Startup Engineering
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Social/Local/Mobile, Virality, and Growth

Overview

Social, Local, and Mobile. The mantra of venture capitalists from roughly[1] 2007-2012. It's a catchphrase, a buzzword, and arguably a cliche in Silicon Valley. The term and its relatives attract disparagement because they are so closely associated with photosharing, social gaming, check-ins, and recreational apps of this nature. Now, there's actually much that is admirable about the companies in these areas: Instagram is a highly complex engineering feat, Snapchat does account for a significant fraction of all photos taken in the world, and Zynga was, at one point at least, a multibillion dollar public company[2]. Still, these are with some justification seen as cotton candy apps, as the kind of apps that healthy twenty-somethings make for each other, rather than apps that solve problems of real significance. But is that really all there is to say about "social, local, and mobile", though? Let's see if we can dive into the phenomenon term by term to understand why VCs love it and whether there's something deeper there.

Mobile

Let's begin with mobile. We've already discussed this in some detail, but to get some scale of the buildout, let's begin from the June 2007 launch of Apple's iPhone. Since that time point approximately 1.5 billion people - fully 20% of the world's population - have purchased smartphones of some kind (either from Apple, Samsung/Google, or another vendor). Let's say that's been six years and two months, or 74 months. A simple division gives us the average number of smartphones bought per day over this time period:

$$\frac{1.5 \times 10^9}{74 \times 30.5} \approx 6.65 \times 10^5$$

So more than half a million people have bought a smartphone every day for the last six years in a row. And it's still growing, as at least 3.5 billion more will be installed to catch up to world feature phone penetration. It's also one with heavy turnover, as phones are replaced every few years with new models bristling with new sensors. Additionally, mobile app stores (the App Store and Google Play) provide unprecedented distribution comparable only to the World

[1] "SoLoMo" hasn't exactly died off, but the latest mantra is consumerization of the enterprise. A genuine trend, a real thing enabled by the proliferation of mobile devices over the last few years and the rise of business social networks like LinkedIn, Salesforce Chatter, and Yammer - but somewhat faddish nonetheless.

[2] Yes, you might want to do something that's more technologically interesting. But once you start a company and are involved with operational details, you quickly realize that great drama and effort lies behind even the most innocuous pastel-colored divs. In Hollywood it's often said that the serious movies tend to be comedies behind the scenes, while the comedies tend to be deadly serious when the cameras stop rolling. It's thus a significant mistake to assume that company which is fun and games on the surface is significantly easier to build from an operational perspective than a more obvious technology play like SpaceX. As proof: Facebook and Snapchat's founder imbroglios, Instagram's antitrust holdup, and Zynga's shareholder lawsuit. Startups that involve large dollar figures become stressful, serious business quickly, even if their external appearance is fun and games.

Wide Web itself, and combine it with the crucial aspect of monetization. And tens of billions of dollars in profit are being made every quarter in this space. So of these three buzzwords, mobile is certainly not overhyped. VCs love mobile because it offers an enormous, rapidly growing market for software entrepreneurs along with unprecedented monetizable distribution for apps.

Social

And what of social? Though also legitimately used on a regular basis by one-billion-plus people, the social arena is older[3] and less profitable than mobile, due to the lack of physical hardware sales comparable to iOS/Samsung. Yet let's give credit where it's due; social networking is influential enough to spark civil wars and occupy a significant portion of the industrialized world's conscious attention. Major players in this space include the usual suspects (Facebook, Twitter, LinkedIn, Google+), the newer entrants (Pinterest, Instagram, Path, Quora, Tumblr), and the older-but-still-fairly-popular crowd (Flickr, Reddit). Of all categories, we assume these companies to be the most familiar and won't spend much time reviewing them.

Like mobile, the buildout of social networking is impressive. Facebook achieved one billion monthly active users (MAUs) in approximately eight and a half years of operation, corresponding to the following average user installation rate:

$$\frac{1 \times 10^9}{8.5 \times 365} = 322,320$$

At 86,400 seconds per day, that means signing up roughly four people per second, every second, for eight years straight. Not bad. Incredibly impressive in fact, but this also puts mobile's growth into stark relief. To sign up for a social network one pays nothing and need only click a link. To obtain a mobile phone one must travel to a store and pay hundreds of dollars. Yet the installation rate of smartphones significantly exceeds even the extraordinary growth of social networking, and might well be one of the fastest growing technologies of all time. This gives some sense of the relative utility of the two areas, and why Facebook has been so interested in getting into mobile, now with considerable success. We'll return to perhaps the most important aspect of social networking in a bit (namely the concept of *virality*), but it's worth pausing to consider two points.

