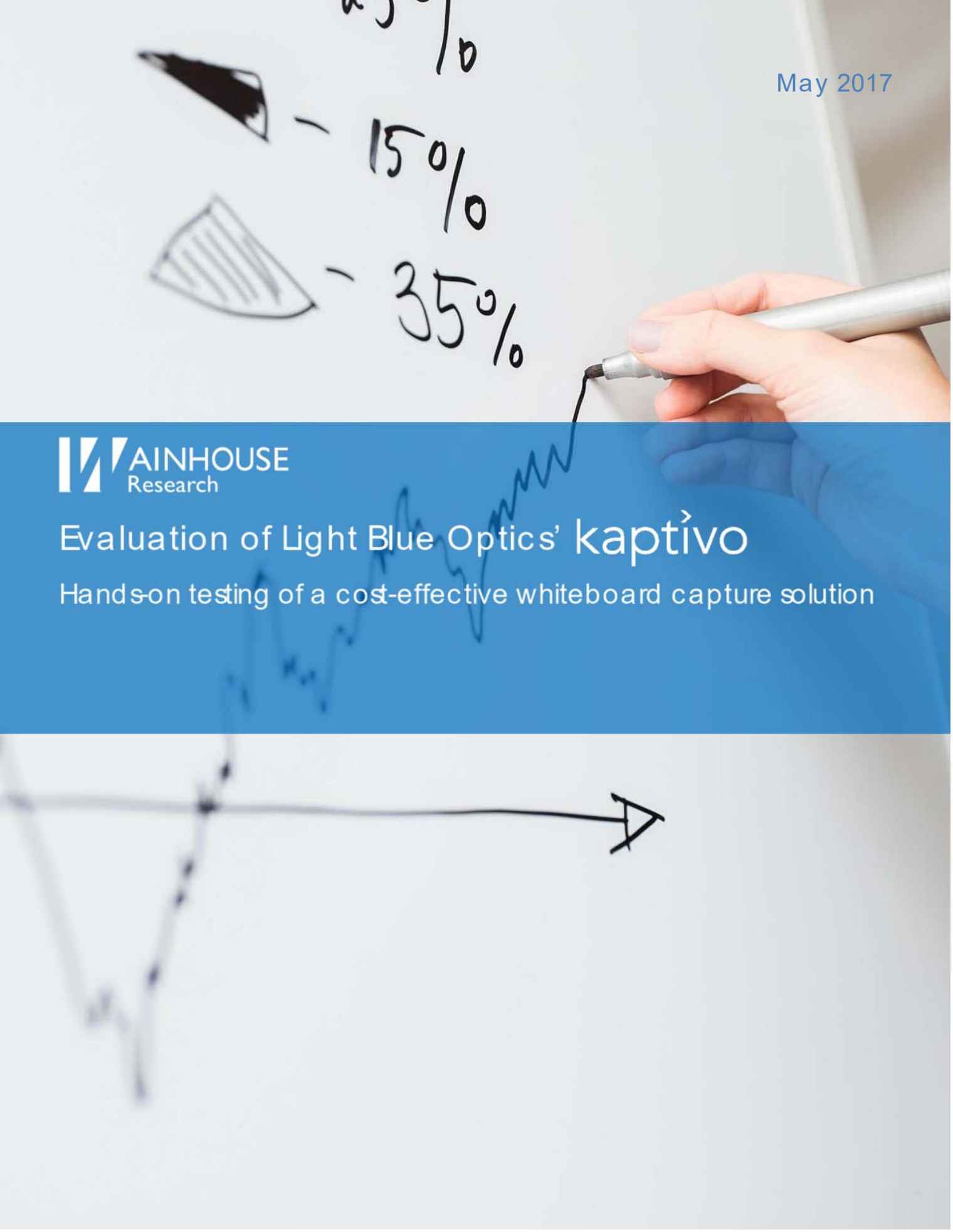


May 2017

MAINHOUSE Research

Evaluation of Light Blue Optics' kaptivo

Hands-on testing of a cost-effective whiteboard capture solution

Background

Founded in 2004 and with offices in Cambridge, UK, and San Mateo, CA, Light Blue Optics (LBO) is a developer of collaboration solutions and tools for corporate meeting rooms, and the training and education markets.

In December 2016, LBO announced and started shipping its newest product – Kaptivo, a camera unit that mounts above a standard whiteboard, captures the content on the whiteboard, and makes that content available to remote users.

