



# UK Banking Prospects (Underlying Metrics) Fall 2007

# Table of Contents

- Purpose and Methodology
- Ranking Methodology
- Key Performance Factors
  - High Speed Response
  - Response Time Consistency
  - Geographic Uniformity
  - Load Handling
  - Availability
  - Outage Hours





**keynote™**

The Mobile & Internet Performance Authority™

# Purpose and Methodology

# Competitive Research

- In 1996 Keynote published the first Web performance indices which are now considered in the industry to be the 'gold standard' for benchmarking page download and transaction speed and reliability against competitors.
- At the core of these services is the Keynote Transaction Perspective measurement agent, the most accurate and the highest fidelity measurement technology available. **The Keynote Transaction Agent uses the IE 6.0 browser to ensure measurement accuracy.** Just like a user, the agent uses two concurrent threads to fetch page components and allows the use of persistent connections. This browser also handles SSL, JavaScript, Flash, ActiveX, and other interactive languages that can have a significant impact on both performance and availability. Measurement data includes rendering time of all components to ensure that the data gathered represents the complete customer experience.
- Keynote's Service Level Analysts have deep experience in comparative analysis and have performed studies for some of the world's largest financial and retail companies over the last 5 years. **Our team includes statisticians, application tuning experts, and Internet performance analysts.** Together this team has measured and diagnosed the most prominent Web sites providing independent, unbiased assessments.

# Purpose

- **Keynote Service Level Rankings:**
  - Provide an objective comparison of a site's service level, focusing on response time and reliability factors (key components of a user's overall experience that are tied to user satisfaction and site success)
  - Answer questions like:
    - **Which sites offer the quickest transactions (fewest steps, fastest pages)?**
    - **Which sites are the most stable, offering consistent levels of service?**
    - **Which sites offer well-designed Web pages?**
    - **Which sites are the most reliable (fewest outages)?**
  - Are based on quantifiable metrics that site owners can use to improve rankings and overall customer/site experience
  - Create a baseline for the industry and a way to systematically track that baseline (this study will be done bi-annually)
  - Provide insight into which sites are doing well and identify industry-wide areas for improvement
  - Help site owners set appropriate goals for their specific industry
  - Help industry analysts keep abreast of the ever-changing technology underlying the industry

# Sites Profiled

- Halifax
- RBS
- NatWest
- Lloyds TSB
- The Co-op Bank
- Barclays

# Transactions Compared

- **Keynote compared the process of finding and applying for a checking account online**
  - Each measured transaction began at the site's Home Page and ended within the application where the user is asked for their name/address
  - The number of pages (or clicks) included in each transaction varies between sites as each has a unique navigational path



**Home Page**



**Account List**



**Account Details**



**Application**

# Methodology

## 1. Investigation

- Which sites are the largest in their industry?
- Which transactions are most commonly performed on these sites?



## 2. Deployment

- Transactions are defined across all sites
- For each transaction to be tracked, a script is created for each site to step through the appropriate pages for that site
- Transactions are deployed to the Keynote agents for measurement



## 3. Data Collection

- Data is collected over a one-month period



## 4. Analysis

- Data sample undergoes statistical analysis
- Sites are investigated individually
- Industry trends are noted



## 5. Rankings

- Rankings are created and presented
- Best sites are named



# Measurement Agents

- London BT
- London Level3
- London PSI
- London Verizon

# Data Collection

- **More than 2500 total samples were collected for each site**
- Data was collected from **August 8th, 2007 – September 4th, 2007**
- The transaction was run against each site every hour throughout the day from each of Keynote's agents.
- For many of the metrics presented a peak period was used. This period was defined as daily **8 am to Midnight GMT**. Using a peak period was especially important when calculating reliability as many sites have planned maintenance over the weekends that would negatively impact their ranking

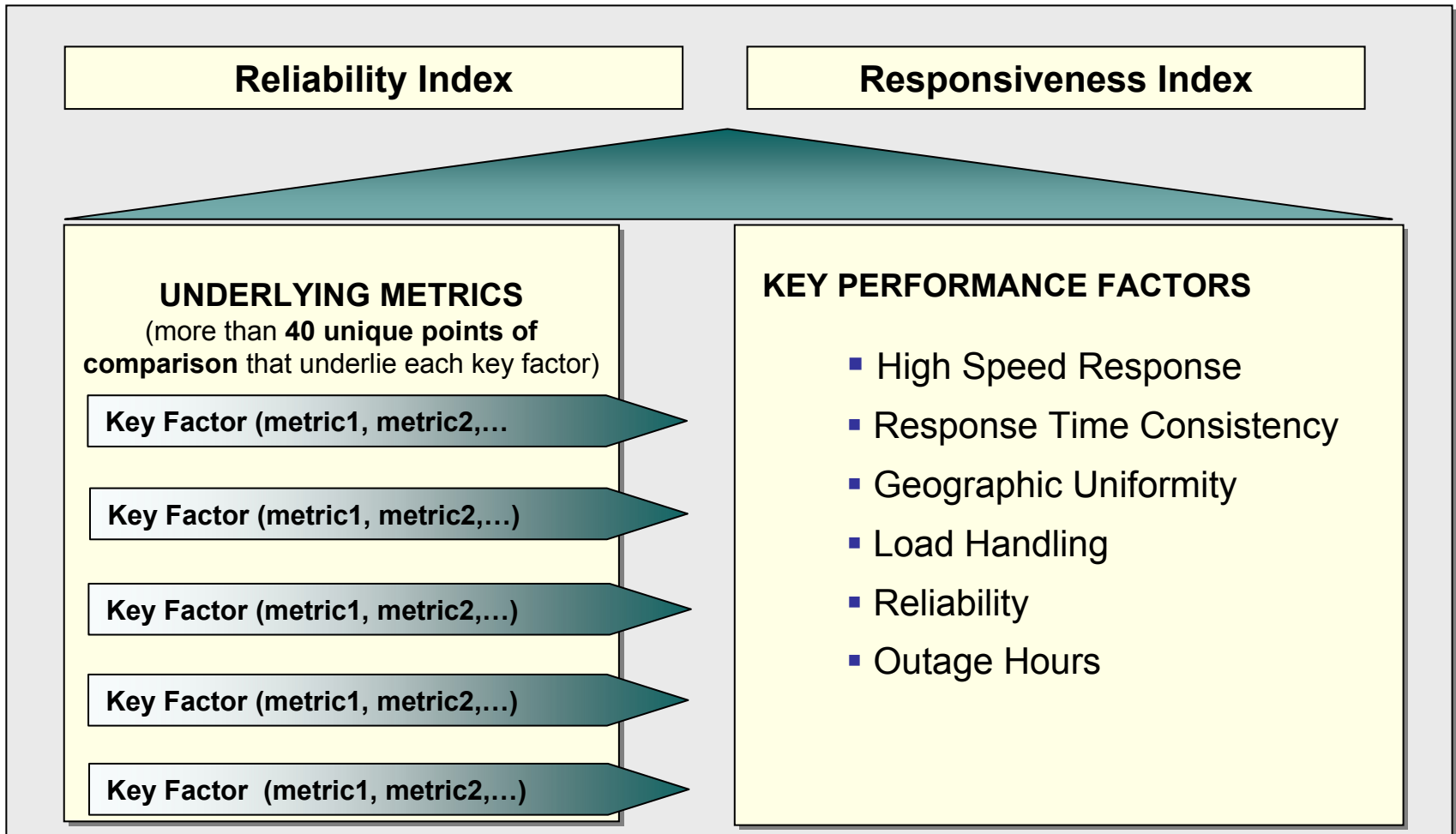


**keynote™**

The Mobile & Internet Performance Authority™

# Ranking Methodology

# Ranking Methodology



## Ranking Methodology (cont.)

- Rather than simply comparing the site's overall response time and reliability, Keynote chose to rank a number of key areas of each site's performance. This methodology takes a more detailed view of each of the sites' service levels and rewards and penalizes the sites in a more consistent manner.
  - 6 key performance factors were identified. Keynote believes these factors describe a site's overall service level. A site's overall performance score and ranking is based on a combination of these 6 factors. The factors are:
    - **High Speed Response** – How quickly do the transaction and portions of the transaction (individual pages) load when measured from a T1 connection?
    - **Response Time Consistency** – Does the site minimize its response time variation?
    - **Geographic Uniformity** – How well does a site service all portions of the US Internet market?
    - **Load Handling** – Does the site regularly slow down during peak periods?
    - **Availability** – How often do users on the site receive errors?
    - **Outage Hours** – How many hours is the site effectively unavailable during the measurement period?