First, a social connection is much more permanent and well-maintained than an email address. This may not seem like that significant an issue till we do a brief calculation. Let's say that you have 730 friends, and a given friend changes their location, their email address, or their phone number every two years on average. Then if you were manually keeping an address book on pen and paper, you'd have to make an edit every day. And this assumes that said friend broadcasts their information out to all of their friends every time these values are updated. Instead, today we just keep a pointer to someone's Facebook or LinkedIn profile; in this manner changes to their contact information are automatically available to all their contacts. Indeed, this insight was behind Sean Parker's second company, Plaxo; part of his reason for joining Facebook was that it was going after the same thing in much greater generality and with much more success.

[3]You can date it all the way back to Six Degrees in 1997, but Friendster in 2002 was probably the first breakout social network. See this IEEE timeline.

Second, if one thinks of the internet as a quasi-frontier, one can think of social network connections as digital *roads* between people, as channels over which one can send digital packages. Today they're used to send photos, videos, and chat messages. And social networks are mocked for this, for the idea that we set up the internet simply to share cat videos. Tomorrow, though, these roads may be carrying digital payloads with significantly more significance, like source code or 3D printer schematics or Bitcoin. As every good becomes digital, a new or existing social network has the potential to become a *trade route* and not just a communication channel, with Gumroad as one of the first along these lines but with many more (likely using the internet-native Bitcoin currency) to follow. At that point social starts to get even more interesting.

Virality

Let's now return to the topic of virality. As we noted above, Facebook's signup form *alone* received approximately[4] four submissions per second for the last eight and a half years, a significant load for any web application. And yet how many times do people sign up for accounts compared to their use of the service? If you consider that most users signed up once or twice within the past eight years, but have executed tens of thousands of writes and reads on the `facebook.com` domain over that period, one starts to get a sense of the sheer colossal scale of the site. How did Facebook achieve such scale? In a word, *virality*. We illustrate the importance of virality with this cautionary tale of Hipstamatic vs. Instagram (Part 1, 2, 3):

> Hipstamatic was one of the first startups to crack the photo formula in the mobile space–then it watched similar services gain ground and eventually blaze by. The company's experience proves that no startup can rest on its laurels in the age of the iPhone, when the time between innovation and disruption is ever shortening, and when IPOs and fast exits are valued over establishing long-term viable businesses. And perhaps most significantly, Hipstamatic proves that no modern startup can ignore the siren call of social, even if at its own peril. . . .
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> In October 2010, Hipstamatic was booming. Its business model of selling in-app digital lenses and films, which effectively turned your iPhone into an old-school Polaroid camera, was attracting millions of users and millions of dollars in revenue, especially from its fast-growing community of shutterbugs in industries ranging from fashion to media. . . .
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> So on Oct. 6, when an ex-Googler named Kevin Systrom launched a photo-sharing service called Instagram, there was no way of knowing that it would mark the beginning of the end of Hipstamatic's honeymoon. Like Hipstamatic, the iPhone app enabled users to add vintage-era filters to photographs, but there were two key differences: Instagram was free and inherently social; Hipstamatic was not. . . .
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> By March of 2011, when Hipstamatic hired its new designer, Laura Polkus, Instagram had already rocketed to 2.2 million users, and was growing by 130,000 users per week. But Polkus says the team largely ignored Instagram. "There wasn't a

[4] And these are users that log in at least every month, so-called Monthly Active Users (MAUs) as distinct from those that log in at least every day Daily Active Users (DAUs). If we include every signup of a fake account, or an account that just isn't checked that often, we'll get much larger numbers.

> whole lot of attention paid there," says Polkus, who was later let go. "The conversation internally was, "Well, we're completely different. They are a social network, and we are not. Who cares what's going on with them? We'll just continue to do what we do.' But from the public's perspective, that's obviously not the way things were seen."
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> "As Instagram started to build, everyone was like, 'You guys should do this or that,"' recalls Buick, who was hesitant to enter the social game at first. "That's not what we wanted to build."