In May 2017, LBO commissioned Wainhouse Research (WR) to provide a third-party assessment of its Kaptivo product. To facilitate this effort, LBO provided WR with a complete Kaptivo unit.

This document contains the results of our hand-on testing of Kaptivo.

Understanding Kaptivo

Kaptivo is a low cost (MSRP of $399) accessory that captures and digitizes any content (words, drawings, etc.) created using standard dry-erase markers on a standard whiteboard (or any flat white surface for that matter), and makes that content available to local and remote users within a standard web browser.

Available for purchase directly from the company's website or via numerous e-tailers (e.g. Amazon, Staples), a complete Kaptivo package includes the following:

- Kaptivo main unit (includes embedded camera at tip of the main unit's arm)
- Control pad (with start / stop session button)
- USB and power cables
- Wall mounting plates and screws

The Kaptivo main unit is designed to be wall-mounted above a standard (or glass) dry-erase board with a maximum size of 6' x 4'. The shape of the main unit (see image above) positions the camera ~18 inches from the whiteboard surface. This arrangement provides the Kaptivo camera with a clean view of the writing surface.

The Kaptivo solution uses the customer's Wi-Fi network to connect to and send captured whiteboard content to the Kaptivo cloud. To view the captured content, users simply browse to the Kaptivo cloud and enter the ID of the host Kaptivo unit. It's just that simple

Hands-On Testing

System Physical Installation

We installed our Kaptivo in our test lab equipped with a glass dry-erase whiteboard measuring 5.5 feet x 3 feet. The physical installation of the Kaptivo system involved the following:

- Installing the camera mounting plate (with 3 screws) centered above our whiteboard
- Sliding the camera unit onto the mounting plate
- Installing the control pad mounting plate (with 4 screws) next to the whiteboard
- Snapping the control pad onto the control pad mounting plate
- Connecting the provided USB cable between the camera unit and the control pad
- Connecting the power supply cable to the control pad

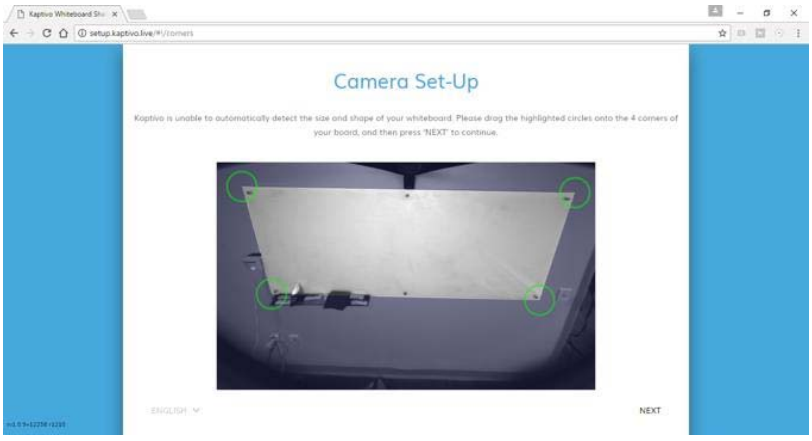
The above process took us less than 15 minutes to complete.

System Configuration

With the physical installation complete, we stepped through the following process to configure the device to work in our environment:

- Connected a wireless device (in this case, our notebook PC) to Kaptivo's Wi-Fi network (during system setup the Kaptivo base unit acts as a wireless access point, and the wireless network SSID includes the Kaptivo unit's unique six-letter ID / pairing code)
- Opened an Internet browser on our notebook PC and browsed to http://setup.kaptivo.live
- Followed the on-screen prompts to …
    - Give our Kaptivo unit a name (e.g. WRLab)
    - Enter camera setup mode (by pressing the flashing blue button on the control pad)
    - Define the corners of our white board for the Kaptivo camera by dragging the four green circles so they align with the corners of the board (see image below showing the glass whiteboard in the WR test lab)

The entire configuration process took us less than five minutes to complete, and we were now ready to use Kaptivo to capture and distribute our whiteboard content.



Using Kaptivo

Perhaps the best thing about the Kaptivo system is that Kaptivo allows people to use the whiteboard as they always have. Pick up a marker and start writing. And that's just what we did.

Author's Note:
WR is aware of, and has tested, some competing solutions that use special pens and sensor arrays to capture whiteboard content. Essentially, these solutions track pen position and pen movement, and use that information to recreate the whiteboard content.