## Ranking Methodology (cont.)

- **Within each key factor, Keynote identified several underlying metrics. These metrics comprise the final standing in each key area. For example, within the High Speed Response factor seven underlying metrics were used:**
- - Overall Transaction Response Time
  - Average Page Download Time
  - Home Page Download Time
  - Account List Download Time
  - Account Details Download Time
  - Application Process Response Time
  - Average Application Page Download Time



**keynote™**

The Mobile & Internet Performance Authority™

## Overall Results

# Responsiveness Ranking

Site	Score	Rank
Halifax	906	1
RBS	853	2
NatWest	796	3
Lloyds TSB	727	4
The Co-op Bank	551	5
Barclays	115	6

# Reliability Ranking

Site	Score	Rank
The Co-op Bank	1000	1
Halifax	987	2
Lloyds TSB	986	3
Barclays	838	4
RBS	420	5
NatWest	250	6

# Key Factors

High Speed Response	Response Time Consistency	Geography Uniformity	Load Handling	Availability	Outages
Halifax	Lloyds TSB	Barclays	Lloyds TSB	The Co-op Bank	The Co-op Bank
RBS	Halifax	Lloyds TSB	NatWest	Halifax	Halifax
NatWest	RBS	NatWest	The Co-op Bank	Lloyds TSB	Lloyds TSB
Lloyds TSB	The Co-op Bank	Halifax	Halifax	Barclays	Barclays
The Co-op Bank	NatWest	RBS	RBS	RBS	RBS
Barclays	Barclays	The Co-op Bank	Barclays	NatWest	NatWest



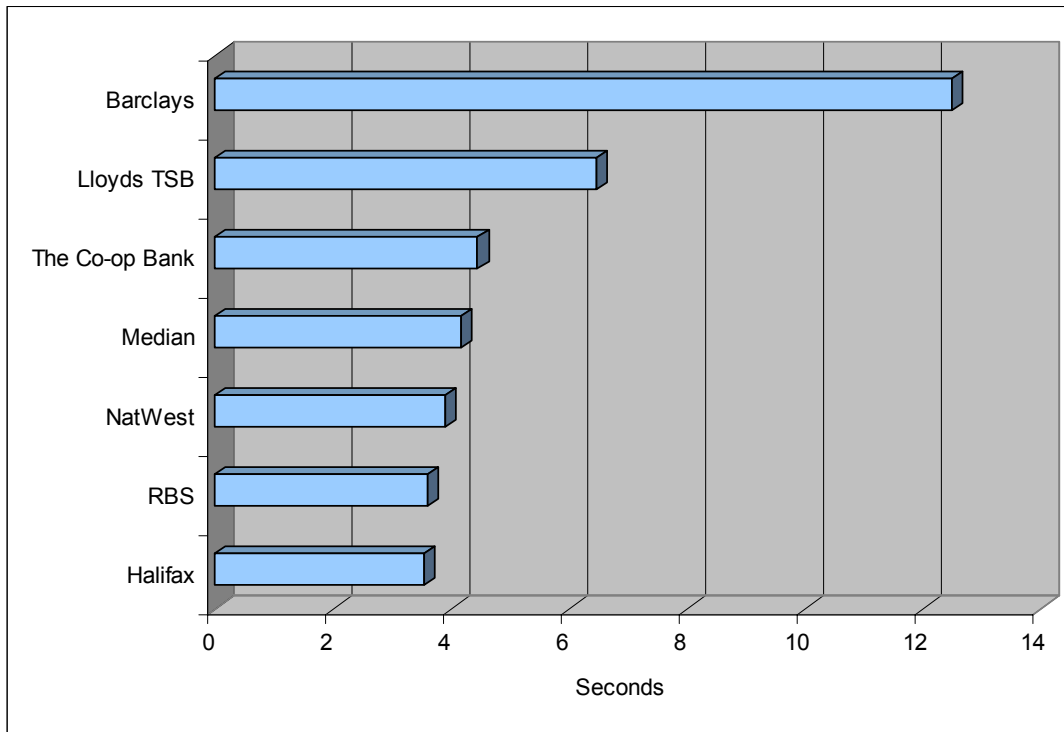
**keynote™**

The Mobile & Internet Performance Authority™

# High Speed Response

# High Speed Response

## Overall Transaction Response Time



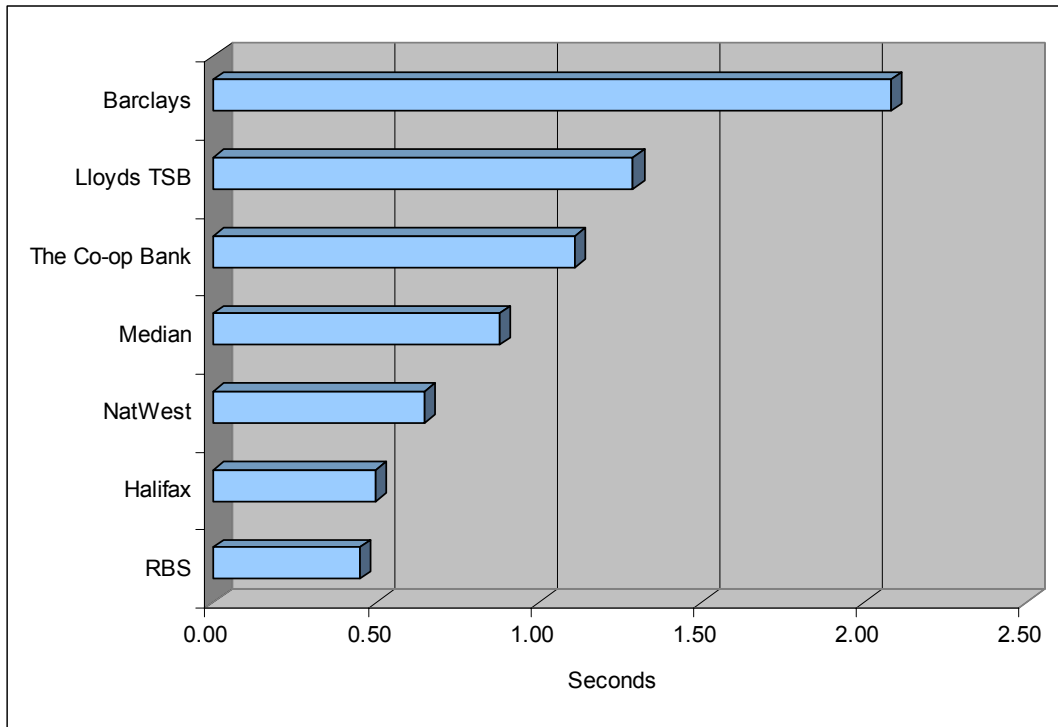
■ Geometric mean of total transaction response times as seen from Keynote agents

- How long does it take to perform the entire transaction?
- Barclays reported the longest transaction execution time at 12.5 seconds
- Halifax was the fastest site, executing the transaction in 3.5 seconds
- The industry average was 4.2 seconds
- Note: “industry average” = median