Instagram was built to be a social network from the beginning and was thus inherently viral; this trumped any other features Hipstamatic may have had, including the originality of being the first to have millions of users taking filtered photos on the iPhone. This is a variation on a theme: Startup = Growth. If you don't consciously optimize your company for growth, you will be outgrown by a competitor that has done so. In particular, to maintain a constant monthly growth *rate*, you need to either keep hiring ever more salespeople of equal or greater quality (a very difficult task) or you need some way to grow virally, via your existing customer base. Virality thus means the ability to acquire more customers *without* a constantly expanding physical salesforce. It also means your economy of scale becomes vastly better, because you don't need to budget for as much sales effort for each incremental customer.

The Virality Equation

In thinking about virality, there are three components to the virality equation:

- $p \in [0, 1]$: the probability that a given person decides to share
- $N \in [0, \infty)$: the number of people who the invite is shared with
- $\tau \in [0, \infty)$: the time interval between shares

Most people's intuition tells them that the ideal way to build something highly viral is to improve the content, namely improving the value of p. However, suppose that we quantify the number of users at successive timepoints who have seen the content via $U(t)$ as follows, with $U(0) = 1$:

$$\begin{aligned} U(0) &= 1 \\ U(\tau) &= (Np) \\ U(2\tau) &= (Np)^2 \\ U(m\tau) &= (Np)^m \\ U(t) &= (Np)^{t/\tau} \end{aligned}$$

Here we have substituted $t = m\tau$ in the final line. We see immediately that if $K = Np < 1$ we do not have viral growth. We can also ask an important question: what's the relative impact of increasing p by 2-fold, increasing N by 2-fold, or decreasing τ by 2-fold? For concreteness, let's say that $p = .1$, $N = 50$, and $\tau = 1$ day. Then after three days we would have roughly:

$$U(3) = (.1 \times 50)^{3/1} = 125 \text{ users}$$

If we doubled p to .2 we'd get:

$$U(3) = (.2 \times 50)^{3/1} = 1000 \text{ users}$$

And if we doubled N to 100 we'd get:

$$U(3) = (.1 \times 100)^{3/1} = 1000 \text{ users}$$

But if we halved τ to .5 we'd get:

$$U(3) = (.1 \times 50)^{3/.5} = 15625 \text{ users}$$

Wow! The impact of reductions in τ is highly nonlinear because it affects the *exponent* in the virality equation. Shorter incubation times mean rapid viral spread. One can quantify this further by calculating partial derivatives of U with respect to N, p, τ but the point should be clear. A few further observations:

1. *Np must be greater than 1 to achieve viral growth.* It doesn't matter what your cycle time τ is if the underlying viral cycle doesn't spread to more than one person on average. Moreover, for a fixed $Np = K$, the larger the value of N and the smaller the value of p the more noisy and stochastic the viral spread is.

2. *Increasing N is easier than increasing p.* While p is upper bounded at 1.0, N is not. And while improving p requires improving the quality of the webpage, it's often easier to increase N by simply setting a default of "share all".

3. *Decreasing τ at first is easy.* Often to decrease τ one can get some easy wins by rearranging a user signup flow or the like. After that point diminishing returns kick in.

4. *Users need an incentive to share.* Communication applications like email, Facebook, Paypal, or Skype are inherently viral[5], in that people need to make their contacts sign up in order to use the app. With Dropbox or Google Drive, we're dealing with optionally viral services, where users can use the app in a standalone fashion but collaboration on documents is quite helpful. Finally, with not-obviously-viral apps (like Mint.com), there's no immediate incentive for users to share private information (like their finances); Mint famously scaled up nonvirally.

5. *Lowest common denominator increases N.* The more broadly appealing your content, and the simpler it is to process conceptually, the easier it will be to sustain a large N, low p strategy.

6. *Financial incentives increase p.* The most obvious way to increase p is to surrender some of your profit margin per customer to achieve rapid viral growth. This strategy was highly successful for Paypal, but make sure to do the worst case math on this.

[5]This is one reason behind Zawinski's law: "Every program attempts to expand until it can read mail. Those programs which cannot so expand are replaced by ones which can." Put another way, programs which can communicate with other programs are more likely to spread virally.

7. *Invited users should see exactly the same content.* In order to get a true viral loop, it's important to preserve the exact context on the page that provoked your initial user to share. If the users they invite don't see the exact same item that stimulated their contact to share, they'll need to hunt around on the page and/or chat with their contact to determine what was of interest. This will kill your viral loop.

