The Core Concepts of Mobile-Visual Analytics

Meeting the Next Generation of Analytics Professionals

T he history of science fiction is peppered with devices that eventually became real. One of the areas we see this the most is in science fiction: writers and filmmakers of yesteryear envisioned our future interaction with computer systems, and they were not shy about dreaming big.. As far back as the 1960s, science fiction shows, movies, comic books, and novels were describing supercomputers, mobile devices, and interfaces that stretch the imagination. Now, many of them are real, or are becoming real.

The most immediate example of invention mirroring science fiction would be in mobile computing. The tablets and phones of our time would surely amaze any writer from the 1960s, but what is interesting is how those same writers seemed to have correctly guessed what we'd be able to do with our technology in the year 2014: we would have access to vast computer resources through them, and they would display information in highly interactive ways. This trend has become particularly popular in the field of analytics, as things have moved towards visualizing the results that, up until recently, were usually displayed as pure numbers or text

This trend has changed the way we think about data, analytics and mobility. It has created an entirely new industry that is focused on not only creating mobile-visual experiences for use in analytics, but also showing us how useful these innovations really are. iVEDiX, a dedicated player in the field of mobility, analytics, and business intelligence, has garnered quite a bit of experience when it comes to developing these new tools and methods. So with this trend in mind, this paper will seek to answer two key questions about mobile analytics and visualization:

1   What makes a great mobile-visual analytics experience?

2   Why should you care about creating one?

Data Visualization

Data Visualization is becoming an increasingly important part of every BI solution provider's arsenal, and this trend is owed to several factors.

First, the emergence of Business Intelligence, Analytics, and Data Management as must-have tools means that CEOs, COOs, and other decision makers have no choice but to get onboard. Only a few years ago, these tools would have been reserved for a highly skilled, highly select group of folks who made a living out of translating statistics.

Whereas previous users were primarily concerned with functionality, depth, and breadth of information, the introduction of this new user base -- educated, smart, but not necessarily math geniuses -- meant that usability was now a factor that needed consideration when designing BI solutions. This, combined with the increase in graphical computing power now available on even lower-end machines, made the emergence of visualization a sort of natural evolution of Business Intelligence.

Giving decision makers direct access to data has surely increased the productivity of organizations, but without adequate visualization, it can also increase confusion. Understanding the important aspects of the user, then, are crucial to designing visualization schemes that work, that capture the attention of the user,that actually aid in decision making. This is true on desktop PCs, but putting such visualizations into a mobile analytics format is even more vital to the platform's success.

Mobile analytics -- whether pure data, BI solutions, or anything else -- places a different set of demands on the user and the developer, insofar as the tools must conform to the demands of the platform. A smartphone functions differently than a

tablet, and a tablet different from a desktop. The unique restrictions of a tablet, such as limited processing power and a smaller screen, demand that any solution make the best, most efficient use of the device's attributes.

Finally, the usage of visualization elements in a mobile analytics platform changes the game. No longer is visualization sufficient; equally important is interactivity. When using a tablet or a smartphone to interact with data, the user is really interacting with two things: the data, but also the "skin," or the visualization.

Visual Interactivity is a relatively new element of solution design, as interacting with the visuals directly -- dragging and dropping, pinching, tapping, etc -- has come into its own only within the last few years. Studies have shown that the introduction of tablets has changed the way we interact with our computing devices. Tablets have us using our desktops less frequently, and it is no surprise that trend would affect the approach to application design.

Core Concepts

The iVEDiX philosophy for the design of miVEDiX encompasses five main concepts of visual interaction. These concepts have developed both intentionally and organically, to varying degrees. Using this development as a guide, we can say that at present there are few main pillars holding up the superlative mobile-visual interactivity experience -- herein referred to as the MoVIE -- when it comes to data interaction:

| Tactile | • | Immediate | • | Concrete | • | Empowering | • | Lean |

Tactile

The importance of tactile feedback in computer usage has been an area for some time. Research has shown that increasing tactile feedback in a computer interaction scheme increases usability, and giving the participant an increasing tactile feedback in a computer interaction scheme increases usability, and gives the participant an increased sense of engagement with the device. Studies have also indicated that a user's efficacy in completing tasks is greatly increased by tactile feedback.

Foolproof tactile response on a touch screen (such as the type offered by Senseg) is not a technological reality yet, at least not one that is economically feasible for usage in mobile devices. But tactility is more than just physical feedback. The important thing to remember is that the experience *feels* tactile, which means that interaction elicits a response to the user that goes beyond merely carrying out the action requested. Dragging and dropping an item from one area to another should include some kind of visual or audio feedback that gives the user a sense that he or she is truly interacting with the device.