# High Speed Response

## ■ Average Page Download Time



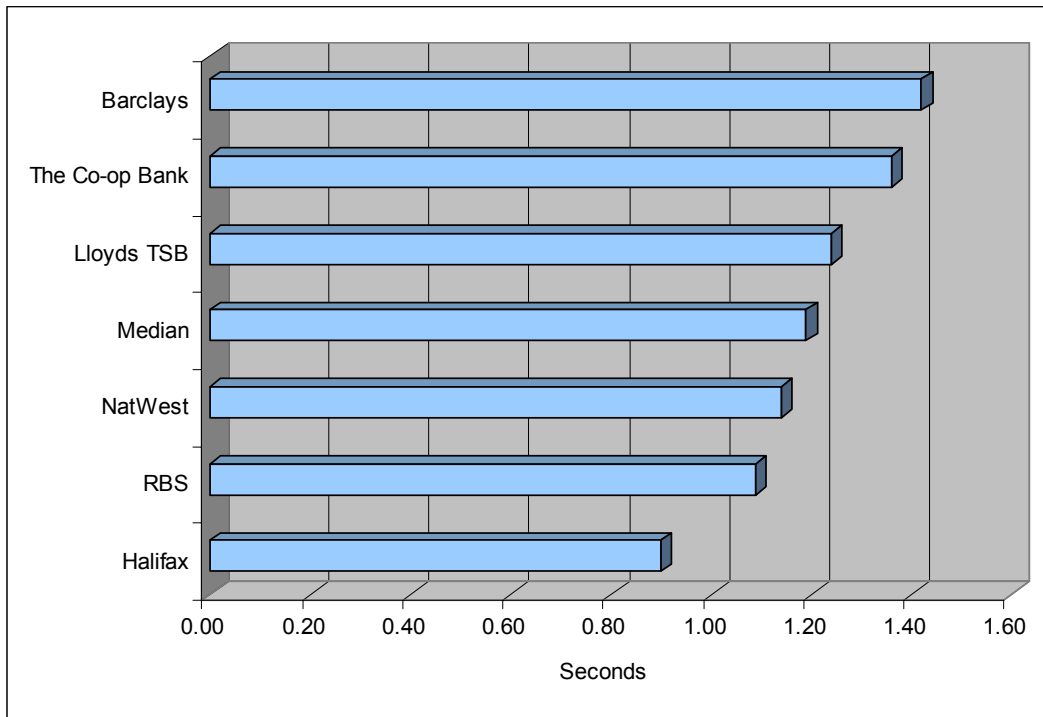
- Geometric mean of page download time as seen from Keynote agents

- What is the average performance of the pages within the transaction?
- Each site has a different number of pages in the transaction. Rather than penalize a transaction with a longer transaction, the average page performance rank normalizes for transaction length
- The industry average was 0.88 second, with RBS reporting the fastest average download time at 0.45 second



# High Speed Response

## ■ Average Home Page Download Time



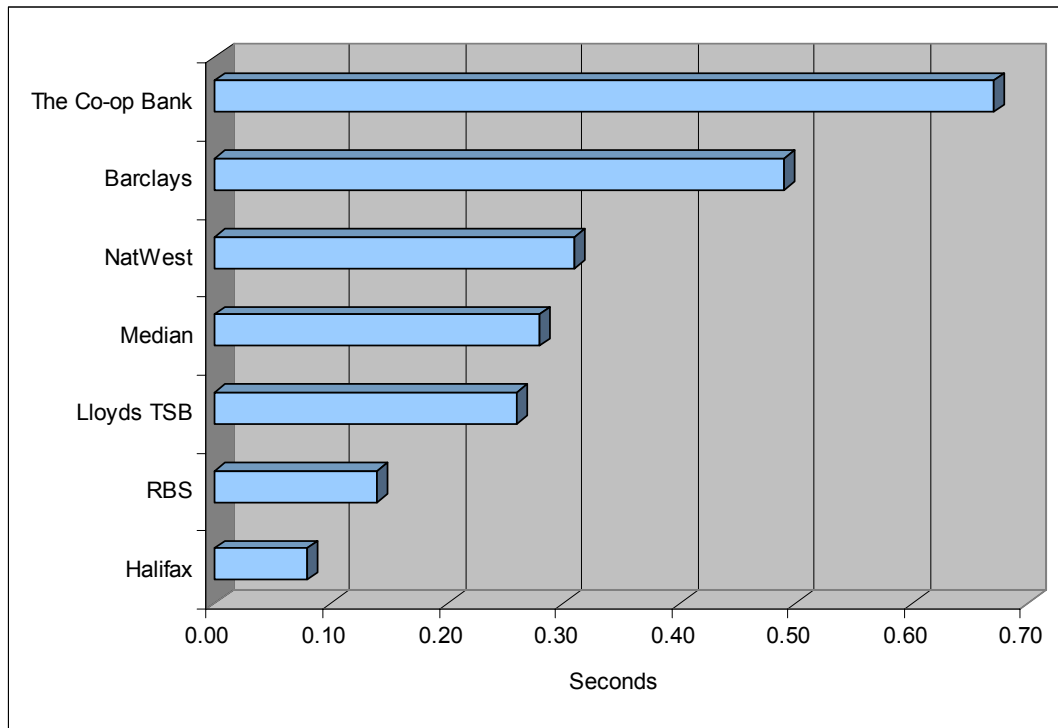
- Geometric mean of page download time as seen from the Keynote agents

- How long does my Home Page take to download?
- The performance of a Home Page sets the expectation for every other page in the site. Keynote recommends that this page be the fastest of any page in the site
- Halifax had the fastest Home Page download at under 1 second
- Barclays had the slowest Home Page download, loading in 1.4 seconds



# High Speed Response

## ■ Average Account List Download Time



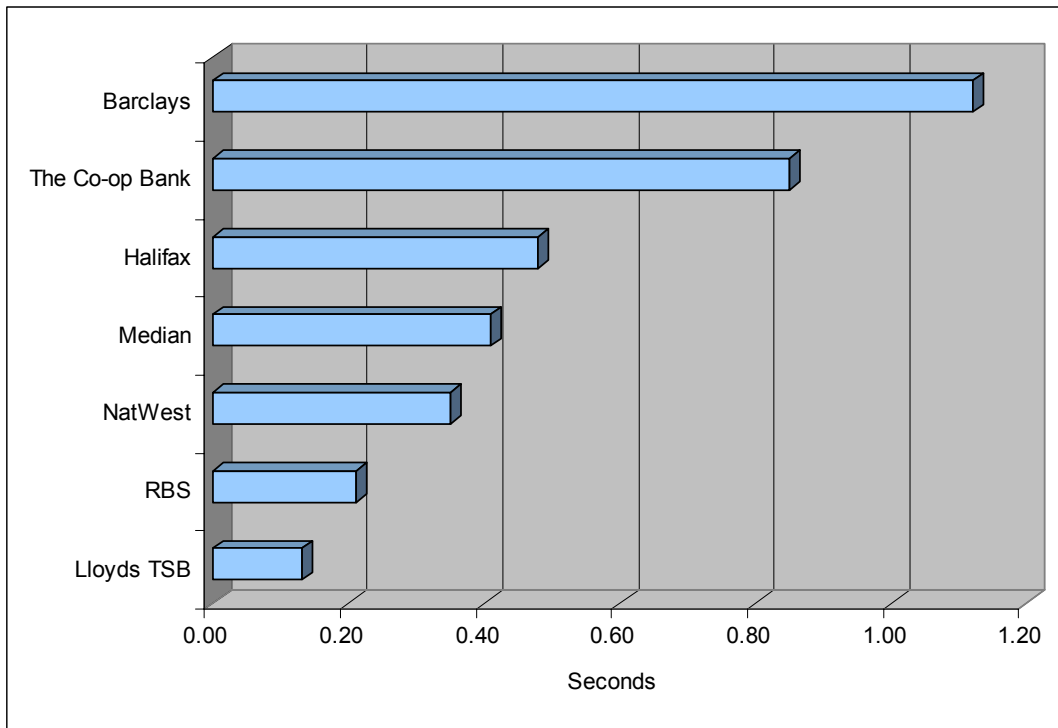
- Geometric mean of page download time as seen from the Keynote agents

- How long does the Account List page take to download?
- The Account List page displays the checking accounts that can be applied for on each site
- The Co-op Bank had the longest Account List download time at about 0.67 second, compared to the industry average of 0.28 second
- Halifax reported the fastest Account List download at close to 0.08 second