Putting these things together, we can start to gain more insight as to why the Reddit image macro is the Ebola meme. An image meme is instantly processed ($\tau \to 0$) and understood by a wide audience ($N \to \infty$). It thus need only be shared by a small fraction of people to achieve incredible viral growth. Here are a few more historical examples of successful viral campaigns that illustrate various optimizations of p, N, and τ:

- *Hotmail and the email signature.* One of the earliest and most successful examples of viral marketing on the internet was Tim Draper's suggestion to include a link and marketing pitch at the end of every email sent from Sabeer Bhatia and Jack Smith's Hotmail. "Get your free email at Hotmail" resulted in explosive viral growth. Every single person in a person's address book now contributed to N.

- *Youtube and Flash Video.* There were many video sharing sites in 2005. Why did Youtube in particular take off where others did not? One key technology choice was to use the lowest common denominator of Flash Video, rather than forcing the end user to install a new plugin such as Quicktime. This seemingly simple decision radically reduced τ and improved Youtube's viral loop beyond all competitors.

- *Facebook's use of Gmail contacts.* Before the OAuth standard was developed, Facebook asked directly for your Gmail password to help find friends. They then bulk downloaded contacts and used this to build their friend graph. Google eventually caught on and closed the barn door after the cows had escaped. A classic example of N optimization.

- *Zynga's incentive structure.* In the early days of Zynga, Mark Pincus had observed that people wanted to use real money in online games, but traditional gaming companies like Blizzard were dead set on stamping out such transactions. He cloned the popular Chinese app Happy Farm to create Farmville and created Zynga, which included invite mechanics as standard; either one could pay for a new item, or one could invite/spam one's friends. These tactics increased both p and N, as any active user was bound to share at some point and the rewards they got increased in proportion to the number of people they shared with.

The concept of social, then, is intimately linked with virality. It is not enough that your user merely discusses your app with their friends; it must be compelling enough for at least some of your user's friends to in turn share with *their* friends. This is why VCs mention social constantly: because a successful social strategy offers the possibility of rapid viral growth.

Local

Of the three, local is arguably the laggard in terms of market impact. The term can be interpreted in two ways: does it refer to the use of a GPS[6] signal (aka a location-based app)

[6] As a side note, the use of GPS for such things is a bit astonishing. For many years, the GPS signal was selectively degraded by the US military. Civilian airlines needed to do things like GPS triangulation to provide

or does it involve outfitting local businesses with technology? The former describes apps like Uber and Exec, while the latter refers to commerce apps like Square, with the combination manifest in sites like Yelp and Foursquare. The companies in the local space are a bit less well known than their social counterparts, so let's run through some of the highlights.

- *Google Maps.* One of the unambiguous heavyweights in the local space by either definition, Google Maps is by some measures the most popular mobile app on Earth. It has fought off all comers for years and is a sophisticated, polished product. However, recently Google put a foot wrong with their Maps pricing snafu, giving new energy to the Open Street Maps (OSM) open source competitor and forcing big price cuts.

- *Loopt.* Acquired for $40M by Green Dot, Loopt was one of the first YCombinator companies. Sam Altman saw the importance of GPS before others and spent enormous effort getting carrier deals, only to find that the iPhone's built-in GPS obviated much of his work (see here). This is a relatively rare example of a startup being directly killed by a big company's competing product; Kiko vs. Google Calendar is another.

- *Zocdoc.* One of the most successful local business companies. They solve one problem (online physician appointment booking) and they solve the whole problem. This seemingly trivial issue actually requires significant integration with the doctor's office, as their entire schedule is dictated by their calendar, and calendaring is actually a surprisingly challenging distributed systems problem.

- *Opentable.* Another successful local business company, and one of the first in the local space. Did much of the blocking and tackling necessary to get restaurant reservations and menus online, again requiring a significant sales process with often non-tech-savvy local restauratiers.

- *Foursquare.* A bit surprisingly, Foursquare looks like it'll be a letdown for the investors. This is not unprecedented: Napster, Friendster, Digg, and Second Life were all ramping at one point before missing a turn. For whatever reason, the seeming no-brainer-monetization of checkins as the new loyalty cards hasn't materialized. The check-in concept might get revisited in a few years with new technology, if and when mobile payments become mainstream.

- *Uber.* Uber uses GPS to locate the user and the cab s/he has just hailed, showing them each other's location and taking care of the billing and transaction. Now raising at a deserved multibillion valuation, Uber has reinvented local transportation in the metro areas where it's debuted. It faces significant competition from up and coming ridesharing cos (especially Lyft), but is arguably the single most successful location-based app to date.