And while functional, these solutions require users to change their behavior by forcing them to use special pens or pen sleeves (adds cost, feels less natural in the user's hand) and activate the capture system BEFORE they start writing. These systems are unaware of any content created before they were activated, so any such content cannot be captured.

Kaptivo works by taking images of the writing surface several times per second. The system then uses advanced computer vision/image analysis algorithms to extract written content and remove shadows, reflections, lighting variations and body parts in front of the board to produce a "digital surface"-like experience. Kaptivo then provides a stream of images that update / refresh in near-real time within a browser. This approach offers two benefits; (1) it allows the use of standard dry-erase markers (low cost, familiar, easy to purchase), and (2) it allows users to activate Kaptivo at any time and capture anything on the board.

For our first test, we walked up to the whiteboard and just started writing (see picture below). The local experience was exactly as you'd expect --- a person writing on a whiteboard. And true to life, some colors and some lines are darker than others.

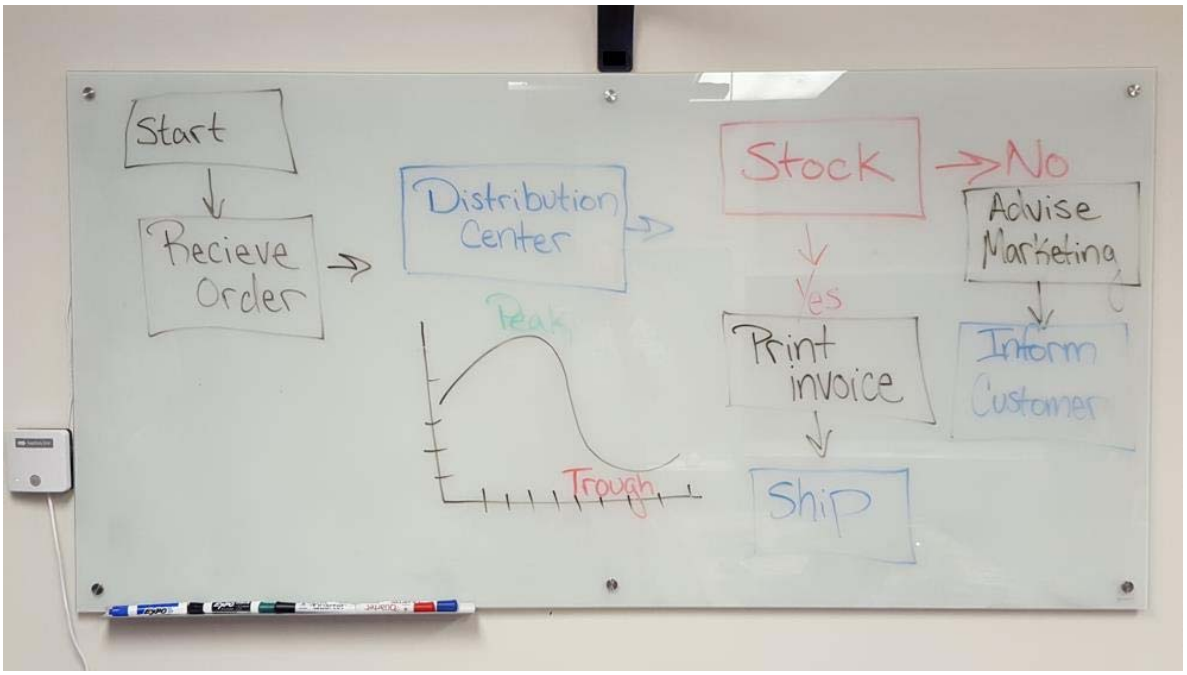


Figure 1: Photo of Glass Whiteboard in the WR Test Lab (note the Kaptivo Control Pad to the left of the board)

Viewing Captured Content

To access the content online, we followed these steps:

- Used a browser to go to https://kaptivo.live
- Entered our name (e.g. Ira Weinstein)
- Entered our Kaptivo's unique pairing code (written on the arm, on the control pad, etc.)
- Clicked the "View Board" button on the web page
- Pressed the "On/Off" button (which at this point was flashing blue) on our Kaptivo control pad

A few seconds later, our whiteboard content was displayed in the browser window (see image below).