# High Speed Response

## ■ Average Account Details Download Time



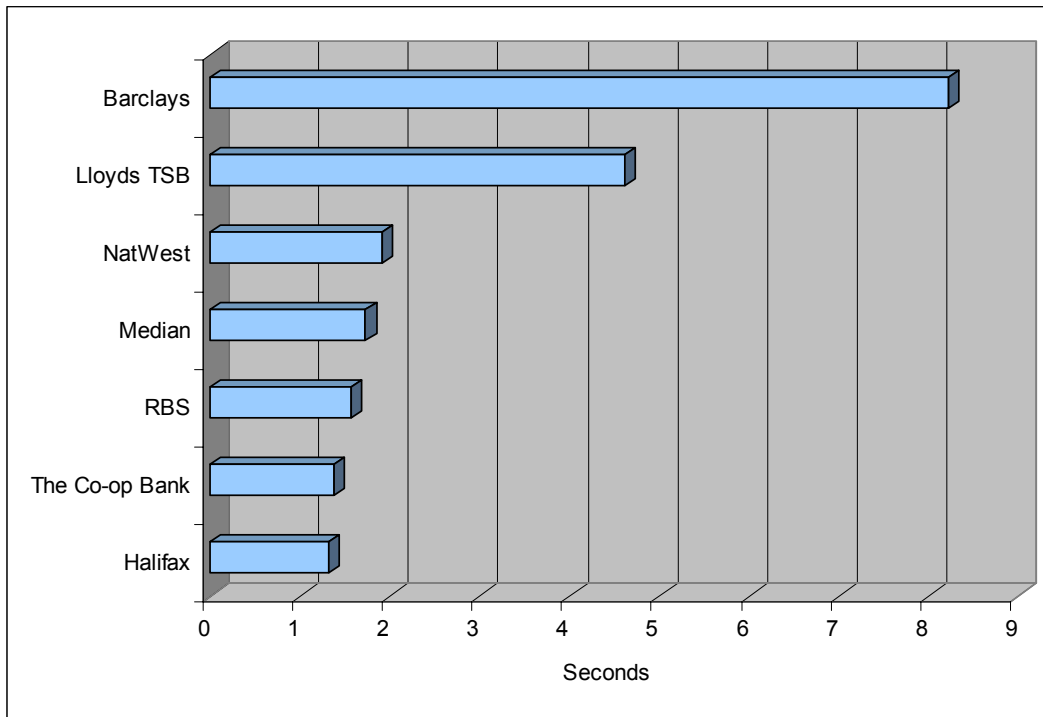
■ Geometric mean of page download time as seen from Keynote agents

- How long does the Account Details page take to download?
- The Account Details page displays the information about the specific account that is being applied for
- Barclays had the longest Account Details download time at about 1.1 seconds, compared to the industry average of 0.41 second
- Lloyds TSB reported the fastest Account Details download at close to 0.13 second



# High Speed Response

## ■ Total Application Response



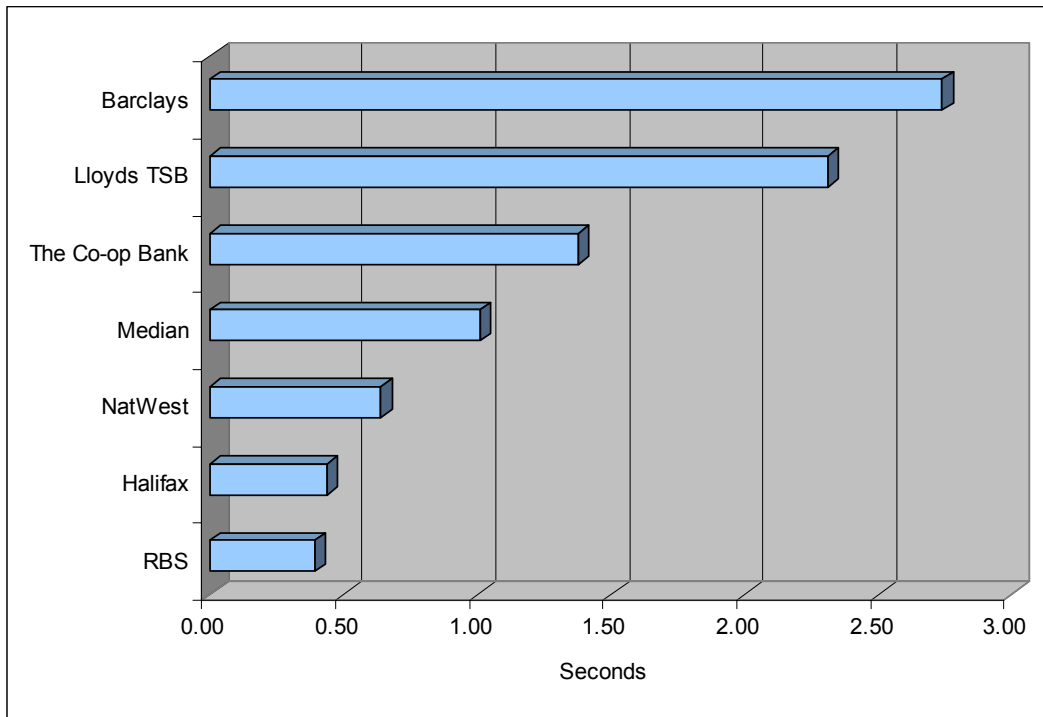
- Computed by summing geometric mean of each of the Application pages within the transaction. An Application page is defined as the page displayed between the Account Details page and the page that asks for the user's name/address.

- How long does the Application process take?
- The Application process captures the time it takes to move through the online Application on the site. This typically includes pages that display terms and information about the application
- Barclays had the longest total Application time at 8.2 seconds while Halifax and The Co-op Bank had the fastest at about 1.3 seconds



# High Speed Response

## ■ Average Application Response



- Average of Application page response times. An Application page is defined as the page displayed between the Account Details page and the page that asks for the user's name/address.

- What is the average Application page performance?
- Normalizing for the number of pages in the Application process, Keynote found that RBS had the fastest average Application time
- The industry average was about 1 second with Barclays reporting the slowest download time of 2.7 seconds





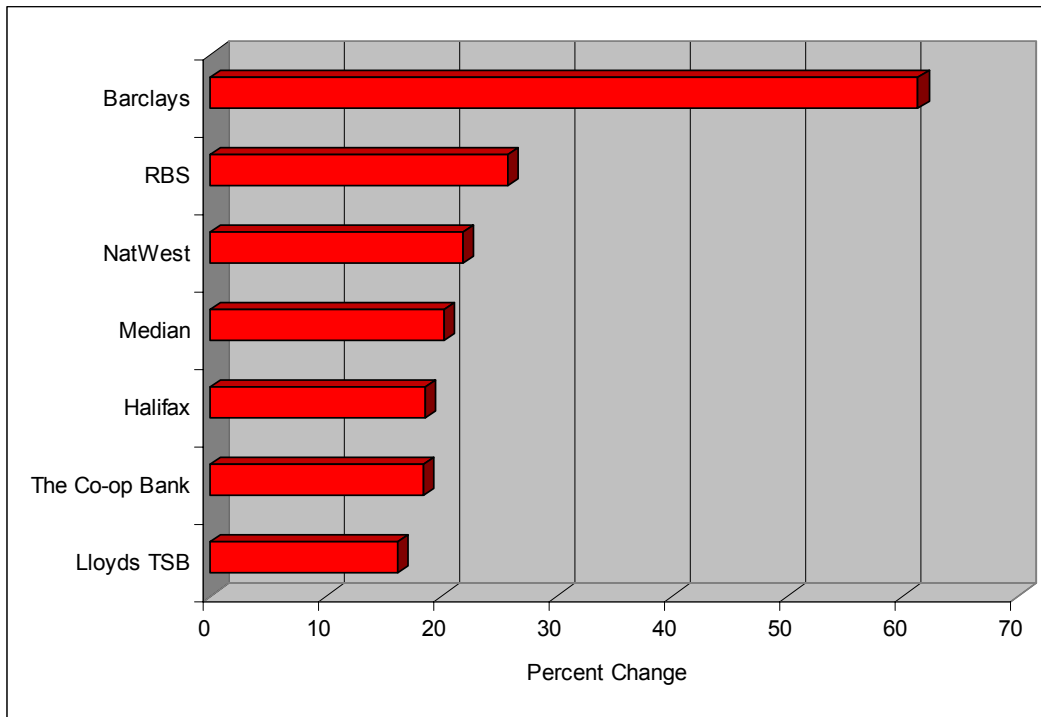
**keynote™**

The Mobile & Internet Performance Authority™

# Response Time Consistency

# Response Time Consistency

## ■ Percentage Change Between 25<sup>th</sup> and 75<sup>th</sup> Percentiles



- Percentage change in overall transaction response between 25<sup>th</sup> and 75<sup>th</sup> percentiles (normalized by 50<sup>th</sup> percentile).
- Formula used:  $100 \times (75^{\text{th}} \text{ percentile} - 25^{\text{th}} \text{ percentile}) / (50^{\text{th}} \text{ percentile})$

