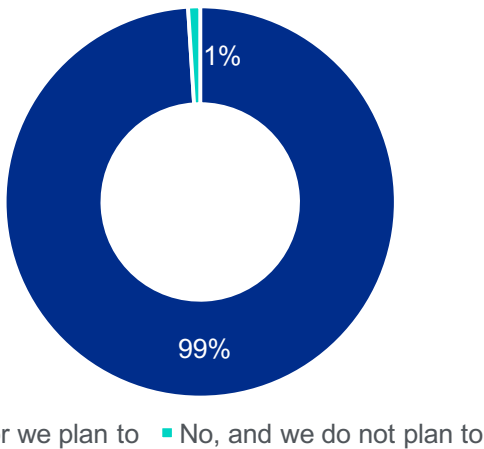


Figure 1: "Has your organization implemented IPS at any of its sites?"
Asked to all 301 respondents

Today 38% of respondents' organizations have already implemented IPS. US organizations are leading the globe, with 43% of respondents' organizations having implemented it already. The UK (33%) and Asia (33%) are not far behind.

The full momentum of IPS is even more apparent in the fact that almost all (99%) respondents surveyed say that their organization has or plans to implement IPS within the next 24 months. This shows how much IPS is set to grow in a relatively short time.

Budget

In line with IPS growth, IPS budgets are also rising and more budget will be prioritized to fund IPS over the next five years.

The average percentage of departmental budget spend dedicated to implementing IPS is 2.47% over the next 12 months. In one to two years, 100% of these organizations will be spending on IPS. In fact, spend is set to grow to over 3% of the department budget in the next three to five years.

With both IPS usage and spend set to increase over the next two years, it shows that there is positive growth in the market as well as within organizations themselves.

Budget spend on IPS

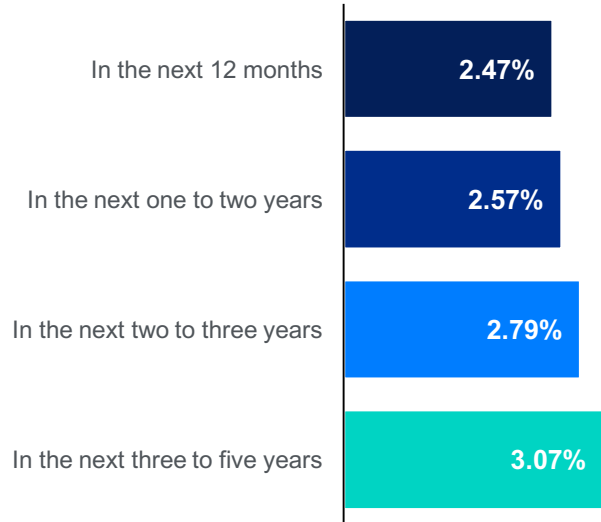


Figure 2: Analysis of the average percentage of department budget that will be spent on implementing IPS in respondents' organizations. Asked to the 298 respondents whose organization has, are in the process of, or plans to implement IPS

Adoption

When it comes to the different IPS methods that are available for organizations to choose from, the most popular method currently adopted is WiFi. Just under half (47%) of respondents' organizations who already have or plan to implement IPS are using WiFi and just over a quarter (26%) are using beacon IPS.

Not surprisingly, geomagnetic, which is a newer and less known technology, follows beacon with 17% of respondents' organizations using this technology. Geomagnetic is rising in popularity as the scope of IPS deployments increases. Geomagnetic will attract the most pilots (22%) compared to WiFi (20%) and beacons (20%) in the future.



