Abstract

If the lessons of the fixed Internet experience hold, search engines seem to be called to play a preponderant role in configuring mobile Internet markets. The actors that currently dominate the computer search market are trying to transfer their hegemony to the mobile scenario. However, mobile search must answer to a different logic: the one resulting from using all the context variables that can be obtained through a mobile device. This is opening up new options for actors to develop creative applications and enter this market. Precisely, this paper reviews the technological and socioeconomic conditions which will influence the development of the mobile search market and derives some conclusions for interested parties and policy-makers.
Those who cannot learn from history are doomed to repeat it. Those who learn from history are likely to repeat it?

On April 2007, Google reached an agreement to acquire DoubleClick, the online advertising company, for $3.1 billion in cash. Acquiring DoubleClick expanded Google’s business far beyond algorithm-driven ad auctions into a relationship-based business with web publishers and advertisers. The buyout of DoubleClick is not, certainly, the sole factor (neither probably the main one), in the company’s evolution but what is true is that Google’s revenues in 2008 were twice as much as those of 2006 (95% of these revenues were originated by advertising as a business model) and expanded its dominance in the search engines market.

Three years later, on May 2010, Google invested $750 million in the buyout of AdMob. AdMob had become the world’s largest mobile advertising platform. The company claimed to serve more than 8.5 billion mobile banner and text ads per month across thousands of mobile networks, websites and applications.

How should Google’s purchase of AdMob be interpreted? Can a parallelism be established with that of DoubleClick?

It basically means that the battleground of the extremely lucrative network-provided applications and services markets (from leisure to social relationships, including all sorts of e-services) is shifting. With an increasing number of users demanding ubiquity and permanent availability, the new scenario will be greatly mobile, undoubtedly. But, is it so today?

Susan Wojcicki, vice president of product management at Google, gave some clues on a blog post she wrote on the occasion of the AdMob acquisition: *Over the past two years, Google’s mobile search volumes have grown more than fivefold, at an accelerated pace. In the first three months of 2010, people with smartphones with “full” WebKit browsers (such as the iPhones, Android devices and Palm Pre) searched 62 percent more than they did in the previous three months. Moreover, Eric Schmidt, former chief executive of Google, is known to have mentioned several times since 2008 that Google can make more money in mobile than in the desktop.*

Impressive. But what is truly stunning is the first, finally, official statistical information on wireless broadband. On December 2010, the Organisation for
Economic Co-operation and Development released new statistics on the broadband penetration in OECD countries as of June 2010 reporting for the first time a wireless broadband penetration indicator. There were 294 million fixed broadband subscriptions in June 2010 in the OECD area. All right. But the number of mobile broadband subscriptions (those included in a mobile voice plan), and dedicated mobile data subscriptions (which need an additional data plan) was… 435 million!

Does anyone still have any doubts? Mobile Internet has arrived and is here to stay.

In the fixed Internet, search engines have become the access gate towards all sorts of contents and applications providing those who control that access with a powerful business that does not even require toll collecting. And what about mobile Internet? The strategy seems obvious: learn from history and repeat it.

However, a series of circumstances make it impossible for the translation to be literal. Mobile search is sensitive to a different logic than today’s one: success will be probably based on new added-valued applications that exploit unique mobile functionalities, i.e., the use of personalized and context-based services. All this provides opportunities for new players to enter the pitch.

This article analyses the techno-economic conditions which will shape (and are already shaping) the development of the mobile search markets. The first part deals with the technological improvements that can (and must) influence the development of mobile search. Next, the paper deals with the economic (and regulatory) factors, those that will actually decide what applications will reach and thrive in the market. In the conclusions section the assessment of a disruptive change in the current market dynamics is presented, as well as some implications for interested stakeholders.

**Technology enables ...**

Of course, mobile search is search on a mobile gadget. Therefore, it can first be interpreted as a mere “transference” to a mobile environment of the established PC-based Internet search tools. Albeit complementing the search with some “mobility” enhancement function, such as refining the results taking into account the user’s location or adapting them to the type of display, this would result in a *search-as-usual*
strategy, extending the same approach, systems and algorithms to a new platform with specific features and limitations.