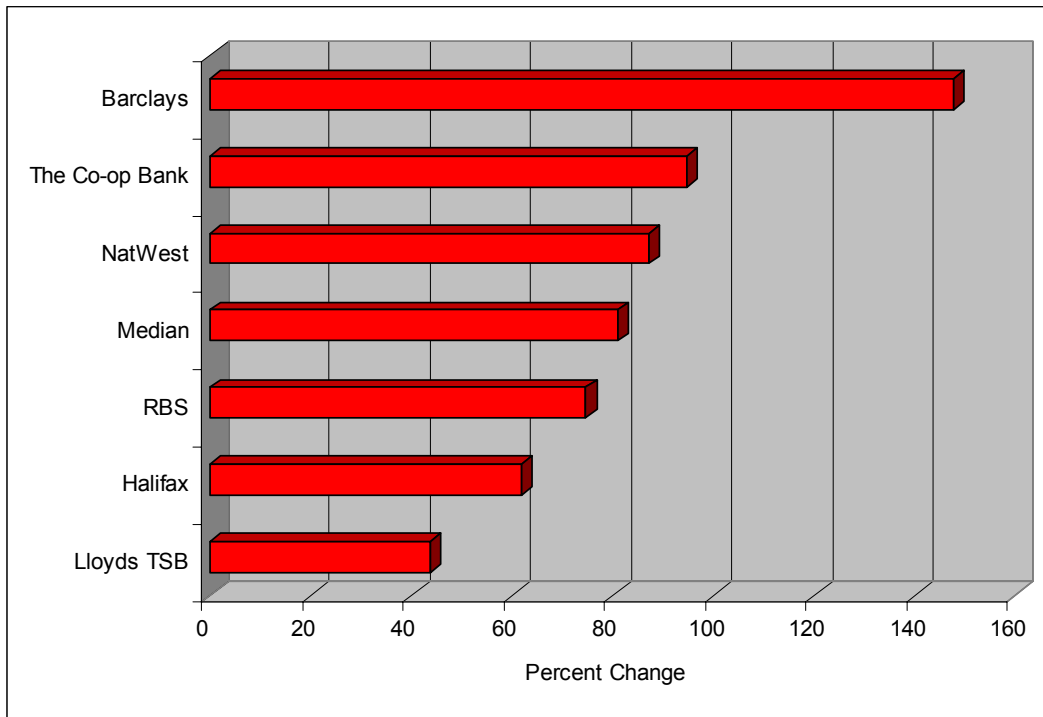
How consistently does each site perform? How much variation was there during the measurement period?

- Consistency is a good indicator of site health and stability
- Barclays reported the greatest amounts of instability, with over a 61% variation between the 25<sup>th</sup> and 75<sup>th</sup> percentiles
- The industry average was 20% with Lloyds TSB reporting only 16% variation between the 25<sup>th</sup> and the 75<sup>th</sup> percentiles



# Response Time Consistency

- Percentage Change Between 10<sup>th</sup> and 90<sup>th</sup> Percentiles

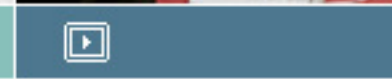
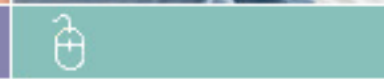


- Percentage change in overall transaction response times between 10<sup>th</sup> and 90<sup>th</sup> percentiles (normalized by 50<sup>th</sup> percentile).
- Formula used:  $100 \times (90^{\text{th}} \text{ percentile} - 10^{\text{th}} \text{ percentile}) / (50^{\text{th}} \text{ percentile})$

How consistently does each site perform?  
How much variation was there during the measurement period?

- All the sites were more variable when looking at the extreme percentiles (which is expected)
- Barclays continued to report the largest instability and Lloyds TSB the least





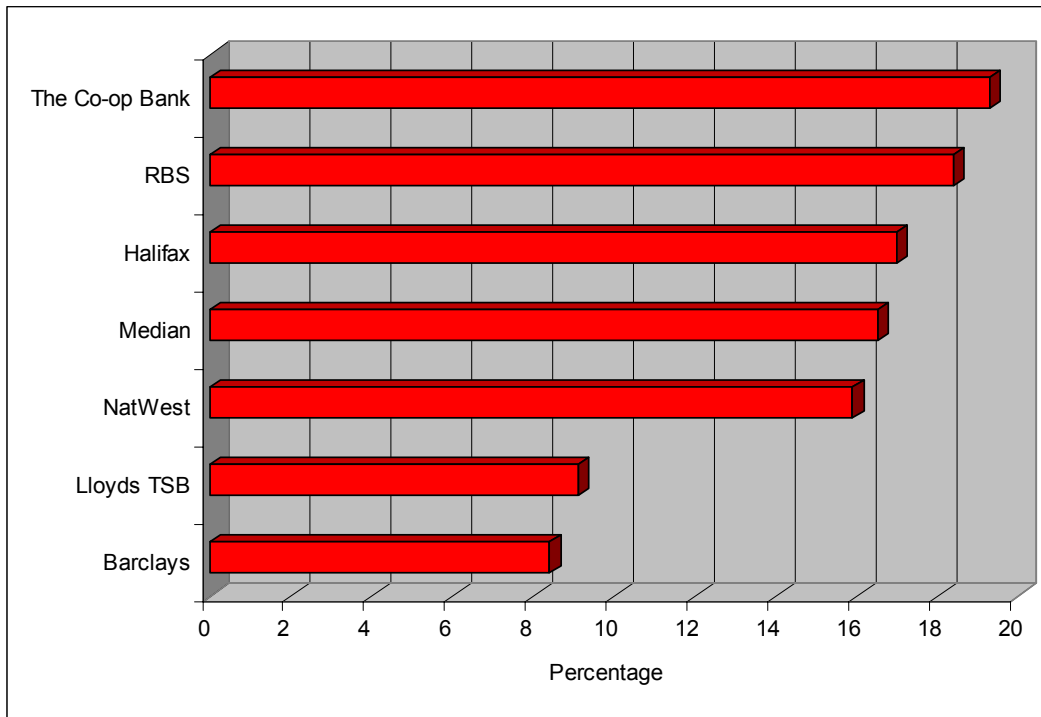
**keynote™**

The Mobile & Internet Performance Authority™

# Geographic Uniformity

# Geographic Uniformity

## ■ Variation Between Agents



- Standardized standard deviation percentage (normalized by average response time).
- Formula used:  $100 \times \text{standard deviation of average response time of four agents} / \text{average response time}$

- How uniform is the site's performance throughout the country and for users on different backbones?

- Ideally a site should provide a very consistent experience to users in all areas of the country and on all major backbones
- Some variation is normal given the nature of the Internet network and that most sites do not have a physical presence in each area of the country
- Barclays and Lloyds TSB showed very little geographic variation





