

# Serving Up from the Internet Melting Pot

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## ABSTRACT

I draw from two studies of home network and internet use in Kenya and the United Kingdom (U.K.) to showcase how bandwidth and economic constraints shape internet usage patterns and perceptions. I suggest that increasing visibility of these constraints can improve internet experiences for within-home browsing and transnational communications.

## Author Keywords

Internet use, transnational, HCI4D, ICT4D

## ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

## General Terms

Human Factors

## INTRODUCTION

In the recent 2010 World Cup Soccer completion held in South Africa, FIFA initially only sold the tickets online and wondered why sales were poor in Africa [4]. Upon realizing that most Africans do not have internet access at home or otherwise, they initiated over-the-counter sales to rectify their original mistake. Such examples highlight how internet use in a limited and sporadic access environment in a relatively bandwidth poor nation such as South Africa is vastly different to surfing the internet in the developed world—where bandwidth seems unlimited and ubiquitous. Rather than there being one universal internet experience, local, geographically bounded constraints affect how we consume and produce online information.

I draw on two studies of internet use in Kenya and the U.K. to point out differences and provide empirical evidence of how localized constraints shape internet use. I argue that serving up from the internet melting pot can yield varying experiences depending on where we are situated geographically. Finally, I suggest that increasing visibility of resource constraints can change how we use the internet—by setting expectations for transnational communications between bandwidth rich and bandwidth

poor countries or by allowing users to adapt their home internet usage patterns around bottlenecks in internet speeds.

## RELATED WORK

Researchers have been studying how people use the internet in both developed and developing settings for decades [6-8,10]. As internet and broadband adoption has increased worldwide, some point out that questions of access to the internet are not the only forces shaping use [3]. Instead, factors such as equipment used for access and even technical skill influence usage patterns. Similarly, I argue that localized constraints bounded by where one is geographically, such as bandwidth and economic forces, also affect internet use, giving rise to so-called “multiple-internets”.

## METHODS

Our two studies of internet use took place in the Kenya and the U.K. Only 8.6% of Kenya’s 41 million population may be described as online compared to 76.4% of 61 million in the U.K. [5]. In both studies, we used semi-structured qualitative interviews for exploring internet usage patterns. In the Kenyan study, we interviewed 12 individuals in technology related fields about their internet use for work and play [11]. These interviews took place at their offices.

In the U.K. study, geared at evaluating a bandwidth monitoring tool, we asked six households about their everyday home internet use [2]. Each household completed a week long internet diary and surveys to indicate their main uses of the internet, in addition to three in-home visits and interviews. Because of the infrastructural, economic and political differences between these two countries, comparing internet use in both places provides insight into how ‘multiple internets’ might exist as local and global forces shape browsing experiences.

## RESULTS

Although our studies take place in the home (U.K.) and the workplace (Kenya), a comparison is warranted because our Kenyan participants mostly did not enjoy the luxury of having internet access at home. Instead, high costs and sporadic internet availability meant that they primarily used the internet at work for both personal and business purposes.

## Lessons from Kenya

In Kenya, internet usage patterns at work followed what we call a *deliberate interaction style*. This style is characterized by offline preparation and maximizing task efficiency while

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online. This stands in contrast to the more unplanned and opportunistic style we observed in high bandwidth settings. Four factors typically contributed to a deliberate interaction style:

*Limited bandwidth* meant overall, our Kenya participants did not have “always-on”, “anytime, anywhere” internet access and browsing opportunities. For instance, even when participants had internet connectivity at work, sometimes the email systems were so unreliable participants resorted to free email services for their work email address. In other cases, limited connectivity even meant that participants shared one Ethernet cable that was connected to the Internet, passing it back and forth when connectivity was needed.

*Costs*: Because of the high cost of access for home internet connections, our participants frequently arrived at work early to use the internet for personal reasons. They were also less likely to work from home for this reason. On occasions where internet access at work was particularly poor, participants visited internet cafés to respond to work emails. In the latter scenario, a deliberate interaction style was necessary in order to minimize overall costs.