- *Exec.* Allows you to book a worker in realtime for $25/hour and see them running to your destination (and/or carrying out errands) via GPS. The latter feature seems superfluous but is surprisingly helpful in providing confidence that your tasks are being carried out in the right place at the right time.

signals suitable for automatically landing planes. But in a move similar to the repeal of the NSF AUP, in May 2000 the government stopped degrading the GPS signal. Who would have known that within the span of a decade the technology built for guiding nuclear missiles to their destination would be repurposed for guiding travellers to Dunkin Donuts?

- *Topguest.* Notable primarily for being perhaps the first genuinely monetizable use of checkins, Topguest incentivized sharing of locations for frequent flyer miles and was acquired in 2011.

- *Yelp.* Provides reviews and star ratings of many local businesses. Now a public company, Yelp has been successful in many respects, especially in terms of usage. Their Monocle app remains one of the first and most useful augmented reality products out there. While Yelp has had issues making a profit, the company is too valuable to simply go bust. At some point they will likely be acquired for the value of their data, perhaps by Apple.

- *Groupon.* The darling of 2010, Groupon has fallen quite a bit since that time. They didn't seem like competitors to Square at the beginning (one was a coupons company, one a payments terminal) but Andrew Mason's mission statement directing Groupon towards becoming an "Operating System for Local Commerce" clearly put both companies on a collision course. The problem, though, is that Groupon hired too many salespeople and didn't fundamentally have an engineering DNA. As such it has been outcompeted by Square.

- *Square.* This is the company that is probably going to win local commerce, with semi-stationary products like Square Checkout and mobile products like their original Square Reader. Unlike Groupon, Square is run by computer scientists; it thus has a faster metabolism, higher intelligence, and greater creativity than a purely sales-driven squad. This is particularly important in a rapidly evolving business area like local payments.

Local Commerce, the Graveyard of Startups

The main difference between local (in the sense of local commerce) and the others is that it's a large market but extremely difficult to attack scalably. Even Benchmark's Bill Gurley, who is bullish on local, says:

> The playbook requires a deep understanding of the industry, access to all the key content and its structure, a targeted and experienced sales structure, and a willingness to invest in a market that may seem "niche" to the broader service provider. You have to "be willing to get your hands dirty."

Why? Because you can't write a script to automate the process of selling to small businesses. Small businesses are generally the last to adopt new technology, outside of government agencies[7]. As a small business owner you are pinned down with a constant stream of demanding customers. The upside from this glowing technological doodad shown to you by some 20-something whippersnapper is unclear, but the downside is that your restaurant may come to a halt and/or you may need to retrain your entire staff around this one new item. To give an atmospheric sense of what it's like to run a small business, read this article and this one:

> The failure of a small cafe is not a question of competence. It is a sad given. The logistics of a food establishment that seats between 20 and 25 people (which

[7]There are many pockets of high-tech excellence in the US Federal Government (e.g. NCBI), but in general government procurement processes and regulations mandate purchases of the safe "industry standard" rather than the risky "next big thing". This innate conservatism means that in government agencies, more than anywhere else, no one ever gets fired for buying IBM (or Microsoft, nowadays).

> roughly corresponds to the definition of "cozy") are such that the place will stay afloat - barely - as long as its owners spend all of their time on the job. There is a golden rule, long cherished by restaurateurs, for determining whether a business is viable. Rent should take up no more than 25 percent of your revenue, another 25 percent should go toward payroll, and 35 percent should go toward the product. The remaining 15 percent is what you take home. There's an even more elegant version of that rule: Make your rent in four days to be profitable, a week to break even. If you haven't hit the latter mark in a month, close.

This starts to make clear why local businesses are a tough sell:

1. *In-person sales.* In general, local business owners do not spend much time on the internet looking for new technologies. So Adwords campaigns and the like will be of limited effect. You will almost certainly need a separate physical sales visit to each locale, which gets expensive and time-consuming rapidly.

2. *Low margins.* Your customers aren't rich. You'll need to recognize that most local businesses aren't making much money. So unless you are careful, you are now spending a lot of manual sales effort for relatively small and low-value conversions.

3. *High customer-service overhead.* Local businesses have no engineers to do integration or upgrades; everyone is busy serving customers and mopping floors. It is true that the more essential your technology is to their business, the more likely they are to buy; however, the more essential the technology the more you will have to support it. For example, if their new internet cash register goes down, their business grinds to a halt. Yet these cash registers are physical devices, distributed all around the country, and not easily updated or retrofitted as new technology comes out. So make sure that your engineers don't push an update that can't be undone without physically traveling to and resetting a device.