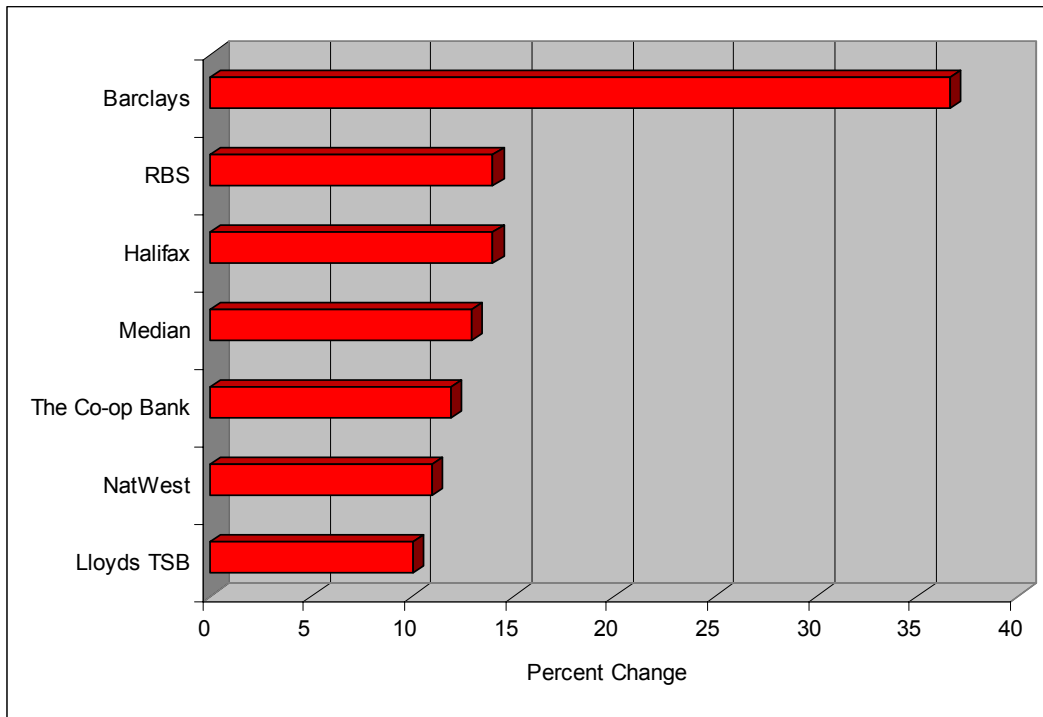
**keynote™**

The Mobile & Internet Performance Authority™

# Load Handling

# Load Handling

## ■ Peak Period Response Time Degradation



- Total percentage change in response time during the peak period. Indicates load sensitivity. Formula used:  $100 \times (\text{Maximum response from just peak period} - \text{Minimum response from entire day}) / (\text{Minimum response from entire day})$
- Keynote had no knowledge of the load patterns or volumes on each of the sites. This rating simply captures the site's ability to service users consistently throughout each day, when user traffic on the Internet is in general higher.

- How does a site handle load?
- Typical Internet traffic peaks mid day, Monday through Friday. A site should be designed to handle daily increases in load without significant performance degradation
- A large peak period degradation indicates an underlying capacity issue or system bottleneck
- Most of the sites showed very little peak period slowdown.





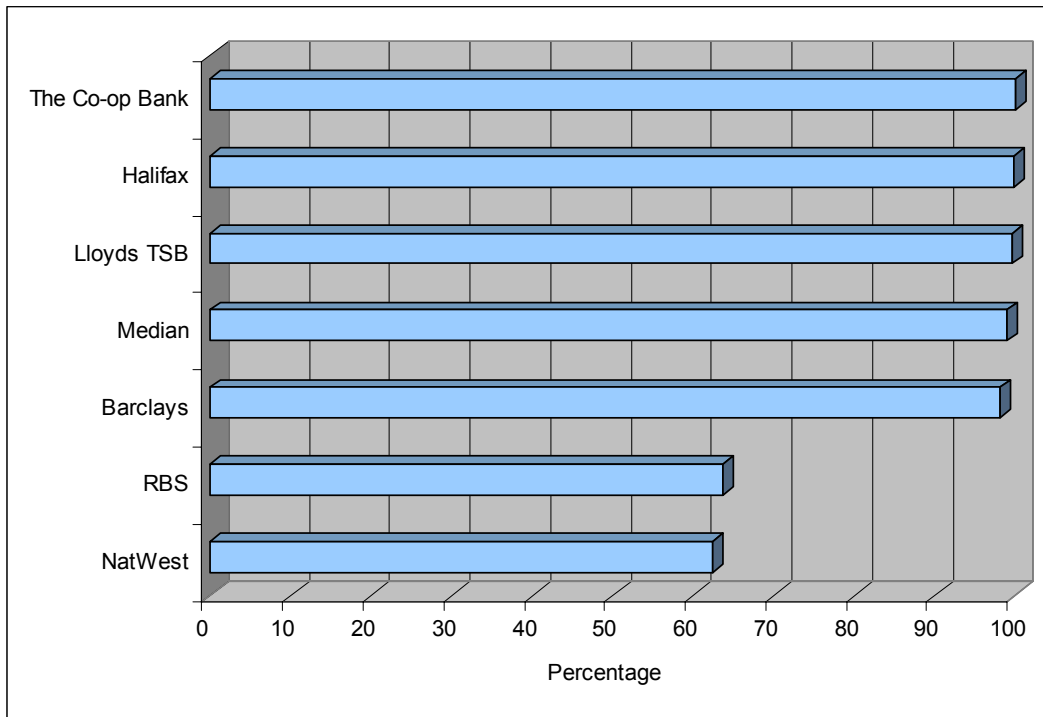
**keynote™**

The Mobile & Internet Performance Authority™

# Availability

# Availability

## ■ Total Transaction Availability (24X7)



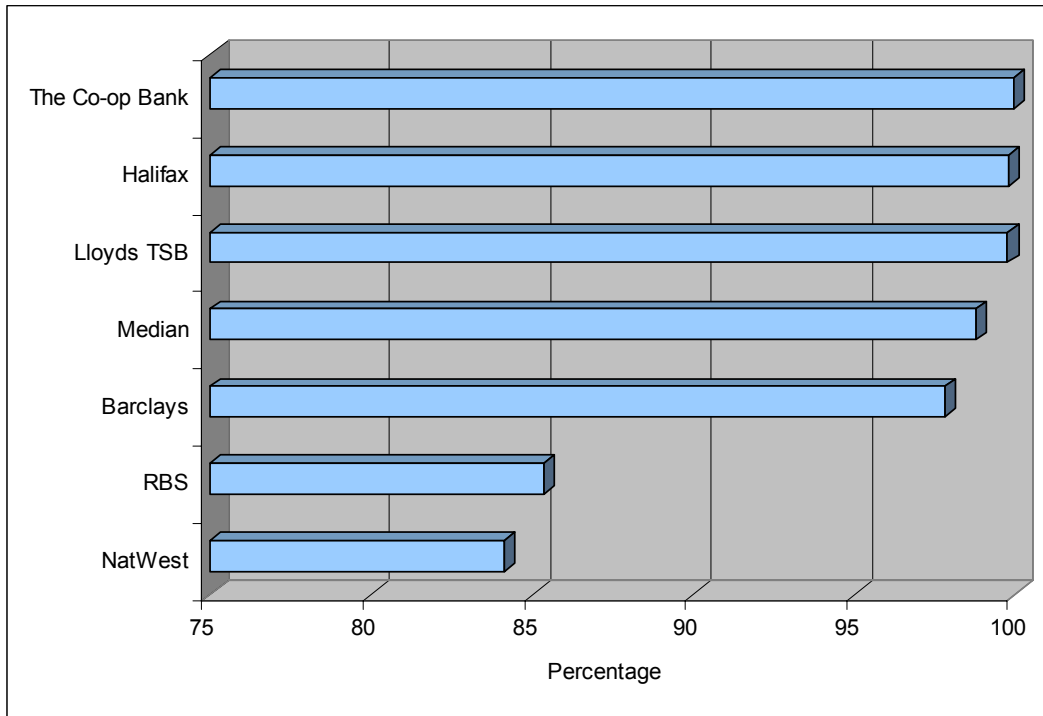
- Availability for the entire measurement period. Does not include content errors.