*Responsiveness*: Limited connectivity, frequent network drops and a lack of internet access at home put pressure on our participants when they were unable to respond to emails in a timely manner. Untimely responses led participants’ colleagues in more developed countries to form what they felt were unwarranted perceptions of their work ethic. Participants also complained that colleagues in other countries with superior bandwidth connections were not sensitive to the poor connectivity in Kenya. For example, colleagues in the USA and U.K. often sent files that took a long time to download. Such inconsideration frustrated our participants since they mainly used programs that did not allow them to refuse email attachments.

*Security*: Because of crime, participants did not necessarily feel comfortable using expensive mobile phones to access the internet in public places. Also, because of having to resort to internet cafes for work purposes, participants worried about cyber-security and picking up viruses on flash drives used to ferry information between work and these cafes.

These four constraints not only shaped the style in which our participants accessed the internet, they highlighted the tensions inherent in transnational technologies when people in very different settings with varied resources are communicating. An interplay of local constraints and global expectations for communication created transnational impression and identity management angst as workers in less developed settings tried to maintain a professional face despite constrained working conditions. Similar difficulties arise when colleagues are separated by time zones—increasing visibility of resource constraints may likewise help transnational workers mentally make provisions for delays in responses.

## Lessons from the United Kingdom

In contrast to deliberate interaction style we observed in Kenya, participants in the U.K. talked about opportunistic grazing on the internet using mobile and desktop computers. Unlike our Kenyan participants, their interactions were not confined to the workplace but spanned their homes as well as times spent outside of these places, on smart devices such as iPads, blackberries and iPhones. Indeed the rhetoric of plastic time [9] seemed more pervasive largely due to readily available broadband and internet infrastructure.

For our U.K. participants, visibility of *limited bandwidth* information was an issue. However, rather than home internet access being prohibitively expensive, our participants in the U.K. could afford continuous home broadband connections but occasionally experienced frustration with slow speeds relative to the high speeds to which they had become accustomed.

Moreover, as opposed to there being a last-mile bandwidth paucity, in our U.K. sample, bandwidth contention arose for other reasons. Either, there were too many people in the same house using the internet at the same time or, the internet service provider was not providing the speeds promised or, the devices people used were old, and sometimes slow if over-laden with applications. These issues stand in contrast to the Kenyan participants who often had to bring content into their non-Internet enabled home computers via USB flash drives.

In terms of *responsiveness*, for our U.K. participants, browsing and responding to emails at work or home was more a matter of personal preference than an infrastructural or economic constraint. Some participants chose not to work at home. Our participants in the U.K. also had mobile devices that were internet enabled, such as blackberries, again meaning they were likely to respond to email even when not at work or at home.

In terms of *costs*, participants in the U.K. were more concerned with whether they were getting the speeds that they were paying for from their providers. Overall, this availability meant that internet browsing experiences tended to include more unplanned and opportunistic browsing as opposed to being solely deliberate. Finally, *security* issues did not seem as prominent with our UK participants using their mobile devices comfortably in many settings.

In sum, in the UK sample, our participants had more opportunities to access the internet, and were less deliberate overall about their use. However, they still experienced internet speed bottlenecks within their homes and desired more visibility into why their connections were slowing down.

## FODDER FOR DISCUSSION

In the Kenyan case study, we observed that transnational workers have difficulties maintaining a professional face because of bandwidth, economic and infrastructural

constraints but desired that their colleagues overseas became more aware of their situation. In the U.K. study, even in an infrastructure rich setting, we noted that participants still desired methods to control their local bandwidth resources for a better internet experience. Rather than speak to one global village, the examples raised here highlight how varied experiences of the internet may be depending on local conditions of access.

Two questions for discussion are:

1. How do we design online and networked systems that allow for workers to maintain their transnational professional face despite bandwidth, economic and infrastructural constraints?
2. How can we make infrastructural constraints more visible for internet users even in developed settings where bandwidth contention can arise?