The rise of indoor positioning

IPS methods in use today:

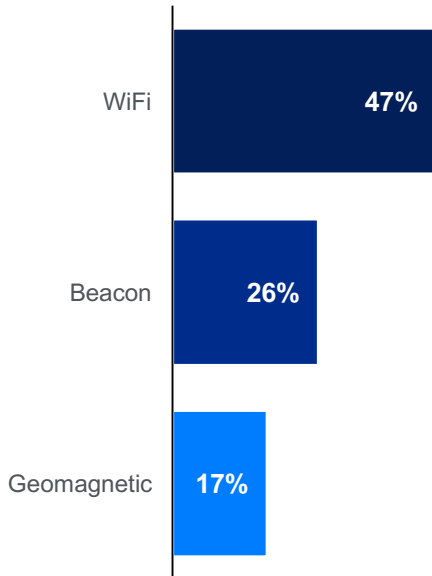


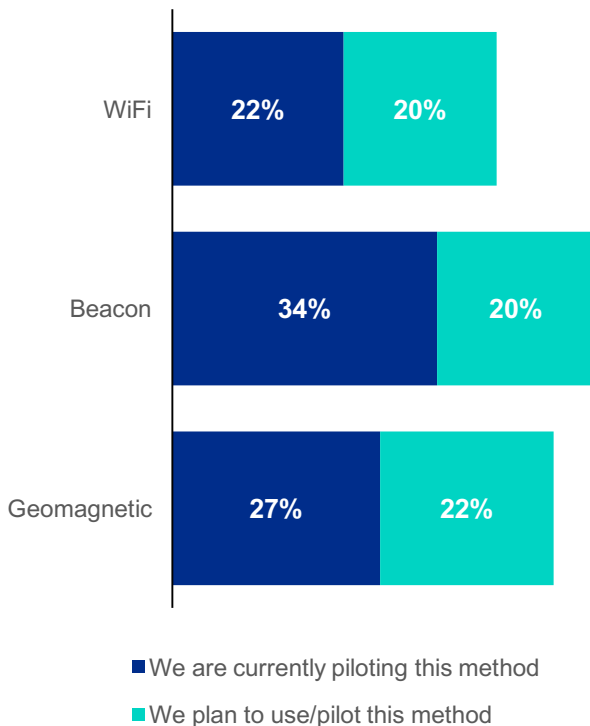
Figure 3: Analysis of respondents' organizations that are already using each method. Asked to the 298 respondents whose organization has, are in the process of, or plans to implement IPS

Of those organizations that are using IPS, they revealed that they will be deploying this across 53 venues on average - a number that dramatically increases with the size of organizations. For those organizations with over 5,000 employees, the average number of venues increase to 140.

On average, organizations will deploy IPS in 53 indoor venues

As highlighted in figure five, the average number of venues also differs by vertical, with retail deploying IPS in the most sites (83), followed by health services (77) and marketing and media (58). Interestingly, the leisure, transport and travel verticals surveyed will only plan on deploying into 22 venues on average. Perhaps due to the fact that their deployments are very focused on airports (70%), which is discussed more later in this report.

IPS methods piloting and planning to pilot:



- We are currently piloting this method
- We plan to use/pilot this method

Figure 4: Analysis of respondents' organizations that are piloting or planning to pilot each method. Asked to the 298 respondents whose organization has, are in the process of, or plans to implement IPS

Average number of venues deploying IPS

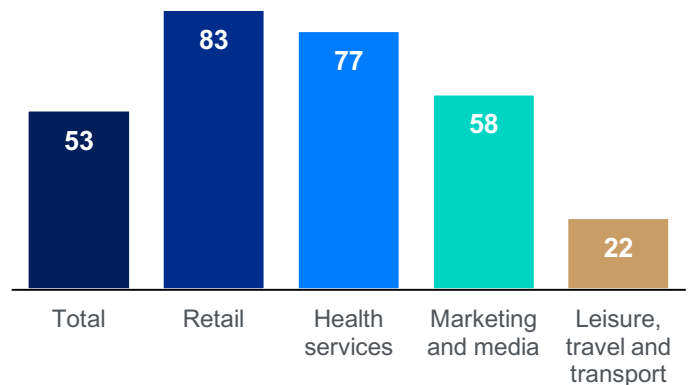


Figure 5: Analysis of the average number of venues IPS will be deployed in, shown by sector. Asked to the 231 respondents whose organization is already using or piloting any IPS method

When you consider venue deployment findings alongside IPS adoption over the next two years, it is clear that there is a very real and focused effort taking place by organizations across the globe to bring indoor positioning to their mobile users.