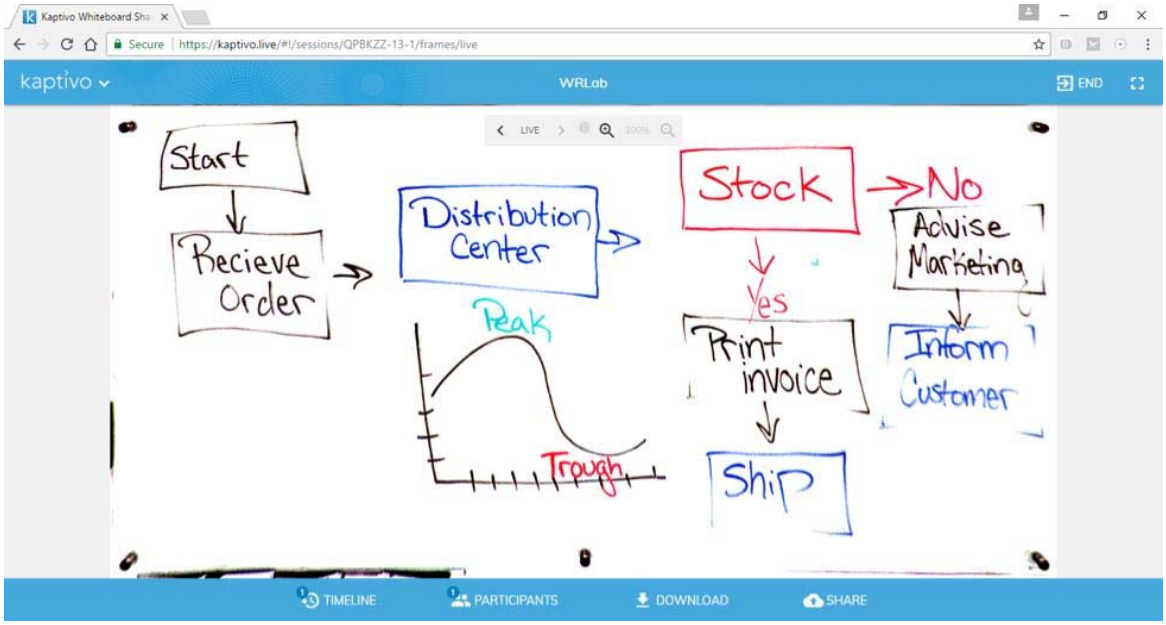


Figure 2: Kaptivo Captured Image of the Same Whiteboard

A side by side view of the in-room photo and the captured content (see below) highlights how effectively the Kaptivo system captured the whiteboard content.