Design ideas for improving *visibility* of internet constraints vary. One could envision for instance, extending the signature lines displaying information to denote when one is accessing the internet from a mobile device e.g. “Sent from my iPhone”, which sets the context for the often abbreviated nature of a message. Other types of messages might include “Sent from an internet cafe” or “Sent from a flaky internet connection”. Other visible display measures could include frequency of communication or average response times for email. These small interventions may help set expectations for those in higher bandwidth settings of anyone in a more constrained environment.

For home internet users in developed settings, increasing visibility of bandwidth bottlenecks could help users adapt usage patterns to avoid slow-downs e.g. when watching a streaming video or doing work. Showing the source of slow-downs (e.g. the website is slow versus the provider is slow versus my equipment is slow) on individual machines as well as providing a household view of machines could help users plan their online activities around household member habits.

Arguably, increasing visibility of infrastructural constraints could help people prepare for online activities so that they may use their time productively, or unproductively as it may be, depending on the goal of online interaction. Of course, there is a caveat with increasing visibility of access constraints—there are privacy issues around what one chooses to reveal to others and also whether having this information visible leaves room for the social ambiguities of communication (noted by others as making space for stories) [1].

Further, increased visibility may have unintended consequences—the effects of introducing indicators of constraints on internet browsing or communications are unclear. For example, will people change their communication patterns when dealing with recipients in low bandwidth settings by sending less frequent messages or smaller messages that do not have attachments? Or will

those in low bandwidth countries feel less inclined to reply straight away if the understanding is that a delayed response is acceptable. Answering these questions will require conducting further comparisons of internet usage in different environments with these types of visual interventions.

## CONCLUSION

Geographically bounded constraints shape how, when and what people access on the internet. Because of these constraints, rather than one global village, serving up from the internet melting pot may yield many flavors of experience depending on where you are located. I have provided empirical evidence from two different settings highlighting how local constraints, such as bandwidth and costs, shape internet use. I suggest that increasing visibility of these constraints can help workers maintain their professional face in transnational communications and that awareness of internet slow-downs can help households understand how to schedule their online activities accordingly.

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## REFERENCES

1. Aoki, P.M. and Woodruff, A. Making space for stories: ambiguity in the design of personal communication systems. *CHI 2005*, ACM, Portland, Oregon, USA, 2005.
2. Chetty, M., Banks, R., Harper, R., Regan, T., Sellen, A., Gkantsidis, C., Karagiannis, T. and Key, P. Who's Hogging the Bandwidth?: The Consequences of Revealing the Invisible in the Home *CHI 2010*, ACM, Atlanta, GA, USA, 2010.
3. DiMaggio, P. and Hargittai, E., *From the 'Digital Divide' to 'Digital Inequality': Studying Internet Use As Penetration Increases*. Princeton University, Woodrow Wilson School of Public and International Affairs, Center for Arts and Cultural Policy Studies, 2001.
4. <http://news.bbc.co.uk/2/hi/world/africa/10132613.stm>. Fifa admit World Cup sales in Africa 'poor' *BBC News*, 2010.
5. Internet World Statistics. <http://www.internetworldstats.com/stats4.htm>.
6. Kraut, R., Mukhopadhyay, T., Szczypula, J., Kiesler, S. and Scherlis, B., "Information and Communication: Alternative Uses of the Internet in Households," *Information Systems Research* 10, 4 (1999), 287-303.
7. Livingstone, S. and Bovill, M., *Families and the Internet: An observational study of children and young people's internet use*. Final report for BT, 2001.
8. Pew Internet & American Life Project, *Home Broadband Adoption 2009*, 2009.

9. Rattenbury, T., Nafus, D. and Anderson, K. Plastic: a metaphor for integrated technologies *UbiComp 2008*, ACM, Seoul, Korea, 2008.
10. Sambasivan, N., Rangaswamy, N., Cutrell, E. and Nardi, B. UbiComp4D: Infrastructure and Interaction for International Development—the Case of Urban Indian Slums *UbiComp 2009*, ACM, Orlando, Florida, 2009.
11. Wyche, S.P., Smyth, T.N., Chetty, M., Aoki, P.M. and Grinter, R.E. Deliberate Interactions: Characterizing Technology Use In Nairobi, Kenya *CHI 2010*, ACM, Atlanta, GA, USA, 2010.