Why organizations use IPS

Drivers for implementing IPS

Behind the global momentum for deploying IPS are a number of drivers that business and marketing decision makers are focused on. The most important are centered on attracting new customers through proximity marketing and driving sales (both at 55%).

Unsurprisingly, the health services sector is most focused on usability of sites (60%), to make venue navigation easier for their patients. Retail organizations are driven to IPS by proximity marketing (58%).

Top IPS drivers	Total
Attracting customers and sales from proximity marketing	55%
Increasing sales/revenues	55%
Usability of venues	48%
Customer experience	47%
Brand awareness	42%
Customer loyalty	41%

Figure 6: "What are the main drivers for your organization implementing IPS at any of its sites?" Asked to the 298 respondents whose organization has, are in the process of, or plans to implement IPS. Showing the top six answers

Currently, organizations in the UK are the most focused on proximity marketing (63%), more so than in the US (54%) and Asia (49%) counterparts.

When asked which location-based app features will be deployed, a wide variety of features were cited. Undoubtedly, the most important feature is proximity marketing (82%), which can be defined as the localized distribution of advertising content within a particular place to a user that wishes to receive them. This can include adverts and offers/coupons to mobile users. Location accuracy is almost unanimously cited as the key technical requirement to make proximity marketing successful.

Location-based app features

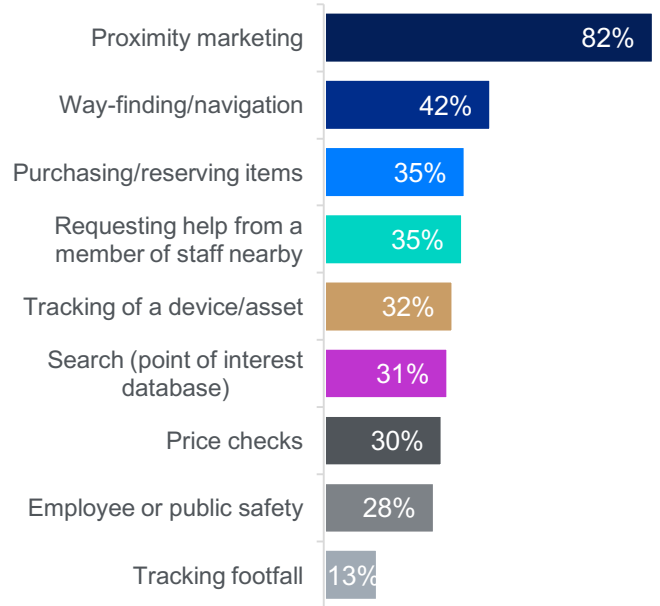


Figure 7: "What location mobile app features has your organization built, or is your organization planning to build (either internally or with a third party)?" Asked to the 298 respondents whose organization has, are in the process of, or plans to implement IPS

Aside from proximity marketing, there were a number of important location-based app features that are driving IPS adoption. This includes way-finding (42%), purchasing/reserving items (35%), asset tracking (32%), and search (31%).

Considering how important proximity marketing is to many organizations, it is worth noting that sub-two meter accuracy is paramount. Almost all (98%) respondents state that sub-two meter (6.5 feet) accuracy is important for proximity marketing. This is also the case when it comes to way-finding accuracy (98%) and search (98%).

98% of respondents state that sub-two meter (6.5 feet) accuracy is important for proximity marketing



Why organizations use IPS

Types of indoor venues

Of the top five types of venues that organizations are deploying IPS in, four are closely linked to the different sectors that respondents were interviewed from. Health services are most likely to deploy IPS in hospitals (86%); leisure, travel and transport in airports (70%); and retail in shopping malls (61%).