However, mobile search is not just search on a mobile gadget. Mobile search can (should) also exploit the unique features of mobile devices or the environment in which they operate. Under this paradigm, mobile search will increasingly make effective use of contextual information (relevant data embedded in the mobile device, information in the surrounding environment, users’ profiles or behavioral patterns) to improve the relevance of search results and/or to provide a more valuable and entertaining user experience as the “engine within” new types of applications. Such a specificity can flourish in an environment were hardware becomes “senseware,” where information coats objects and people, where ubiquitous location-aware social networks enhance the available information sorting it out on users’ behalf, and where mobile devices become the entry point to a networked environment in which “intelligence” is distributed across different elements.

Going into more detail, three groups of technologies are likely to have a direct impact on mobile search. The first one comprises generic search technologies for retrieving, for example, accurate and enriched content. Such technologies may include semantic approaches, cognitive approaches and multimedia retrieval. The second group comprises specific mobile search technologies. Examples include technologies that render mobile data acquisition, its processing and its matching more context-aware, or that introduce augmented reality technologies to enrich context awareness. Finally, we may consider any technology components that enable mobile applications as a third group, which includes wireless networks (broadband access ubiquity, dynamic spectrum management), sensor networks (RFID, internet of things), devices (multimedia capabilities, location, interoperability, openness), and cloud computing (web browser, connectivity, security, data protection).

... But money decides

Interestingly, there seem to be no significant bottlenecks from a technological point of view for the introduction of new mobile search applications. Most of those technological building blocks are either already available or in an advanced prototype stage. Thus, in the short to medium term, there is no missing "critical technological
component.” Instead, the main technological difficulty is to better integrate (existing) technologies. In other words, system integration and technological interoperability is the key issue, rather than the development of new “hard-core” search components.

However, the real challenge, beyond technological considerations, is how to monetize new potentially disrupting mobile search applications. Advertising seems the intuitive response when comparing with current Internet search, particularly for search-as-usual applications; obviously, strategies and formats need to be adapted to the mobile environment. Other sources of revenues are yet possible for mobile search companies. But this is not a question of choice. The business model adopted by new schemes will be influenced by two basic factors: first, the feasibility to monetize the added value provided by mobile search within a given application, and, second, the economic value of the search functionality with regard to the totality of the value added chain of the service. It should not be forgotten that future search-based applications are neither simple nor autonomous building blocks. Rather, search functionalities will be (are) tightly embedded into the value chain of wider mobile services, which themselves can be numerous and of diverse natures. In techno-economic terms, we could portray the search functionality as a key constituent in an “ecosystem” where industrial players compete and/or collaborate to generate successful and scalable business strategies in a highly dynamic and still emerging market landscape.

The consideration of the mobile ecosystem drives attention to additional factors that need to be considered when determining the sustainability of new types of mobile search ventures. First, stakeholders in the mobile search ecosystem are diverse and heterogeneous, including device manufacturers, mobile network operators, infrastructure providers, mobile OS providers, web search players, and mobile-specific search players. The variety of players, technologies and approaches complicates interoperability and increases transaction costs, particularly for the type of applications that are described here. Secondly, this ecosystem is embedded in an institutional framework. Therefore, the level of success of search-based applications in the sector is dependent on regulatory environment factors, ranging from international data roaming costs to spectrum allocation issues and privacy regulations, as personalization of services requires different degrees of personal data collection.
Leaving apart spectrum allocation, an issue much wider in scope than just mobile search opportunities, both data roaming and privacy regulations deserve a closer look. Data roaming is relevant for search-based mobile applications because of the usefulness and innovative proposals they can offer to users while on the move. International data roaming is slowly to be solved on a regional basis, with main initiatives (some imposed by regulation, some originated in market forces) taking place in Europe, Africa and Asia. Privacy regulation is a controversial issue notoriously immature. Two main visions, possible complementary, collide in practice. On the one hand is privacy by design where technology and contractual provisions are thought to give the user enough control on his/her personal data. On the other hand is privacy by law, where a minimum set of rules is considered as mandatory to defend the interest of consumers. For instance, whereas the US legislator has taken an utilitarian approach to data protection, the European legislator tends to define privacy as a fundamental right.

And so what? What is the market saying?

Mobile search is expanding rapidly and steadily into a growth market. The spin received from the PC environment is given a first-mover advantage to established players. They are gaining time to first take up a big part of the market and, then, evolve smoothly into a new and smarter search if and when needed. The big tree is providing shade also on the mobile footpath.