- How reliable is the transaction at all times?
- The industry average was 98.9% during all hours of the day and all days of the week
- The Co-op Bank reported the best 24X7 availability at 99.9%
- NatWest and RBS both take down their application portion of the site during off peak periods and this caused the high “error” rate on the site



# Availability

- **Total Transaction Availability (Peak)**



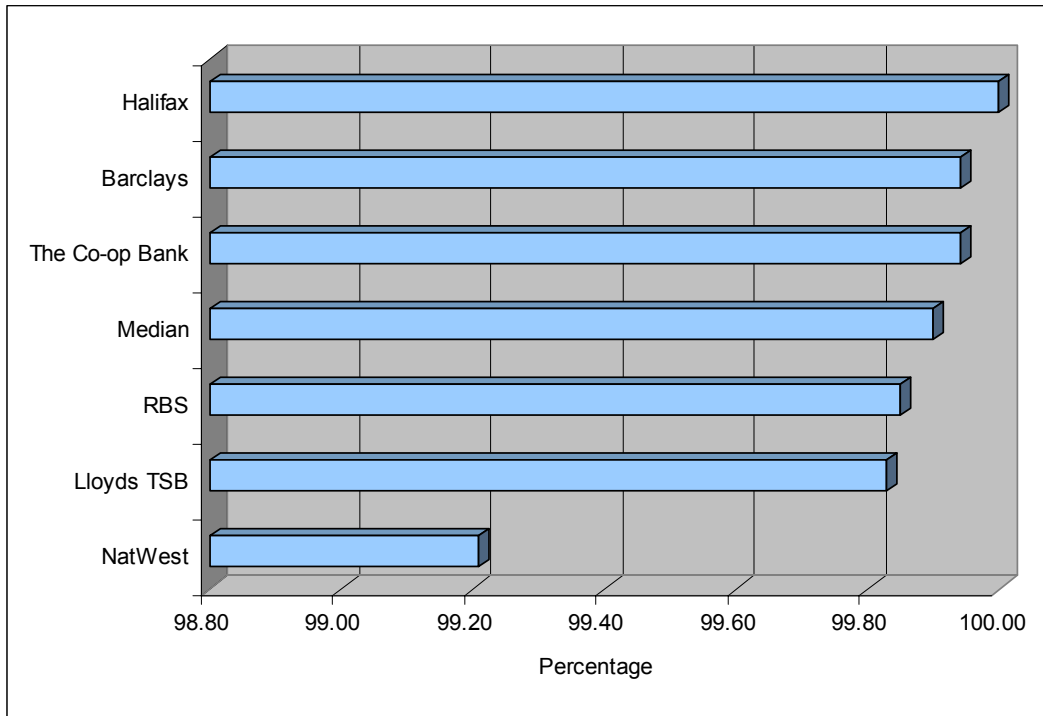
- Availability for the entire measurement period. Taken during the peak period (Every Day 8am–Midnight EST). Does not include content errors.

- **How reliable is the transaction during the peak period?**
- The industry average during the peak period was 98.8%
- The Co-op Bank reported 99.9% average availability during the peak period



# Availability

- Home Page Availability (Peak)



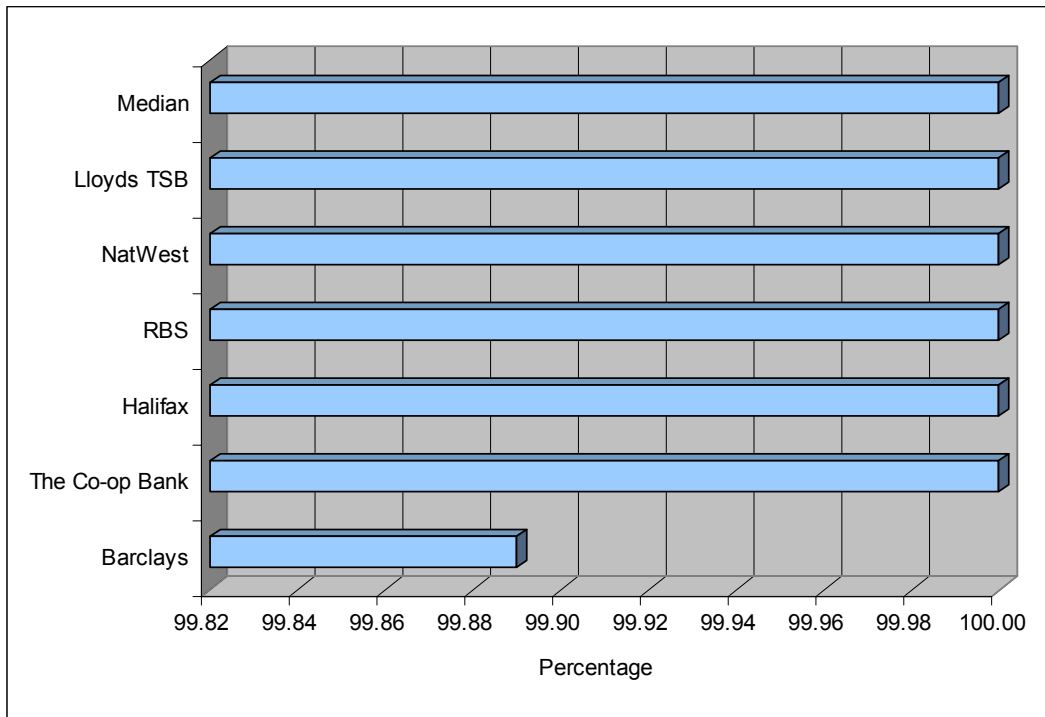
- Availability for the entire measurement period. Taken during the peak period (Monday–Sunday 8am–Midnight EST). Does not include content errors.

- How reliable is the Home Page?
- All of the sites had very reliable Home Pages



# Availability

- **Account List Page Availability (Peak)**



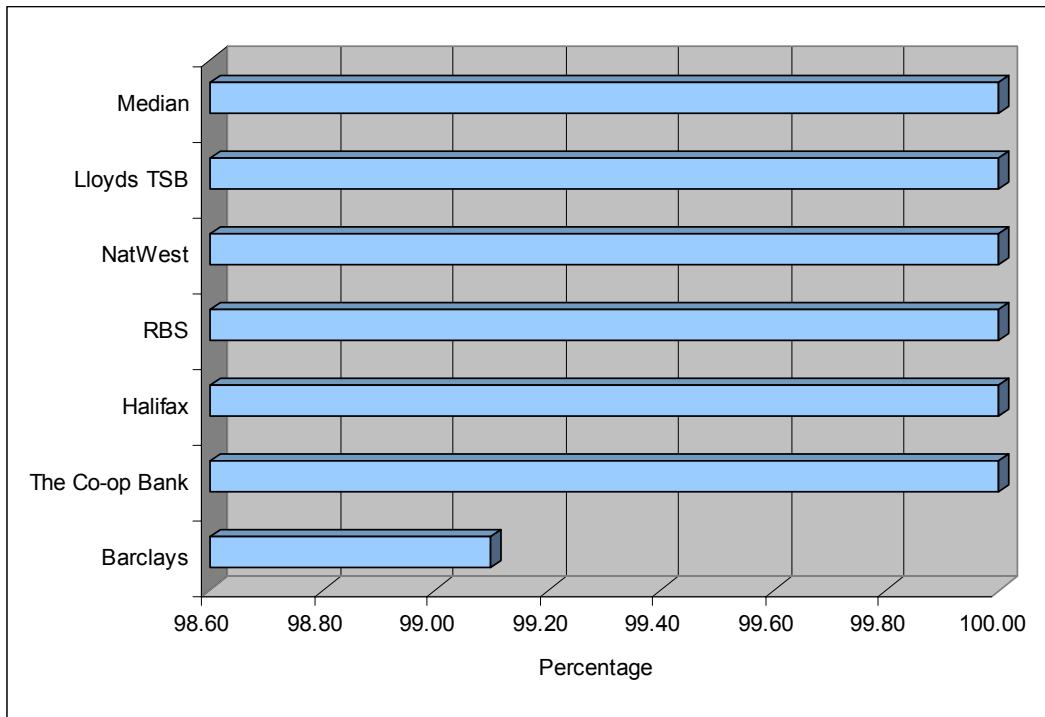
- Availability for the entire measurement period. Taken during the peak period (Monday–Sunday 8am–Midnight EST). Does not include content errors.