Top five IPS venue deployments

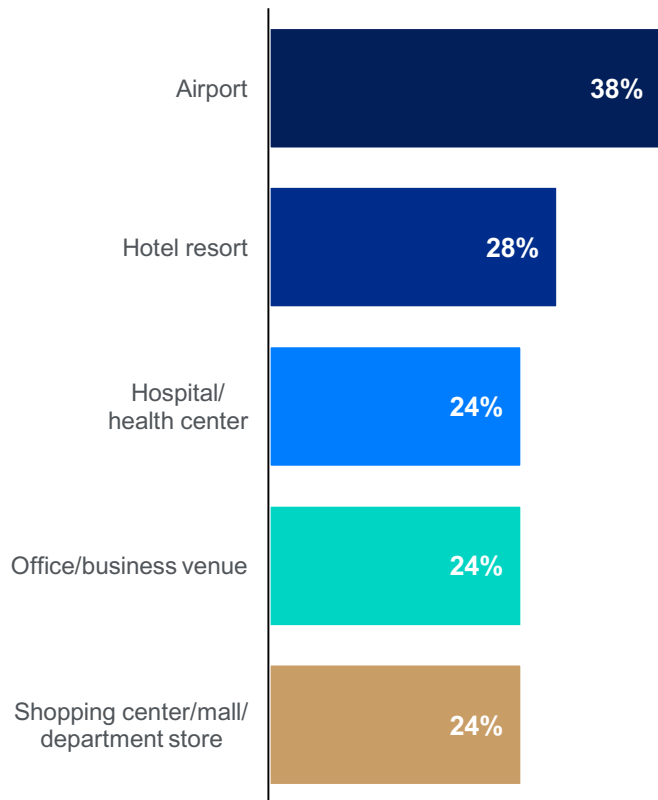


Figure 8: "What type of venues is your organization deploying IPS in?" Asked to the 231 respondents whose organization is already using or piloting any IPS method. Showing the top five answers

Business/office venues (24%) also made the top five overall for current IPS deployments. This may be an unexpected indoor venue for organizations to implement IPS, but large business/office venues could be considered difficult to navigate for visitors. Offering a location-based app could ease this difficulty and make the venue more optimized.

Future venues on the IPS deployment list are very varied but not surprising. The top ten are listed in figure nine.

Top ten future IPS venues

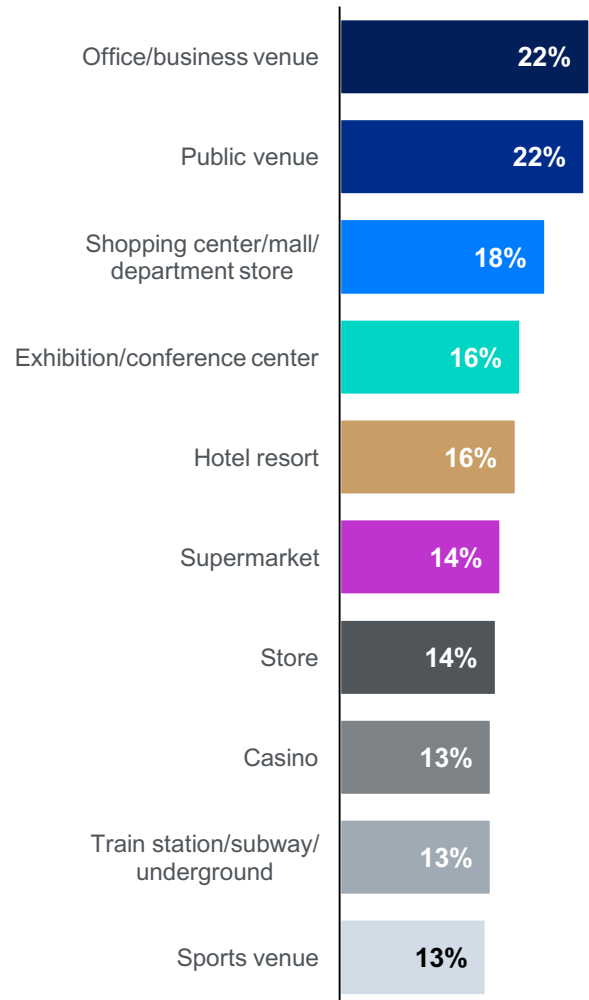


Figure 9: "What further types of venues would your organization like to deploy IPS in?" Asked to the 231 respondents whose organization is already using or piloting any IPS method. Showing the top ten answers