Under these conditions, does it worth to try to enter this competition? Well, the playground is large enough. Users’ demand for opt-in, highly personalized, location aware, social-aware search services is not yet satisfied. Services are not yet fully interoperable; they do not link multiple dynamic databases and do not morph according to the context. Furthermore, current interfaces do not allow dynamic usage situations. Voice-, touch- and movement-based interfaces should seamlessly support the users in accessing information in situations that change not only depending on the location, but also in interactions with other devices, other users, other available services, and users needs, activities and preferences. Most of those possibilities remain commercially unexplored.
The competition is not going to be easy, though. The challenge remains in bridging data and information needs and offering useful services. Services that create utility for consumers and, at the end of the day, which make users willing to pay for the service. Innovations are the key constituents to fulfill these expectations and they depend, as in any other emergent domain, on a conjunction of technological, economic, social and regulatory aspects...plus a bit of luck. It is useful to remind that many of the most successful applications in the mobile industry have been “accidental”; that is, applications that have evolved from an initial user base in a manner totally unforeseen by the original designers of the technology or application.

In the case of mobile search all these aspects are relevant and encompass both hurdles and uncertainties. Nothing new here. With different nuances, naturally, but this is the scenario faced by any innovator wanting to open up some space in the market for themselves. It is also the scenario faced by sprouts which have now become big trees. The sole difference is that the stages during which a market is being created or restructured are more prone to the appearance of changes or innovations. And the mobile search market is facing undoubtedly one of those moments.

As stated before, disruptions are to be found not in the most technical domain but in the integration and interoperability of existing technologies, as well as in the possible success of business models based on advertising and/or value-added transactions within the mobile application.

Technically, we are talking about a next generation of challenges: interoperability among different types of sensor networks in the surrounding environment with the short data range radios of the mobile device, smart usage of personal information embedded in the device and deducted from behavioral patterns with the help of cognitive technologies, fusion and further processing of this information partly locally and partly in the cloud, and mash-up with layers of information publicly available on the web and specific databases. The “Internet of things” concept shares at least the same physical and network layer challenges.

From a mobile business perspective a secret war of uncertain result is being fought with the users as an unaware army: the mobile browser vs. the mobile application. The outcome, needless to mention, will affect decisively the prospects of new search-based mobile applications. If the browser wins, most probably the mobile
devices will become just a convenient wireless extension of the well known realm of the fix web, and with advertising as a main model. On the contrary, if the applications continue to thrive, there are chances to propose innovations in value-added within the applications, however, at the cost of fragmentation of the solutions available for users. There are many other differences between the two approaches. Development of applications appears to be more agile but very dependent on the techno-economic evolution of current platforms. Standards for browsers seem more stable and also browsers are more suited to cloud computing, while applications are usually incompatible between them but allow for local unconnected usage. Obviously, players position themselves at different sides, with some exception standing at both sides.

To conclude, some remarks about the role of public action can be made. Market dynamics could be partly diverted by proactive actions intended to promote innovation, growth and competitiveness in the sector. These actions include the promotion of interoperability of services, and assuring the openness and mash-ups of content and services. There is considerable room for action here. Apart from the traditional standardization efforts, there is a wealth of public bodies information waiting to be made available in appropriate format to interested parties. Cadastre information is a major example.

In addition, measures need to be taken to ensure take-up by users. Trust-enhancing measures might include both encouraging the development of personal identity data management systems (for users to switch on and off the collection of their personal data), and issuing privacy regulation that fills the existing gaps and provide a stable framework for the development of new search-based mobile offerings. This last item is of paramount importance. Gaps in existing regulation are notorious when considering advanced search-based applications. The accumulation of mobile users’ location data without their consent has been in the news during 2011. Worst, since it seems a common practice across platforms and handsets. The use of location information in a trans-frontier setting, that is, when a user is located a country different from his/her origin, lies in a regulatory limbo (as well as the standards to send this information to a roaming provider). Use of location information blended with communication and behavioral patterns is only subject typically to contractual arrangements. These arrangements, although usually neglected by the user, are extremely difficult to fully grasp on a mobile display. The list goes on with the lack of
user awareness (or control) of the usage of context information by third-parties (for instance for personalized price discrimination). It is not that the authors argue for an ex-ante exhaustive regulation of unknown services, an utterly impossible task, but surely the current framework can be amended to be more protective for users and, at the same time, providing a safe harbor for the unavoidable experiments in the provision of new services that innovators must conduct.