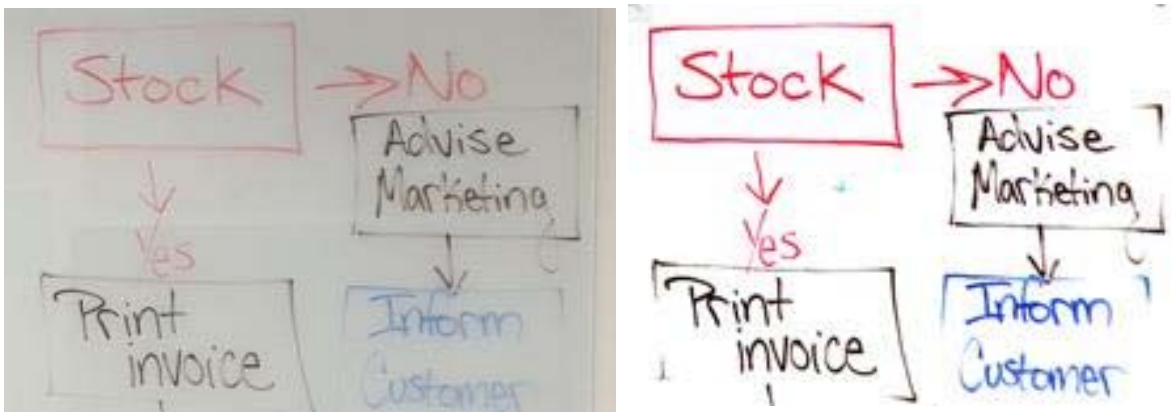


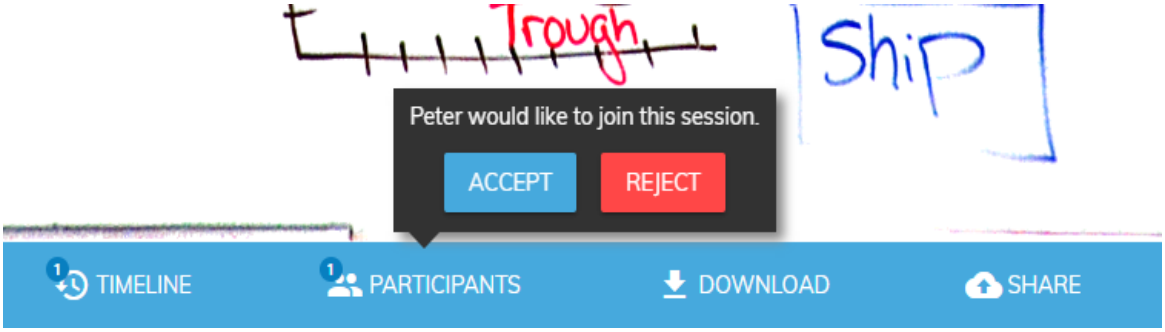
Figure 3: Comparison of Physical Whiteboard (L) and Kaptivo Captured Image (R)

In some ways, the Kaptivo version of the content is better than the in-person version. For example, note how the Kaptivo version has a clean white background vs. the off-white and reflective background of our actual white board. Also note how Kaptivo captured and made some faint lines darker. The net is that the Kaptivo version of the content was easier to consume and far less stressful on the eyes.

It's also worth mentioning that the Kaptivo camera does not capture a person's hand / arm as he writes on the board. Instead, the camera captures only static items within its view. Note that this also includes things like dry erase markers and erasers in a tray, whiteboard mounting bolts, etc. But in all fairness, that's what the in-room users see when they look at the board.

Sharing the Content with Others

The Kaptivo portal allows up to 15 people to view the captured content simultaneously by following the same workflow above (go to URL, enter name and Kaptivo ID). For security reasons, each additional user must be admitted to the session by someone already in the session (see screenshot below).



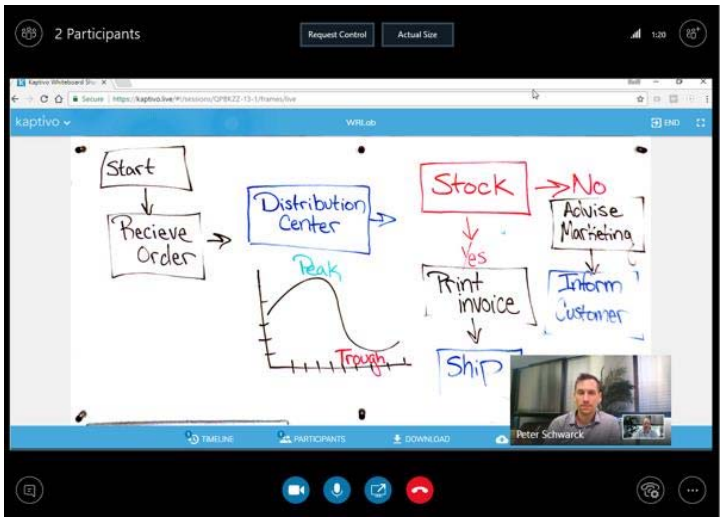
Users can also share the captured whiteboard content through other systems quite easily by simply sharing the browser instance displaying the Kaptivo content.

To test this capability, we conducted conference calls on numerous systems including Blue Jeans Network, Cisco WebEx, Microsoft Skype for Business (via Office 365), Polycom RealPresence, Zoom, and others. Each of these tools allows users to share an application (in this case the browser displaying the whiteboard content) or their desktop with other participants.

In all cases, these tests worked as expected (screen shot at right shows Kaptivo whiteboard content shared within Skype for Business).

The Kaptivo system re-captures and refreshes the whiteboard content in the browser frequently enough to provide a near-real-time view of the whiteboard content.

And the conferencing platforms had no issue sending the Kaptivo content.



In addition, the Kaptivo portal (web UI used to view the captured content) provides a quick way for users to invite others to view the content. To invite others, the host simply clicks on the PARTICIPANTS button, at which point an email including the link to the whiteboard content is automatically created within his default email client (e.g. Outlook). The user can then invite anyone else he chooses via email or by sharing the link within the email in other ways (e.g. via IM).