Why organizations use IPS

Developing location-based apps

Business and marketing decision makers are choosing a combination of in-house and outsourced resources to develop their location-based apps, with the majority opting for in-house developers. These developers sit in their IT department (58%) or in the marketing or business unit (48%). Additional third party help is also being sought from system integrators (34%), app developer agencies (33%), marketing agencies (28%) and freelancers (11%). Organizations are unlikely to solely outsource app development.

No matter who does the developing, the average time given to organizations to implement a location-based service for their mobile app is four months, making the choice of IPS extremely important - organizations need access to technologies that will enable a fast deployment.

The average time to implement a location-based service for a mobile app is four months

Developers of location-based app

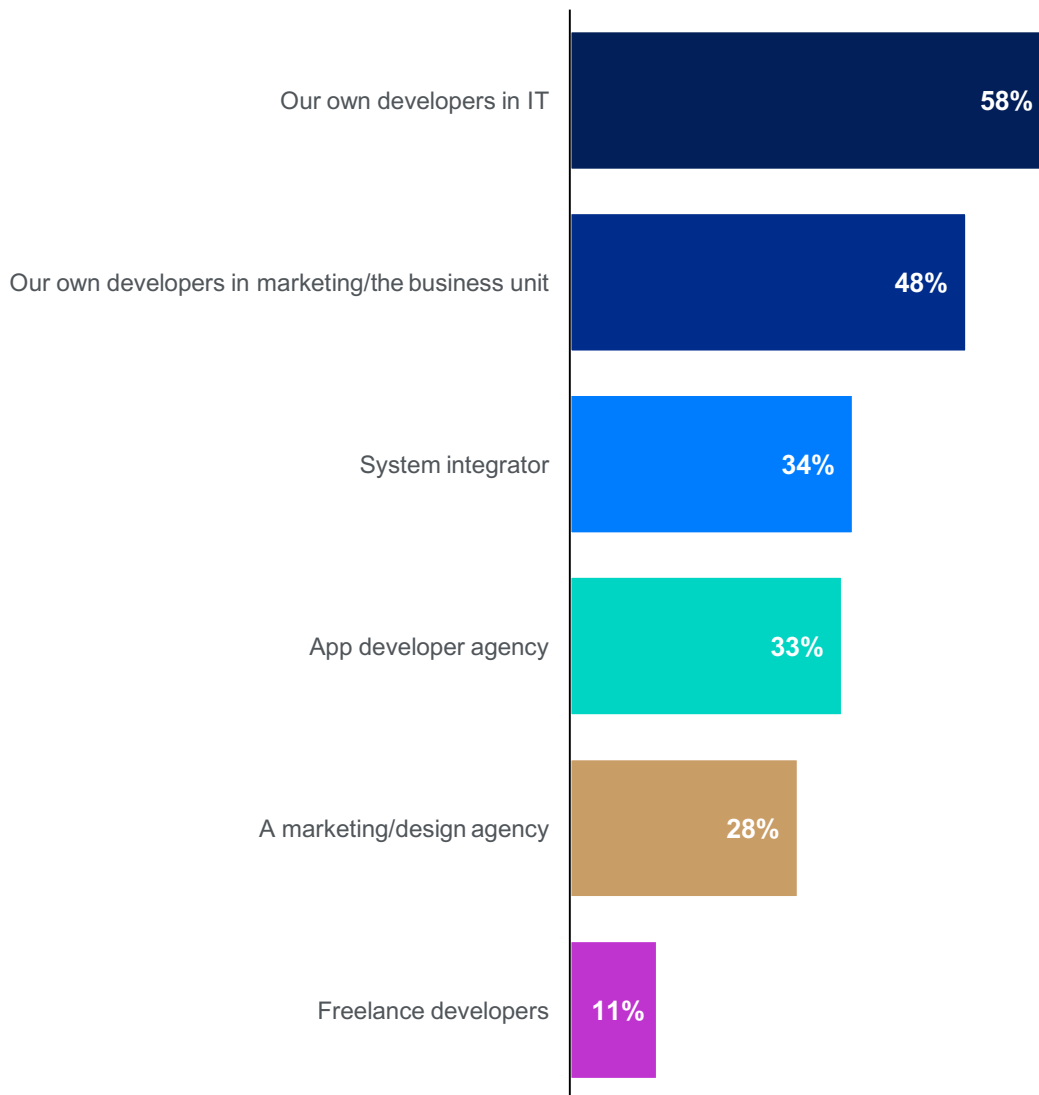


Figure 10: "If your organization were to implement location-based services, who would develop your organization's application(s) for the service?" Asked to all 301 respondents



Roadblocks to IPS

Despite the interest and expected growth of IPS, there are concerns about the scalability of hardware-based IPS. Nine in ten (90%) respondents have concerns about purchasing, deploying and maintaining beacons across all of their sites. That drops slightly to 84% of respondents when it comes to WiFi concerns.

Concerns with beacons and WiFi

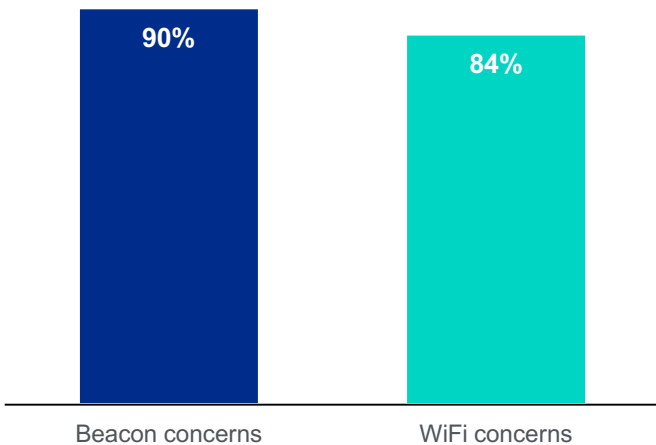


Figure 11: Analysis of respondents who have concerns about purchasing, deploying and maintaining beacons or WiFi hardware. Asked to all 301 respondents

The main concerns for implementing beacon IPS are scalability (40%) and expense (38%). For WiFi the same concerns arise (35% and 34% respectively) but they are not felt by as many respondents. For geomagnetic, the main concern cited was cost (33%).