These functions may eventually be subsumed by the introduction of low-cost tactile feedback mechanisms in touch screen displays, but even so, they will still be useful. Consider that these mechanisms will likely cost battery power, meaning there will be some instances where touch screen feedback is turned off. Also, there are likely to be users who prefer not to use such technology, or devices that will not support it.

No matter which one is in use, actual tactile feedback or simulated tactile feedback are both vital components of creating an engaging MoVIE.
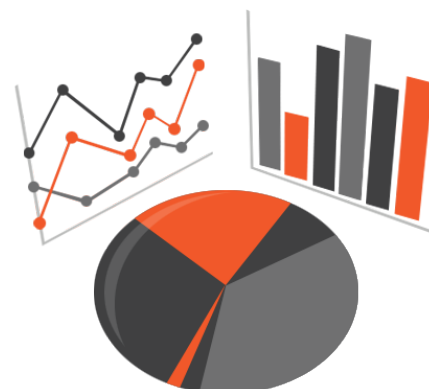
Immediate

Immediacy speaks to the speed of response, and this is something that many mobile applications lack. To some degree, this is outside of development control. For example, if the user is trying to complete an action that calls on a database, the speed of that reaction is limited to the hardware and software specifications of that database, and the intermediate software layers between it and the device, and the speed and reliability of the wireless connection.

But in general a great MoVIE is one that feels urgent and alive. Interacting with visuals must give the user a sense of real-time activity, in the sense that they must feel they are not merely "moving data around" but experiencing and exploring it. Immediacy demands that the visual interaction support the feeling of immersion. Achieving immediacy is both a function of design, and an artistic endeavor.

Concrete

Concreteness is the feeling that what the user is doing is real, that it is having an effect on the interactive landscape. When the experience is concrete, it feels stable and solid -- a solid interface, solid responses, and solid choices. A concrete MoVIE is one that feels like it was designed specifically for the user, and their chosen device.

This does not mean that every application must be built from scratch to be customized for each user of the product -- obviously, this is not realistic! But what it does mean is that the best mobile data experience will be one that *feels* like it was designed for each user. A sophisticated back-end development that accounts for various platforms and devices is the key component, here, but the ability to customize the interface is also extremely important.
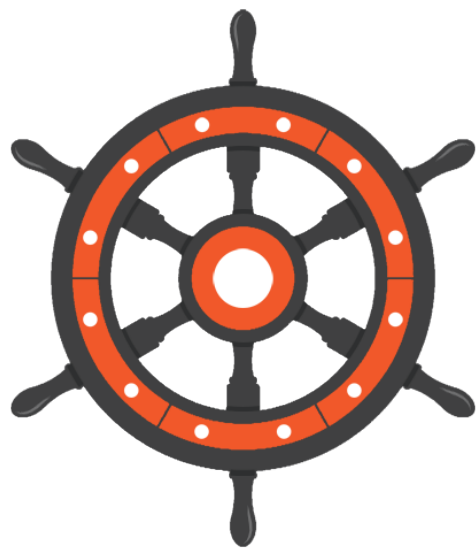
Empowering

When a MoVIE is empowering, it gives the user a feeling that they are really benefitting from the experience. When it comes to analytics, this feeling is best achieved by having a product that actually delivers real, definitive descision-making power. It makes the user feel like the captain of the ship.

This may seem like the most obvious thing in the world, but it is missing from a surprising amount of applications. When it comes to data, BI, and analytics, the entire point of the exercise is to increase the generation of insights, as well as to buttress the decision-making capability of those people charged with directing organizational growth. Visualization is important to this endeavor, but it is vital that visualization does more than just provide a picture to go with the numbers. The visualization must not merely be a wrapper for the data, but present a fundamental shift in the way the user views the problem, prompting real data discovery, as well as generating fresh insight.

Lean

When a program is lean, it feels quick. It utilizes the optimal amount of device resources: processing power, wireless and internet capability, limited screen sizes, and the interface restrictions that frequently come with touchscreens and smaller devices. Leanness is a function of great design, but also an intuitive understanding of what the user will be doing with the product once it is in their hands.

Consequently, leanness is a principle best refined through user testing; it is a well understood axiom in any design field that the creator's intentions for how a product will be used will often give way to how it is *actually* used. Ensuring that the MoVIE feels quick means cutting out extraneous navigation nodes and streaming access to the most important parts of the interface.

