

Revisiting Mobility, Devices and Business Models

A user-centric perspective

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Abstract— Given the array of devices now available to users, how can one make sense of the evolution of user-side mobility? The purpose of this paper is to revisit mobility from a user-centric perspective. We use a mixed methods approach based on action research and case studies. We find that mobility's pervasiveness leads to changes in habits that have a profound effect on devices and business models. We conclude by looking into possible directions for new advances in light of the present research and recent trends in the IT industry.

Keywords— User-centric mobility; devices; business model; user-centric design.

I. INTRODUCTION

Given the array of devices now available to users, how can one make sense of the evolution of user-side mobility? Mobile devices are now ubiquitous in everyday life and they are seldom noticed anymore [1]. Furthermore, in recent years, consumers have faced an increasing array of devices that are very eclectic as exemplified by the vastly different characteristics and capabilities of tablets, handsets, e-readers and others. At the same time, the characteristics and enablers of mobility are present in ever-increasing settings. These may be related 1) to how the user experiences connectedness, or 2) to the device itself. This is especially important, yet often overlooked, because it has been known for a while that information and perception are intertwined [2].

Whatever the design process, whether from groups of designers to the consumer-market or from co-creation by consumers and designers, a user-centric approach is necessary as consumers are ever more demanding when it comes to mobile devices or mobility in general [3]. This has seemingly led to a paradox where one expressed need for mobility yields to a fragmented market of devices that allow mobility. This entails a simultaneous convergence and divergence in the types of devices that are available. At one end of the spectrum, users acquire different devices for different uses, while, at the other end, other users seek use only one sort of device, for all their needs. Along the same lines, users exhibit various learning patterns [4] and some (in)ability to adapt to change when switching devices. Some are tinkerers and like to exploit and configure any possibility afforded by their device while a significant segment could be termed a plug-and-play crowd happy with general default settings. This explains why understanding mobility, devices

and design from a user-centric side and examining business models remain relevant for users and businesses alike.

This paper is structured as follows. First, some related work is examined. Second, in the problem statement section, the general issue being researched is explained. Third, a user-centric view of mobility is put forth. On one hand, the user-side of mobility is examined. On the other hand, issues pertaining to attributes of mobile devices are discussed. Fourth, an overview of the methods used is provided. Fifth, some contemporary business models are discussed in light of the evolution of mobility through mobile devices. Finally, some implications for this work and a way forward for research are presented.

II. RELATED WORK

Related work gives partial insight on how mobility, devices and business models intersect from a user-centric perspective. First, past research on mobility has examined issues related to architecture [5], [6] and awareness management in networks [7]. Furthermore, cloud computing is presented as an option to deal with mobility issues [8].

Second, a strand of literature on devices examines application mobility for cross-network roaming through multiple devices [9] as well as in heterogeneous network environments [10]. Other recent work on devices shows an increased interest for semantic solutions that makes the device a privileged nexus between users and services [11].

Third, while research on business models per se historically focused on value creation [12] business models that may be harnessed and their design [13]. Other work ventured toward mobile payment adoption [14] or demand-related variables [15]. However, cultural factors also affect mobility [16] and users put a high premium on the quality of their experience as evidenced by research on mobile TV[17].

III. PROBLEM STATEMENT

As previous research rarely examined mobility-enabling technology, devices, and business models from a user-centric perspective, the present research makes a contribution by looking at these factors simultaneously. Indeed, making sense of the new trends in devices, platforms and available content, software and applications from the consumer side is increasingly difficult given their diversity. It is not clear yet whether there is a growing convergence or a competitive co-existence of available devices centered on a variety of user

needs. While other studies have focused on specific user behaviour issues from a very technical and quantitative perspective [18], this research contributes a different user-centric way of tackling some challenges associated with mobility while looking at devices, users and some trends as well as business models that may be harnessed.

IV. USER-CENTRIC VIEW MOBILITY AND CONNECTEDNESS

Mobility is of an increasing value for users living a connected life. They also wish to remain connected for longer parts of the day. One factor behind this desire is partly explained by the “Fear of Missing Out” (FOMO), or the fear of missing something important to them – or their social circle – should they not be connected [19]. Another factor may be linked to the emotional response related to higher levels of connectedness. Beyond the sense of belonging or security that is attached to connectedness [20], users also find comfort in the fact that being connected via a device is a reassurance. Thus, it is possible to map the sense of belonging on a spectrum that puts peace of mind at the lowest end and active engagement at the highest end. A third factor to consider is that mobile devices are ideal to fulfill certain types of tasks or for personal distraction during micro breaks [21], whether on the move or not.