Given the importance of IPS accuracy, organizations may be concerned about the total number of devices required to cover all of their venues. For the optimal level of accuracy, respondents estimate that their organization would need an average of 324 devices per venue. Considering organizations will implement IPS in an average of 53 venues, this means that the average number of hardware devices needed to achieve optimal level of accuracy with IPS is a staggering 17,190 across all desired venues. And for retailers, this more than doubles, with an estimate of 482 devices across 83

On average, organizations need 324 devices per venue to achieve optimal levels of accuracy, equating to 17,190 devices across all sites

venues, equaling just under 40,000 devices per retail organization.

It is no wonder there is so much concern about purchasing, deploying and maintaining both beacon and WiFi devices.

For those organizations who have decided not to implement IPS, market/product maturity (32%) was cited as the main concern. For around a quarter of respondents they say that they have too many sites and it would take too long to deploy to them all (26%), the total cost is too expensive (25%), and they have concerns over not being able to get permission from all parties involved (24%), for example store owners in a shopping mall.

For those companies who have used/piloted beacons but decided not to use them, they cited cost and scale as the two main issues. This is also the case for WiFi. The top two reasons that organizations gave for not using geomagnetic were, however, very different - survey respondents were more concerned with existing investments made in other technologies and the fact that geomagnetic is not proven in the market yet.