The portal also offers a quick way to post a screenshot of the whiteboard content to Slack and Trello. To make this happen, the user …

- Clicks on the SHARE button
- Selects the destination system (Slack or Trello are the options at this point)
- Enters his credentials for the destination system (necessary only the first time)
- Chooses where the snapshot should be posted in the system

We tested this feature with both Slack and Trello, and it worked quite well.

Additional Features and Functions

Users viewing the whiteboard content also have access to the following additional features:

- Zoom in / out – by clicking on the magnifying glass within the toolbar, users can zoom in and out and pan around on the zoomed image.
- Timeline – Kaptivo does not archive the entire ongoing stream of captured images on its servers. Instead, Kaptivo provides a 'virtual flipchart' experience by saving a series of timeline images which can be viewed during a session. The system automatically detects when significant changes have occurred (e.g. some content on the board was erased and over-written), and temporarily stores the image captured just before the change was made. This allows users to create and erase content from the board without worrying that the information has been lost. The virtual flipchart images are available for download during the session and for 15 minutes after the session ends.
- Download – users viewing the content can download a snapshot of the whiteboard content as a PNG image or a "slide deck" as a PDF (shows a play-by-play of timeline snapshots taken throughout the session).

Additional Testing and Commentary

<u>Capture Refresh Rate / Frequency</u>

The Kaptivo captured content refreshes within the user's browser automatically every 3 – 5 seconds. While pundits might complain that this is not real-time, for capturing whiteboard content we found this refresh rate to be more than adequate.

<u>Capturing Images (e.g. brochures, post-it notes)</u>

On a whim, we also tested how well Kaptivo could capture other types of content within the whiteboard writing area. First we used a post-it note with a message on it, and then we used a color brochure. Sure enough, the Kaptivo camera saw and captured these items. However, the results highlighted the fact that Kaptivo is designed to capture – and even optimize - dry-erase marker content. Faithfully reproducing pictures is not within Kaptivo's skillset.

Analysis and Opinion

With Kaptivo, the team at Light Blue Optics (LBO) took the "simple is always better" route. Easy to buy. Easy to install. Easy to configure. Easy to use. And, of course, amazingly low cost (MSRP of US $399). It's hard to complain.

There are millions of dry-erase whiteboards in the world today. WR knows of many enterprises that equip each of their hundreds of meeting rooms with dry-erase boards. The reasons are quite obvious - dry erase boards are inexpensive, easy to use, incredibly reliable, and provide significant value.

Organizations seeking to "digitize" their whiteboard content have a wide range of options at various price points and involving various compromises. Some solutions force users to change the way they act. Others require a significant investment in new technology (e.g. a touch display).

Kaptivo, on the other hand, is designed to work with any dry-erase board and standard dry-erase markers. Users do what they've always done, and the content is made available through the web. Simplicity at its best.

We tested Kaptivo with the dry-erase board in our meeting room, and the results were exceptional. In fact, the Kaptivo-captured whiteboard content was – in many cases – better quality and easier to view than the content on the actual physical whiteboard. In this area, Kaptivo exceeded our expectations.

But best of all – we appreciate that the folks at LBO avoided the temptation to bloat the experience with too many bells and whistles. For example, users don't have to create a user account to view the captured content. In addition, the web UI displaying the captured content offers only a handful of key functions (zoom, share, download, etc.).

If we had to complain, we'd say that we'd like to see integration with other systems such as Evernote or SharePoint. This would save users from having to remember to save / download the captured content. Kaptivo already integrates (to some degree) with Slack and Trello, so perhaps other integrations are pending.

All in all, Kaptivo doesn't try to boil the Ocean. It is what it is, and it does what it does – extremely well. Nothing more. Nothing less. All at a price point that should allow any organization to digitize all of its existing (and new) dry-erase boards.

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About Wainhouse Research

Wainhouse Research, www.wainhouse.com, is an independent analyst firm that focuses on critical issues in the Unified Communications and Collaboration (UC&C). The company conducts multi-client and custom research studies, consults with end users on key implementation issues, publishes white papers and market statistics, and delivers public and private seminars as well as speaker presentations at industry group meetings.

About Kaptivo

(copy provided by Kaptivo)

Kaptivo, www.kaptivo.com, is a developer of collaboration solutions and tools for education, training, and corporate markets. The company's mission is to make collaboration easier, better and more fun. Central to everything that we do is the principle that a great user experience comes from allowing people to work naturally, with technology working seamlessly in the background to enable greater productivity. As a company, our belief in collaboration is embodied through our partnerships with a wide ecosystem of industry leaders.