A. User-related considerations

1) *Some psychological considerations:* Many psychological factors may be associated with mobility. The feeling of convenience that comes with increased mobility may bring a higher level of psychological comfort, even in users whose lifestyle does not require a high level of mobility. As such, mobile devices may be construed as extensions of the self or as influencing it [22]. Different devices broadcast different messages. As Apple’s product appeals more to emotion and a desire to be part of a certain “in” crowd, MS Surface tries to cater to “cool” business users that seek to interface their device in a familiar Microsoft Office environment, Samsung counts on the pervasiveness of Android and some “fun” characteristics associated to its products. Finally, there is a level of status that is associated with the type of device one uses and its level of customization.

2) *Anchoring:* Another consideration is the need for an anchor that users have. Traditionally, this anchor was in a physical space, such as a home for example. This provided a sense of place in the world and an emotional anchor that too made this sense of belonging important [23]. As users lead increasingly dynamic lives, where geography is losing ground to information technologies, the traditional need for physical/geographic anchoring has morphed into one for digital anchoring as it remains now the “constant” in many users lives. A direct implication is that one may expect users to develop an emotional attachment to their devices and that this will impact the physical characteristics that

they will want in a mobile device as this will become a reflection of their identity.

B. The device side

Many conditions exist to enable mobility in the consumer’s mind when it comes to devices.

1) *Physical attributes:* First of all, the physical attributes of a device matter much for adoption and for its intended usage patterns. The first factor that matters here is purely physical. The devices weight and their ease of manipulation matter. They are the crux of physical characteristics (Palm CEO famously carried a wooden replica of a device in his pocket to find an optimal design [24]). There is a trend toward more embeddedness of mobility in objects that are beyond the realm of classical mobile devices, as evidenced in the automotive industry (Hyundai BlueLink, MyFordTouch, etc.), but this embeddedness brings challenges in terms of obsolescence and updating needs. As in the car industry where embedded electronics become obsolete faster than the engine or mechanical parts.

2) *Connectedness:* Second, connectedness matters a lot too. 3G and 4G connectivity on a wide range of carriers are important to ensure mobility over large areas as evidenced in the USA by the wars between Verizon, AT&T and Sprint over coverage and speed. Furthermore, more and more consumers expect fast and easy WiFi connectedness in tablets and phones (which is fairly standard nowadays) but also in a range of other devices.

3) *Software:* Third, the issue of software that is not platform dependent, many would say “cloud ready”, is a very important desirable characteristic. Information access and manipulation are cornerstones of the perceived value of mobility. The ability to manage structured information and unstructured information is very important but often overlooked. For instance, software that allows for unstructured or fuzzy queries close to natural language queries is also a desirable characteristic to find specific information on the device. It is important that queries beyond simple keywords be supported. Furthermore, social possibilities afforded by the device, i.e., easy connection to social media [25] and social networks are another element that needs to be factored in (Facebook, LinkedIn, Pinterest, Reddit, etc.)

V. METHODS

This research uses a mixed methods approach to serve its exploratory nature. The combination of methodologies is felt to allow better insights into the complexity and richness of the subject matter in order to move beyond purely technical challenges.

The first method used is that of action research [26] of an inductive nature. Over a full year, mobile devices were used in three different countries (Canada, USA and Switzerland) on major commercial platforms (BlackBerry, Android, and

iOS) linked to major national providers (Bell, Verizon, and Swisscom).

The second method used is case study research [27]. The cases were selected for the breadth of insight they could provide and their diversity (for-profit, non-profit, maker of devices and software). The cases were examined through secondary data sources (newspaper articles, video interviews by third parties, etc) that would shed light on both the user experience and devices.

Important elements like validity, does the research measure what it claims to be measuring, and reliability, does it measure it in a consistent matter, were taken into account [28]. Care was taken to control for biases [29] by adopting a comparative perspective. There are no conflicts of interest to declare with regards to the cases discussed in this paper.

VI. PERSPECTIVES ON MOBILITY'S EVOLUTION AND SOME CONTEMPORARY BUSINESS MODELS

A. Consumer-side mobility

Consumer-side mobility has evolved in cycles. In the 1990's, mobility from the user side essentially came in the form of mobile phones, or mobile handsets and bulky laptops with mobile radios being phased out. In the 2000's, it became a defining characteristic of many devices (PDAs, mp3 players, etc.) that saw their functions converge into "smart" phones and eventually became a noted feature of a range of devices (tablets, e-readers, etc). That trend is morphing into embedded mobility (in cars, public spaces, in airplanes, etc), with the next step likely being improved wearability of devices (Google glasses or intelligent clothing). While wearable computing has been around for a long time, the next generation may prove better adopted as users become used to well-designed I/O apparatus that will make this sort of mobility both sensible and natural.