Top two reasons to not use:

Beacons	Total
Overall cost (purchase, deployment and maintenance)	36%
It would take too long to deploy to all sites (scale)	33%
WiFi	Total
It would take too long to deploy to all sites (scale)	41%
Overall cost (purchase, deployment and maintenance)	41%
Geomagnetic	Total
Already invested in other technologies	40%
It is not a proven technology	29%

Figure 12: "Why has your organization decided not to use beacon/WiFi/geomagnetic as your IPS going forward?" Asked to the 33/22/58 respondents whose organization has already piloted beacon/WiFi/geomagnetic (respectively) and decided not to use it, or who have no intention to use it

Considering all of the concerns around purchasing, deploying and maintaining hardware devices like WiFi and beacon, it is not surprising that 95% see value in using an IPS with little or no hardware, such as geomagnetic.



Opportunities with geomagnetic

Almost all (98%) respondents think that geomagnetic can solve scale challenges. Given that IndoorAtlas designed its geomagnetic indoor positioning solution to address scale issues in the industry, that comes as no surprise. In addition, over nine in ten (94%) respondents think that geomagnetic's ability to leverage existing WiFi and beacon infrastructure in a venue will benefit them. Why? Because it means they don't have to start over. They can continue to gain benefits made from these capital expenditures by using a hybrid solution. IndoorAtlas geomagnetic is a foundational technology that can leverage WiFi, beacon and other sensing technologies in a venue for even further optimization.

IndoorAtlas geomagnetic offers sub-two meter positioning accuracy as a software-based solution. This level of accuracy is important for the majority of organizations surveyed (93%) to enable proximity marketing, way-finding or search features in their location-based apps.

As the survey highlighted, most organizations develop their apps in-house and are looking for features to make app development easier. Respondents valued interoperability and developer resources highly. Nine in ten (90%) respondents think that IndoorAtlas' geomagnetic cross-platform (available on both Android and iOS), solves their challenges. Similarly, 88% of respondents were favorable toward developer cloud platforms and Software Developer Kits (SDKs) for ease of mobile app development. Both of these tools make it even easier for organizations to develop their location-based services within four months – the average time given to organizations.

“Cloud platform provided [by IndoorAtlas] is really effective and time saving.”

—Anonymous survey respondent

Around nine in ten (88%) business and marketing decision makers believe that geomagnetic will have a lower total cost of ownership than beacon or WiFi. More than nine in ten (92%) think that geomagnetic can solve their problems since it is an infrastructure-free technology.

“[IndoorAtlas is] a trustworthy organization that provides inexpensive total cost to user.”