- How reliable is the Account List page?
- All of the sites with the exception of Barclays reported 100% average availability



# Availability

- **Account Details Page Availability (Peak)**



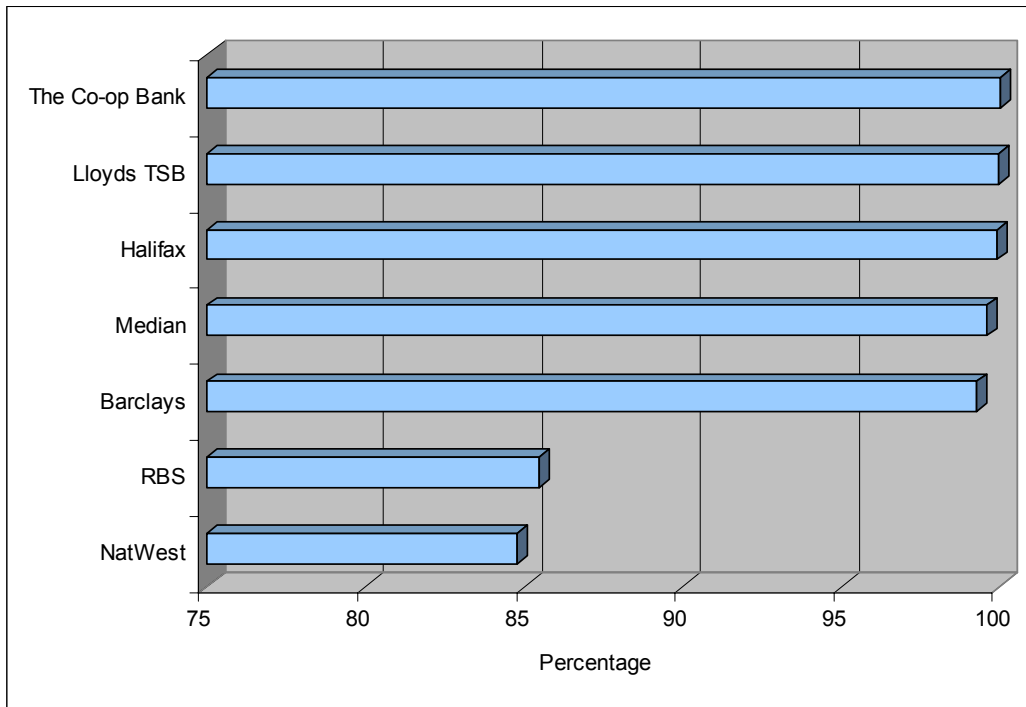
- Availability for the entire measurement period. Taken during the peak period (Monday–Sunday 8am–Midnight EST). Does not include content errors.

- **How reliable is the Account Details page?**
  
- All of the sites with the exception of Barclays reported 100% average availability



# Availability

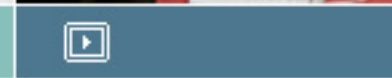
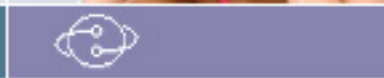
## ■ Application Availability (Peak)



- Availability for the entire measurement period. Taken during the peak period (Monday–Sunday 8am–Midnight EST). Does not include content errors.

- How reliable is the Application Process?
- The Co-op Bank had the most reliable Application process, reporting 100% average availability
- Natwest and RBS had the least reliable Application process, reporting about 85% average availability.
- The industry average for this metric was 99.6%





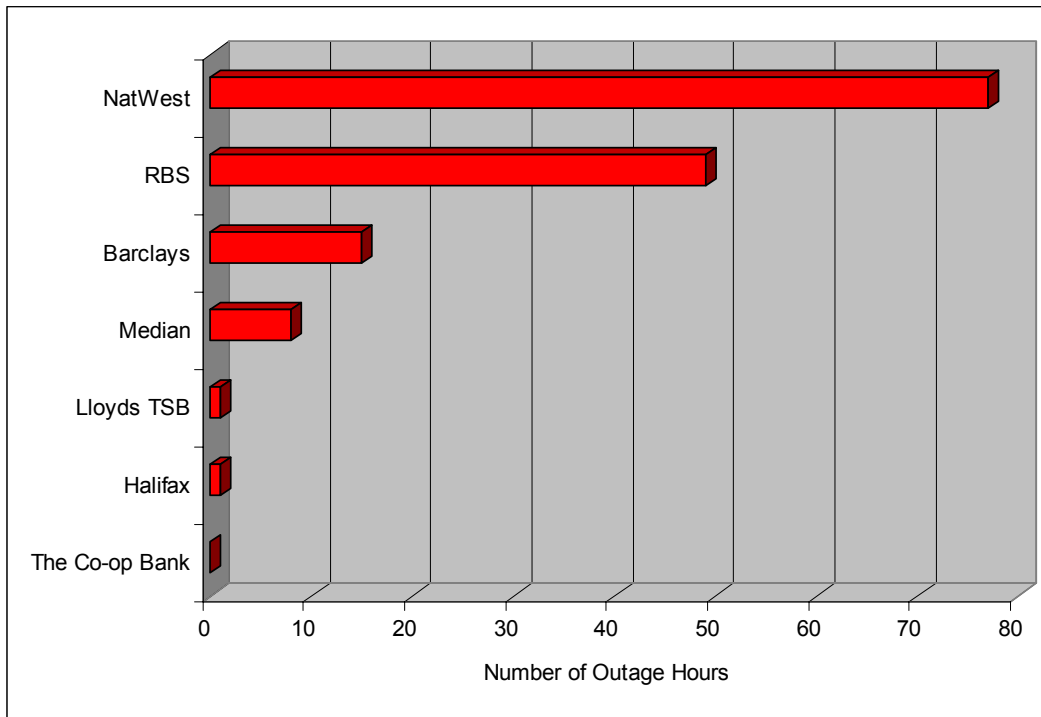
**keynote™**

The Mobile & Internet Performance Authority™

# Outage Hours

# Outage Hours

- **Outage Hours**



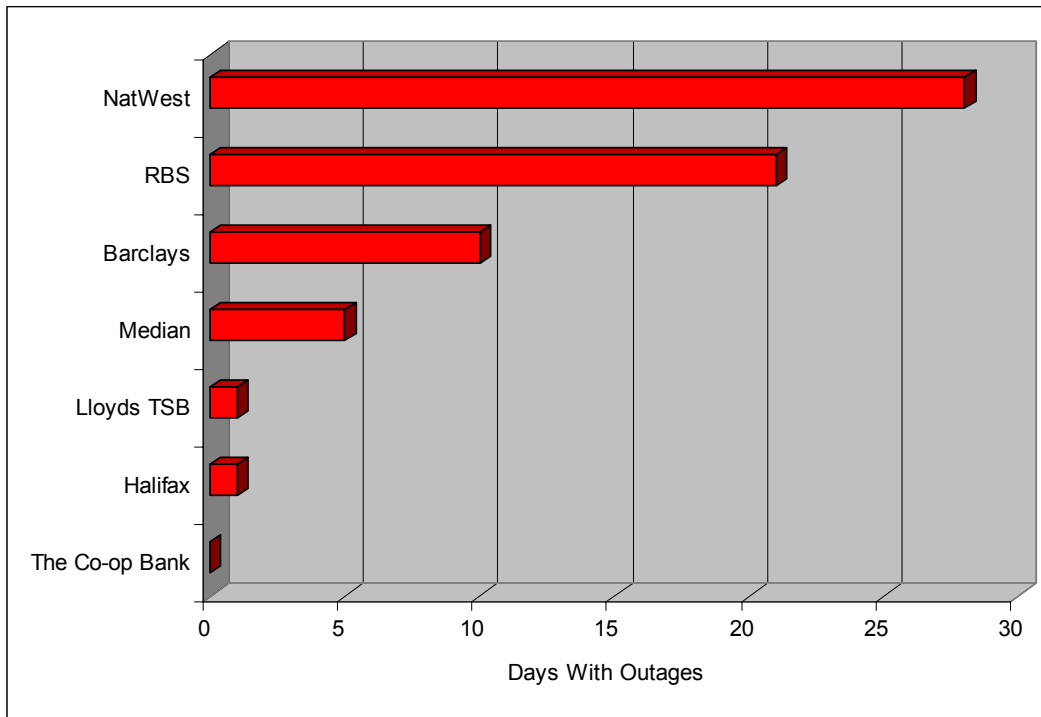
- Outage hours is defined as any hour in which the site reported greater than a 30% error rate. Only calculated for the peak period (Every day 8am–Midnight EST).

- How many hours did the sites have outages?
- The industry average for this metric was 8 hours of outage during peak hours
- Natwest reported the most hours of outage with 77, while The Co-op Bank reported not a single hour of outage



# Days With Outages

- Days with Outage Hours



- A day that has one or more than one outage hour is defined as an outage day. The outage day percentage is normalized by the total number of peak days (Monday through Sunday).

- How many days did the sites have outages?
- All of the sites, with the exception of The Co-op Bank, reported at least one day with outage.
- NatWest and RBS had the most days with outage, reporting 28 and 21 days respectively