B. Business models

These changes in consumer-side mobility have a great impact on business models. For wireless carriers, it means more devices are connected to their networks and thus a rise in their traditional businesses of carrying voice and data. But this also implies new value streams that come from a different way/process of interacting with users: different fee schedules to fit different uses and devices and different ways of modulating the contracting agreements. Device makers can now make money on the physical devices themselves, but also derive advantages from sharing platforms/OS. Applications (apps) and software developers, also have new possibilities to maximize downloads and adjust payment possibilities by moving from free to fee-based models. Last, but not least, ancillary material and peripheral makers also have more devices to cater to and are able to better take advantage of consumers' need for personalizing their devices.

C. Cases

Three cases were examined in light of the research question: Major League Baseball, OneBusAway, and BlackBerry.

1) *Major League Baseball*: A first case is that of Major League Baseball (MLB). Traditionally, the league made a lot of revenue from TV broadcasting rights. But as consumers migrate from – or increasingly use other platforms than – TV, the league created MLB Advanced Media (BAM) to distribute content on a variety of devices. This means that BAM is able to create value by leveraging apps, providing a lot of content that allows for a great interactive experience (videos, etc.) beyond the traditional statistics baseball fans love [30], [31]. In doing so, they also take time to better understand users to better cater to their interests. For example, their data showed them that different devices were associated with different user behaviours and thus different needs: e.g., users with mobile phones did not have the same usage patterns as those with tablets or laptops [32].

2) *OneBusAway*: A second case is that of OneBusAway [33], a non-profit that developed the eponymous app that provides real-time transit information. Transit schedules are often complicated for users to understand, especially in large cities that have a denser transit network. A wide range of users, from daily commuters to tourists, need to plan their journeys. With the strong penetration of mobile devices in major American metropolitan areas, it made sense to develop an easy-to-use app that would assist users in planning their trips in a real-time manner. The app was developed for the Puget Sound area and now covers Atlanta, New York and Tampa.

3) *BlackBerry*: A third and last case is that of BlackBerry [34]. Better known for its handsets, it also ventured in the tablet market, but users did not follow. After market share losses and devices that were not appealing to younger generations, it remained popular with business users. It reinvented its handsets including touchscreens and getting rid of their trackpad. It proposed a model with a keyboard (Q10), another one without (Z10) and a third at a lower price point (Q5) [35]. It fielded a new OS that allows multitasking, provided a secure workspace that can operate with other OS' than BB10. It provided a better app ecosystem for example adding Skype and the new BlackBerry Messenger for real-time communications. It did try to cater better to user needs and habits. The market will tell if it is valued by consumers [36] underlying the fact that reality is the ultimate test.

D. Preliminary findings

The cases that were examined seem to confirm two general trends. First, there appears to be a heavy and cross-platform adoption of intuitive user-centric mobility by consumers. Second, firms do alter significantly or create entire business models based on this shift instead of just paying lip service to this trend. These models create value beyond simple micropayments.

VII. CONCLUSIONS AND IMPLICATIONS

These cases are revealing because they are simultaneously enabled by and enablers of mobility. This self-reinforcing mechanism has many implications for business, academics and future research efforts.

A. Implications for business

Better configured business models taking a user-centric perspective are bound to maximize value creation. Fee structures and modulations along each segment of the value chain will enable better decision-making on hardware, on software, and on ancillary services and apps from the ecosystem surrounding each device. User-centricity also matters a great deal when it comes to critical decision making [37], especially when mobile devices are involved.

B. Implications for academics

Academics need to help industry better bridge the gap between the device, the user and their perceptions, the ecosystem that surrounds them, and business models. This research constitutes a step in this direction. Furthermore, since devices – and the software that they run – are produced in complex networks of firms that collaborate, then working from a common user-centric perspective may in the end reduce the conflicts arising from these firms' asymmetries [38] and lead to a more coherent, yet highly value added, ecosystem of devices, applications and more.

C. Future research

In conclusion, developing a user-centric view of mobility that simultaneously takes into account users and devices is useful to understand how mobility and business models that underpin it may deliver more value for specialized applications like the Physical Internet [39].

Thus, a user-centric perspective in coming research will be paramount to finding new ways of harnessing important contemporary trends such as 1) Bring Your Own Devices (BYOD) [40] to work environments, 2) An increasing pervasiveness of mobility and information combined [41], and 3) challenges brought by the Internet of things [42].

These will force a dramatic rethinking of business models around value creation from intangibles [43] that are focused on user habit "dynamics", i.e., how user habits and preferences change over time. Another relevant dimension will be a careful examination of the interaction between mobility and contents access, especially since a very real possibility of commoditization of "smart" devices may occur. Finally, the interaction of mobility and potentially disruptive technologies like 3D printing and high precision distributed manufacturing may also prove to be a game changer.

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