—Anonymous survey respondent

Geomagnetic IPS – solving business challenges

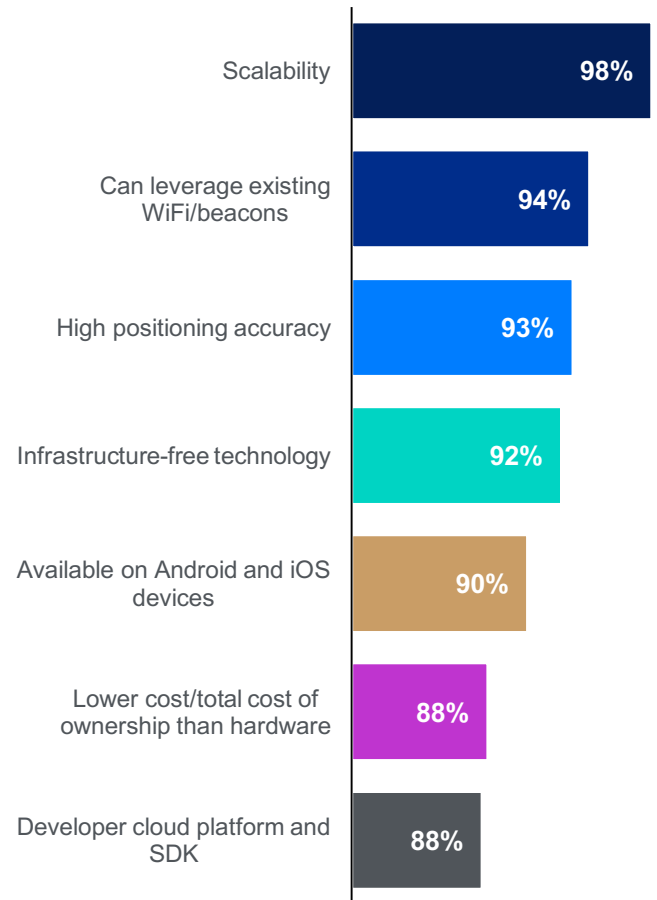


Figure 13: Analysis of respondents who think that the features of geomagnetic indoor positioning could help organizations to solve business challenges. Asked to all 301 respondents

“[IndoorAtlas is] a leading IPS vendor that provides excellent customer support.”

—Anonymous survey respondent

Although IndoorAtlas geomagnetic indoor positioning is still a relatively new technology in the market today, the survey respondents reveal its scale, accuracy and ease of deployment benefits, amongst others, will help to solve their IPS challenges.



Conclusion

The location market is growing rapidly, fueled by a number of factors including IPS deployments to enable location-based apps. Organizations are driving customer engagement, leads, sales and other benefits from using IPS applications. In turn, end users are downloading IPS-enabled apps to get more utility, value or fun out of the places they visit every day. This is happening at a global scale in Asia, Europe and the Americas and at an accelerated rate. Based on the direction of consumer behavior and smartphone adoption, this trend looks set to continue into the future.

As organizations search for ways to attract and engage their mobile app users, they need technology to also keep pace. Scalable and accurate IPS solutions are desired so that user experience standards are met within timescales and budget. So perhaps the biggest roadblock that exists today is that the majority of respondents are simply not aware of the IPS alternatives out there in the market to address their business challenges.

Geomagnetic is quickly growing in popularity as global organizations are becoming aware of its scalability, cost and accuracy benefits. Most agree that geomagnetic is a scalable and accurate IPS for those who want little or no infrastructure.

The fact that IndoorAtlas' geomagnetic technology is able to take advantage of investments already made in hardware at venues is appealing - it means that organizations who have already invested in technologies

like WiFi and beacon, can still reap the benefits of their capital expenditure when deploying IndoorAtlas' technology as a hybrid solution. Using IndoorAtlas geomagnetic will decrease the number of WiFi and beacon devices needed in venues – taking the number down from tens of thousands devices quoted in this report, to a small handful of devices across the desired venues.

So with real IPS options out there today, there is no reason why millions of venues and billions of users across the globe won't be able to leverage the next generation of location-based apps to enhance their lives and brand experience.

With the rate that IPS is growing, it will soon become clear to end users which organizations have not implemented this technology. Organizations who are not planning to implement IPS soon may find themselves falling behind their competitors and losing customers as a result.

Similar to how GPS satellites ushered in a new era of personal navigation outside, so too geomagnetic might accelerate the development of IPS solutions inside.

IndoorAtlas invites you to learn more about its geomagnetic indoor positioning platform at www.indooratlas.com. From there you can sign-up and start piloting the service for free.

About IndoorAtlas

Founded in 2012, IndoorAtlas is a global Platform-as-a-Service leader in geomagnetic indoor positioning. Its patented technology utilizes the compass sensor in smartphones to detect anomalies in the Earth's magnetic field to pinpoint a location indoors. It provides approximately 25,000 developers with a scalable cloud platform to build location-based services without the need to purchase, install and maintain large amounts of costly infrastructures that are often associated with WiFi or beacon solutions. With sub-two meters positioning accuracy and a platform that supports both Android and iOS, customers can create venues, collect data and build indoor location-based services, such as proximity advertising, search and way-finding, within their application. For more information, visit www.indooratlas.com.

About Vanson Bourne

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