These characteristics have helped iVEDiX develop miVEDiX, but they are also applicable to a wide variety of other applications and disciplines.

Mobile Analytics I

"Like television to come before it, it is a natural part of their social landscape, a platform that is taken for granted in the best sense of the term -- it is simply there, all the time, and they cannot recall a time when it was not."

The Changing Demographic of Mobile Analytics

The second part of this paper answers the questions: Why should I care about Mobile Analytics?

There are many responses to this question, and many of them will often boil down to an organization's priorities. But perhaps the most compelling argument as to why a leader should care about the mobile visual interactive experience has to do with the rise of the next generation of workers: Generation Z, or the Internet Generation.

Like all generational divides, there is some discussion on when, exactly, one generation begins and one ends. But generally "The Internet Generation" is the generation that was born starting in the mid to late 1990s. They are the generation that is currently in high school, though some of them are rapidly approaching collage.

This group is referred to as the "Internet Generation" for the very obvious fact that they are the first group of people to be born in a world where the internet was a cemented reality. For as long as they have been alive, the internet has been a cultural staple and a technical guarantee. Like television to come before it, it is a natural part of their social landscape, a platform that is taken for granted in the best sense of the term -- it is simply there, all the time, and they cannot recall a time when it was not.

And increasingly, mobile accessibility is becoming synonymous with that presence. For many people of the internet generation, the mobile device is the internet, or at least the form of the internet they currently care the most about.[1]

Mobile Analytics II

So what does any of this have to do with mobile BI?

The increasing demands for mobility in the various tech industries has business users clamoring for options that can cut the desktop umbilical cord. Recent hardware advances in tablet design have made this more and more feasible, but nobody quite knows the end game, yet. Will it be a world in which desktop computers are saved only for the most intensive tasks? Or are tablets merely one point on a continuum that will end with wearable computing?

No matter which way it goes, the concepts behind current mobile computing mean that a mobile analytics solution -- whether for business or any other purpose -- will only remain solvent if it captures the imagination of the next demographic of Business Analysts, Data Architects, Solution Designers, and BI Specialists: the above mentioned internet generation.

Many of these users are only a few years away from joining the workforce, and they will be used to the freedom and flexibility that only mobile devices allow. To truly capitalize on this next generation's talents, then, is to recognize this familiarity with mobile computing and foster it accordingly. To be sure, recognizing this talent will be a great advantage to any business savvy enough to bring these professionals on board.

[1]"Teens and technology 2013" Pew Research Center. (http://www.pewinternet.org/files/old-media/Files/Reports/2013/) PIP_TeensandTechnology2013.pdf)

Finally, and stepping away from the generational divide, mobile computing can be a great boon to all BI and Analytics users because the requirements of mobile BI computing -- for example, the use of visualizations to convey information -- lets users of all stripes gain access to BI-generated insights. Visualizations are also extremely useful in situations where language barriers may be present.

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Summary

Building a comprehensive mobile analytics interface requires a deep understanding of the trends in visualization, the strengths and limitations of the device, and the target demographic. iVEDiX has learned through experience that the quality of a mobile analytics interface is highly dependent on its interactive and visualization aspects, and these are beholden to a willingness to experiment and to toss out old ideas -- however unsettling this may be.

As mentioned earlier, nobody is quite sure what the end game for mobile technology really is. Recent advances in wearable computing, such as Google Glass and Samsung's Gear Smartwatch, indicate at least some of the design foundations set for tablets and smartphones will carry over, to include working with limitations such as a screen size and processing power.

Putting all of these things together -- the ingredients for an excellent mobile experience, the knowledge of changing demographics, and understanding how the next generation of business professionals will interact with technology -- is not a silver-bullet approach to solving usability problems. Neither can it guarantee that your next mobile product will be the paradigm-shifting hot shot that changes the game. But, the ideas presented in this paper can help. As iVEDiX has learned, understanding these concepts is but one branch of a broad lattice of knowledge that can help an organization make the most out of their time, technology, resources, and vision.

Our Company

iVEDiX is a Business Intelligence (BI) solutions provider with the knowledge to drive efficiencies, empower organizations, and revolutionize mobile analytics through our team of highly skilled practitioners. iVEDiX is a privately held company that serves national and international enterprises, is specialized in serving telecommunications, healthcare, retail and service industries, and is headquartered in Rochester, New York.