4. *Uncertain gains.* For many local businesses, the transition costs for introducing a new technology (e.g. the aforementioned risk of a cash register crash) often overwhelm the ostensible benefits.

Let's do a simple calculation to drive the point home of why local sales is hard. Say that you hire a salesperson at $50,000 per year to visit 10 stores per day over the course of 10 hours. Perhaps you have a 10% conversion rate, which could be high. Then at 5 days per week, the salesperson is acquiring 5 new customers per week, or 250 over the course of a year. Each of the 250 customers must produce at least $200 in annual profit to pay the $50,000 sales salary. If you are a payments startup, you might collect on the order of 2% per swipe. And $200/.02 is $10000. This means you need to sign up 250 companies and do a total of $250 $\times$ $10000 = $2.5 million in transactions through your system to pay for one sales rep. This doesn't include taxes, overhead, benefits, software engineering, or anything like that. Please also note that local business operate on tight margins, and your 2% fee may need to be split with Visa or Mastercard, so even 2% is not assured. Finally, this presumes a somewhat superhuman salesperson who can visit 10 people per day every day for an entire year at only $50,000 per year, with no commission.

This is why local sales is difficult.

There are ways to partially ameliorate these issues, such as local dinners where you can bulk-sell many proprietors at once, a subscription product, or the aggressive use of social networks to automate the process of gaining warm introductions to local business owners. But in general the problems associated with local sales compound. Due to low profit margins and the inability to hire skilled labor, the store manager is often the one responsible not just for running the business, but for promotion, marketing, the store website, and the like, including adoption of new technology.

One starts to understand why chains like Starbucks, with centralized marketing and significant division of labor, present such tough competition for local stores. As a startup, one also starts to understand why making the sale to a Starbucks, or even a much smaller chain, generally provides much more return-on-investment (ROI) than making the sale to a small business. One sale and you are (in theory) good to go at hundreds if not thousands of storefronts. And chains have some degree of internal engineering support, so they won't contact you for every breakage and issue. While it might be harder to get a chain to ink a large contract, once you do, you don't have to spend as much per-capita on customer-service or sales effort. This is why Square did a deal with Starbucks; even if the rollout has had problems (1, 2), solving those problems at scale will provide vastly more ROI than fixing the bugs of 1000 independent shops with all their idiosyncracies.

So, while it sounds like a great idea to sign up the enormous local business market, in practice these customers are the opposite of early adopters. They have thin margins, need high levels of customer service, and do not generally think of technology as a competitive advantage - especially when tech transition costs can dominate benefits. While you can certainly build something of significance in local business (Zocdoc, Zillow, Opentable, Grubhub, and the like are proof of this), you should only start a company in the area if you are comfortable with knocking on doors for the next five to ten years of your life.

Alternatively you can wait for the future of local to arrive. At some point within the next five years category-killers in each vertical will start turning local providers (doctors, drivers, restaurants) into APIs. Google will likely be heavily involved in the search and indexing of these APIs, but there promise to be many more interesting applications than even Google can contemplate.

To summarize, then: VCs tend to refer to two related but distinct things (GPS-based apps and local business apps) with the term *local*. The former is unambiguously technologically interesting and has led to large companies like Uber and fast-growing ones like Exec. The latter can in theory address large local business markets, but depends on laborious customer acquisition in specific verticals (like OpenTable, Zocdoc, Square) and can become a punishing sales grind.

Summary

Let's put it all together. Why do VCs love mobile, social, and local? Because a social app can have incredible viral growth, a mobile app is riding the worldwide smartphone/tablet phenomenon and has access to outstanding distribution, and (more arguably) a local app can use GPS in interesting ways and/or reach heretofore untouched small business markets. Some combination thereof can lead to rapid valuation growth in new markets, and hence substantial contribution to the VC's portfolio of hits. That is why these features are becoming *de rigeur*

for new companies. If you don't have a social and/or mobile component, it's like not having a website: your growth may be inherently limited relative to a competitor that does, even if their product is measurably inferior in other respects.

What will VCs love next? The obvious answer is consumerization of the enterprise. And that's not a bad bet, and will involve a lot of blocking and tackling related to mobile device management (MDM), bring-your-own-device (BYOD) policies, remote wipe, enterprise sales, and things of that nature. But what's more interesting are those things that involve fundamentally new technologies that flip tables and invalidate assumptions. In a subsequent lecture we will discuss the societal implications of several of these areas in some depth: industrial robotics, 3D printing, telepresence, quantified self, Bitcoin, and autonomous drones. These are our technologies of 2013.